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Use of OECD/NEA Data Project Products in Probabilistic Safety Assessment

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NUCLEAR ENERGY AGENCY

Unclassified **NEA/CSNI/R(2014)2**

Organisation de Coopération et de Développement Économiques
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NUCLEAR ENERGY AGENCY
COMMITTEE ON THE SAFETY OF NUCLEAR INSTALLATIONS

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Use of OECD/NEA Data Project Products in Probabilistic Safety Assessment

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The mission of the NEA is:

– to assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purposes, as well as
– to provide authoritative assessments and to forge common understandings on key issues, as input to government decisions on nuclear energy policy and to broader OECD policy analyses in areas such as energy and sustainable development.

Specific areas of competence of the NEA include the safety and regulation of nuclear activities, radioactive waste management, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information.

The NEA Data Bank provides nuclear data and computer program services for participating countries. In these and related tasks, the NEA works in close collaboration with the International Atomic Energy Agency in Vienna, with which it has a Co-operation Agreement, as well as with other international organisations in the nuclear field.

THE COMMITTEE ON THE SAFETY OF NUCLEAR INSTALLATIONS

"The Committee on the Safety of Nuclear Installations (CSNI) shall be responsible for the activities of the Agency that support maintaining and advancing the scientific and technical knowledge base of the safety of nuclear installations, with the aim of implementing the NEA Strategic Plan for 2011-2016 and the Joint CSNI/CNRA Strategic Plan and Mandates for 2011-2016 in its field of competence.

The Committee shall constitute a forum for the exchange of technical information and for collaboration between organisations, which can contribute, from their respective backgrounds in research, development and engineering, to its activities. It shall have regard to the exchange of information between member countries and safety R&D programmes of various sizes in order to keep all member countries involved in and abreast of developments in technical safety matters.

The Committee shall review the state of knowledge on important topics of nuclear safety science and techniques and of safety assessments, and ensure that operating experience is appropriately accounted for in its activities. It shall initiate and conduct programmes identified by these reviews and assessments in order to overcome discrepancies, develop improvements and reach consensus on technical issues of common interest. It shall promote the co-ordination of work in different member countries that serve to maintain and enhance competence in nuclear safety matters, including the establishment of joint undertakings, and shall assist in the feedback of the results to participating organisations. The Committee shall ensure that valuable end-products of the technical reviews and analyses are produced and available to members in a timely manner.

The Committee shall focus primarily on the safety aspects of existing power reactors, other nuclear installations and the construction of new power reactors; it shall also consider the safety implications of scientific and technical developments of future reactor designs.

The Committee shall organise its own activities. Furthermore, it shall examine any other matters referred to it by the Steering Committee. It may sponsor specialist meetings and technical working groups to further its objectives. In implementing its programme the Committee shall establish co-operative mechanisms with the Committee on Nuclear Regulatory Activities in order to work with that Committee on matters of common interest, avoiding unnecessary duplications.

The Committee shall also co-operate with the Committee on Radiation Protection and Public Health, the Radioactive Waste Management Committee, the Committee for Technical and Economic Studies on Nuclear Energy Development and the Fuel Cycle and the Nuclear Science Committee on matters of common interest."

FOREWORD

The main mission of the Working Group on Risk Assessment (WGRISK) is to provide risk-related support to the Committee on the Safety of Nuclear Installations (CSNI) as the Committee carries out its mission "to assist member countries in ensuring adequate safety of existing and future nuclear installations in their respective territories, through maintaining and further developing the knowledge, competence and infrastructure needed to regulate and support the complete life cycle, including the design, construction, operation, decommissioning and waste management of nuclear reactors, fuel cycle facilities, and other nuclear installations." This also states that CSNI "will strive for continually improving the effectiveness and harmonization of regulatory practices and for facilitating consensus through joint undertakings and shared expertise."

The scope of the activities carried out by WGRISK may involve, for current and future nuclear installations under the purview of CSNI, any or all of the two broad sets of activities pursued in managing risk:

- Risk Assessment (including risk characterization as well as technical assessment) and
- Risk Management (including the development and evaluation of options).

WGRISK provides timely, high-quality work products addressing, to the extent practical, the broad range of risk management needs identified and be forward looking in the identification of risk management issues that may need to be addressed by CSNI and the working group thus being sufficiently flexible to respond to emerging risk management issues, appropriately coordinated with the risk management programmes of member countries and other international organizations and serving as an internationally recognized, authoritative source on risk-related matters and as an important resource for risk-related knowledge management activities.

A main challenge identified in CSNI/CNRA joint Strategic Plan (NEA/CSNI/R(2011)1) is the safe operation of current, new, and advanced nuclear facilities. As described in the Strategic Plan, this challenge is being addressed, in part, by utilizing operating experience, research, and analytical tools (such as Probabilistic Safety Assessment (PSA)). Accurate and complete operating experience data is needed to ensure that PSA results realistically represent as-built and as-operated nuclear power plants and provide useful and meaningful insights. In response to this challenge, and based on needs expressed by a number of member countries, WGRISK initiated a task to investigate the use of OECD data project products in PSA.

At the time this task was identified, four OECD/NEA joint database projects were identified as having a direct connection to PSA. These projects are the:

- International Common Cause Failure Data Exchange (ICDE);

- Piping Failure Data Exchange (OPDE) (which has now been subsumed by the Component Operational Experience, Degradation and Ageing Programme (CODAP));
- Fire Incidents Record Exchange (FIRE) Project; and the
- Computer-based System Important to Safety (COMPSIS) Project

These OECD/NEA data projects can, in principle, support the collection and analysis of data that is highly relevant to probabilistic safety analysis, particularly in the areas of material degradation and aging, common cause failures, fire risk, and digital instrumentation and control systems. All of the projects collect qualitative information that can be useful in the development and review of PSA models. Moreover, several of these projects include specific objectives to support quantification activities.

The main objectives of this task are the following:

- Identification and characterization of the current uses of OECD data project products and data in support of probabilistic safety assessment. In this context, the term ‘products’ refers to data analysis results, technical reports, and other project outputs.
- Identification and characterization of technical and programmatic characteristics that either support or impede use of data project products in PSA. This includes an assessment of which PSA parameters could be potentially estimated from the various data project products and gaps between available product information and PSA data needs.
- Identification of recommendations for enhancing the usefulness of data project products and the coordination between WGRISK and the data projects.

This work represents the collective effort of the task group all of whom provided valuable time and considerable knowledge toward its production. In offering it thanks to these experts, the NEA Secretariat wishes to express particular appreciation to Dr. Kevin Coyne, who as task leader performed the overall co-ordination of the task, and to Dr. Marina Röwekamp and Dr. Shane Turner, who provided considerable assistance as members of the core team for this task. This task benefitted greatly from support, advice, and technical assistance from representatives of the COMPSIS, CODAP, ICDE, and FIRE data projects. Of particular note is the support provided by the OPDE/CODAP Operating Agent Bengt Lydell and data analysis performed by Margaret Tobin. The Task Group members and staff contributing to this report were:

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EXECUTIVE SUMMARY

Background

As noted in the Joint CSNI/CNRA Strategic Plan and Mandates [1], safe operation of current, new, and advanced nuclear facilities is a main challenge for nuclear regulators and technical safety organizations. As described in the Strategic Plan, this challenge is being addressed, in part, by utilizing operating experience, research, and analytical tools (such as Probabilistic Safety Assessment (PSA)). Accurate and complete operating experience data is needed to ensure that PSA results realistically represent as-built and as-operated nuclear power plants and provide useful and meaningful insights.

The Nuclear Energy Agency's (NEA) joint database projects and information exchange programmes enable interested countries, on a cost-sharing basis, to pursue research or the sharing of data with respect to particular areas or problems. There are four joint OECD/NEA database projects with direct relevance to PSA activities:

- International Common Cause Failure Data Exchange (ICDE);
- OECD Piping Failure Data Exchange (OPDE) (which has now been subsumed by the Component Operational Experience, Degradation and Ageing Programme (CODAP));
- OECD/NEA Fire Incidents Record Exchange (FIRE) Project; and
- OECD/NEA Computer-based System Important to Safety (COMPSIS) Project[1]

These data projects can, in principle, support the collection and analysis of data that is highly relevant to PSA, particularly in the areas of material degradation and aging, common cause failures, fire risk, and digital instrumentation and control systems. All of these projects collect qualitative information that can be useful in the development and review of PSA models. Moreover, several of these projects include specific objectives to support quantification activities. However, to date, WGRISK members, particularly those who are not members of the database projects, have made little use of the data project products (principally reports). To address this challenge, and based on needs expressed by a number of member countries, the CSNI WGRISK initiated a task on “Use of OECD Data Project Products in Probabilistic Safety Assessment” in NEA member countries in 2011. This task was coordinated with representatives from ICDE, FIRE, OPDE/CODAP, and COMPSIS and benefitted greatly from the perspectives offered by the data project members.

Objective

The main objectives of this task are the following:

- Identification and characterization of the current uses of OECD data project products and data in support of PSA. In this context, the term ‘products’ refers to data analysis results, technical reports, and other project outputs.
- Identification and characterization of technical and programmatic characteristics that either support or impede use of data project products in PSA. This includes an assessment of which PSA parameters could be potentially estimated from the various data project products and gaps between available product information and PSA data needs.

[1] The COMPSIS project ended in December 2011 but was an active project when this task was initiated.

- Identification of recommendations for enhancing the usefulness of data project products and the coordination between WGRISK and the data projects.

The scope of this task addressed the utilization of products from each of these projects in support of PSA activities.

Because access to data project data is limited to project participants, this task focused on the programmatic uses of data project products in PSA such as statistics and trending rather than specific data applications. Therefore, access to restricted individual data was not required and participation in this task by organizations not currently participating in the various data projects was strongly encouraged.

This task report is expected to be useful to both staff supporting the various OECD data projects and WGRISK members interested in using OECD data project products in support of PSA. A major focus of the report is to provide detailed descriptions of each of the ICDE, FIRE, OPDE/CODAP, and COMPSIS data projects along with example uses of project products provided by WGRISK PSA practitioners. These detailed descriptions are intended to provide information about the scope, content, quality assurance, completeness, and participation in the various data projects. As such, it is expected that this report will serve as a useful knowledge management resource on nuclear power plant operating experience data collected under the auspices of OECD/NEA and its application for PSAs.

A major objective of this task was the strengthening of the relationships between the data project and PSA communities. The recommendations identified by this task are expected to support further coordination, collaboration, and communication between the data projects and WGRISK. Finally, it is also hoped that this task may increase industry support for the various OECD data projects by highlighting the potential benefits of these activities.

Process

This project consisted of three major activities:

- Questionnaire/Survey – A survey instrument was developed in collaboration with representatives from WGRISK and each of the data projects. Two surveys were developed, one that was distributed to members of the PSA community, and a second that was distributed to each of the data projects. The surveys focused on the task objectives and requested information pertaining to project participation, data access, uses of data project products for PSA, challenges in data collection and use, and best practices in use of data project products. The surveys were distributed in the spring of 2012. Good participation completing the survey was noted, with 22 organizations representing 14 member countries providing survey responses. Survey responses were also obtained from the ICDE, FIRE, OPDE/CODAP, and COMPSIS data project representatives.
- Task Meeting – After the survey responses were analysed, a two day task meeting was held in October 2012 at OECD headquarters in Paris, France. Fourteen participants attended the task meeting, representing eight NEA member countries, the NEA secretariat, and the FIRE, ICDE, and CODAP projects[2]. The task meeting agenda included a review of survey results from each data project, open discussions on enhancing participation in data project activities and identification of new data needs, and identification of conclusions and recommendations.
- Final task report – The final task report provides the survey responses and associated analysis, along with a detailed description of the key attributes of each of the data projects. The report also includes recommendations for strengthening collaboration between the PSA community and the joint data

[2] At the time the workshop was held (October 15-16, 2012), both the COMPSIS and ODPE projects had ended.

projects. Best practices for the use of data project products for PSA are identified, along with a summary of success factors for data project activities. The final report was coordinated with representatives from ICDE, FIRE, OPDE/CODAP, COMPSIS, and WGRISK and is intended to represent a consensus view among each of these organizations.

Observations and Findings

In general, OECD joint data projects represent mature data collection efforts and have enjoyed substantial support from the NEA membership. These projects have endeavoured to ensure that data collection activities have a high level of completeness and quality. This commitment to quality has resulted in the development of project-specific programmatic requirements intended to ensure quality. However, there remain some challenges when attempting to apply data project products to PSA activities (e.g., data completeness and exposure information needed to calculate PSA parameters). As such, data applicability and completeness should be fully assessed prior to applying data project products to a specific application. In addition, in order to ensure data will be useful for PSA, it is recommended to involve and to have input from PSA practitioners before starting a new data collection activity. Despite these challenges, experience has been developed by a number of NEA members in applying ICDE, FIRE, and ODPE/CODAP data to PSA initiatives. Examples include CCF parameter estimation, fire frequency calculation, and estimation of piping rupture frequencies. Overall, the data projects are an important OECD/NEA activity, particularly for member states with a small number of nuclear installations and limited national databases.

This task identified a number of challenges and opportunities for further improvement:

- Enhancing participation in data project activities
- Striving for continual improvement in operating experience data collection efforts
- Increased sharing of data with national organizations including industry and standards organizations (as appropriate)
- Consideration of new data collection needs
- Consideration of success factors for application of data project products to PSA when developing new activities

Finally, as a result of this task, several success factors for using data project products in PSA applications were identified. These factors include:

1. Data project addresses important/risk significant issue
2. Demonstrated methods for application of data exist
3. Sustained interest from multiple countries
4. Participants strive to address completeness and comprehensiveness
5. Participants fully understand project objectives, limitations, and resource implications
6. Broader PSA community aware of the project

Of the above factors, data completeness and comprehensiveness has a strong influence on the suitability of data project products to support specific safety applications (including PSAs). Therefore, in addition to maximizing participation in data collection activities, a strong commitment from each data project participant to ensuring complete and high quality data is essential for ultimate success of a project.

Recommendations

The following general recommendations were identified as a result of this activity:

- Enhancing participation in data project activities
  - Make clear to project participants the expected resource commitment associated with data project participation
  - Consider how data can be generally applied to a variety of plant types when collecting operational data
  - Develop limited scope "Benchmark" activities that would allow non-participants to share certain data, and exercise the application of data to PSA related problems (protecting proprietary data may present challenges)
  - Promote/advertise information associated with the various data projects, including application examples (for a variety of plant types) and use of different venues to promote data projects (conferences, workshops, etc.)
- Strive for continual improvement in operating experience data collection efforts
  - Emphasize the importance of periodically verifying data completeness and comprehensiveness
  - Improve knowledge management for new participants (particularly important as current participants retire or move to new positions)
  - Investigate use of other data sources (such as WGOE, IRS, or INES data) to compare data completeness (e.g., ensure noteworthy events have been recorded)
  - Investigate means to share information across data projects, particularly events that may be associated with pertinent events across multiple data projects (e.g., piping ruptures involving flammable fluids)
  - Identify best practices for the roles and responsibilities for national coordinators to encourage information sharing within the member country
- Increase sharing of data with national organizations including industry and standards organizations (as appropriate)
  - Encourage practical applications of data project data and sharing of experience.
  - Make all publicly available documents, papers, and other references more easily accessible through the data project websites
  - Develop a more systematic feedback mechanism with PSA community (e.g., PSA/Data project forum, cross participation in meetings)
  - Consider periodically moving the data project meetings out of Paris to build support from a wider range of utilities
- Consideration of new data collection needs (e.g., new and advanced reactors, human reliability analysis, external hazards)
  - Provide feedback to project representatives for evaluation.
  - Periodically evaluate new data needs in light of project success factors. Propose new project needs through CSNI as appropriate.
- Consider success factors for application of data project products to PSA when developing new activities

Additionally, the following specific recommendations were identified:

- WGRISK members (with assistance from the broader PSA community) should consider performing a detailed critical review of past applications of OECD project data to PSA problems. The results of this critical review to can be used to:
  - Work with data projects to help update best practices and coding guidelines, and
  - Identify potential future activities to improve existing analytical methods, models, tools, and guidance.
- OECD data project members should consider the above general recommendations and the issues and potential resolutions identified in Table 12 when planning future activities.

- CSNI and CNRA decision makers can support these efforts by:
  - Continuing to promote and support interactions between working groups (particularly WGRISK and WGOE) and data projects
  - Recognize the lengthy time scales and sustained commitment needed to ensure a successful data project and provide associated management support
  - Identify areas where stronger data would significantly help current or anticipated risk-informed decision making applications

ACRONYMS

BWR	Boiling Water Reactor
CCF	Common-cause-failure
CCWS	Component Cooling Water System
CE	Combustion Engineering
CI	Completeness Index
CODAP	Component Operational Experience, Degradation and Ageing Programme
COMPSIS	OECD/NEA Computer-based System Important to Safety
CSNI	Committee on the Safety of Nuclear Installations
DEGB	Double-ended Guillotine Break
DM	Degradation Mechanism
EPR	European Pressurised water Reactor
ESWS	Emergency Service Water System
FAC	Flow-accelerated Corrosion
FHA	Fire Hazard Analyses
FIRE	OECD/NEA Fire Incidents Record Exchange Project
HEAF	High Energy Arcing Fault
HELB	High-Energy Line Break
ICDE	International Common Cause Failure Data Exchange
IRS	International Recording System
ISI	In-service Inspection
LOCA	Loss-of-Coolant-Accident
NC	National Co-ordinator
NEA	Nuclear Energy Agency
NPP	Nuclear Power Plant
NSSS	Nuclear Steam Supply System
OA	Operating Agent
OP	Operating Procedure
OPDE	OECD Piping Failure Data Exchange
PCSG	Pipe Crack Study Group
PFM	Probabilistic Fracture Mechanics
PRG	Project Review Group
PSA	Probabilistic Safety Assessment
PWR	Pressurized Water Reactor
QA	Quality Assurance
QAP	Quality Assurance Program
RI-ISI	Risk-Informed ISI
SCAP	SCC and Cable Ageing Project
SCC	Stress Corrosion Cracking
SF	Structural Failure
SG	Steering Group
WE	Westinghouse
WGRISK	Working Group on Risk Assessment

1. INTRODUCTION

1.1 Background

The Nuclear Energy Agency (NEA)/Committee for the Safety of Nuclear Installations' (CSNI) Working Group on Risk Assessment (WGRISK) is tasked with supporting the improved use of Probabilistic Safety Assessment (PSA) in risk informed regulation and safety management through the analysis of results and the development of perspectives regarding potentially important risk contributors and associated risk reduction strategies. To accomplish this mission, WGRISK with its members representing PSA experts from member states, exchanges PSA-related information and experience in the frame of annual meetings. WGRISK is also responsible for developing state-of-the-art reports and technical opinion papers of the working group, publication of technical notes representing the opinion of the authors, and supporting international specialist meetings and workshops. The main products of WGRISK are available to all NEA member countries and in some cases also to the public.

As described in the WGRISK Integrated Plan [2], the WGRISK work programme includes a broad range of PSA and PSA-related topics. The program includes a mix of continuing activities (principally the group's Annual Meeting to share risk-related information) and tasks involving specific PSA-related topics. These latter tasks are formally proposed by WGRISK and approved, as appropriate, by CSNI. Each WGRISK task is proposed by a WGRISK member or set of members with strong interests in the topic, and each task:

- Involves work that is appropriate to the composition, methods, and objectives of WGRISK as a multi-national, information exchange and consensus building working group, and is consistent with the directions and interests of the CSNI;
- Is led by a core team of WGRISK members whose home organizations have both needs and active (or at least planned) work programs directly relevant to the topic;
- Is supported, as appropriate, by WGRISK members outside of the core team; and
- Is appropriately scoped to avoid unnecessary duplication with other international activities and to enable satisfactory completion within realistic time and resource constraints.

The CSNI Operating Plan [3] identifies a number of key challenges and supporting technical goals. Challenges include maintaining adequate nuclear skills and infrastructure and ensuring safe operation of operating, new, and advanced nuclear power plants. The supporting technical goals for these areas include the following:

- Knowledge Management, Transfer and Training (Technical Goal 1.a)
- Databases development and maintenance, and data preservation (Technical Goal 1.b)
- Development and use of PSA and other risk-informed methods (Technical Goal 3.g)

It is well recognized that accurate and complete operating experience data is needed to ensure that PSA results realistically represent as-built and as-operated nuclear power plants and provide useful and meaningful insights. Several joint OECD/NEA data projects can, in principle, support the collection and analysis of data that is highly relevant to probabilistic safety analysis, particularly in the areas of material degradation and aging, common cause failures, fire risk, and digital instrumentation and control systems. In particular, the following joint database projects have direct relevance to PSA activities:

- International Common Cause Failure Data Exchange (ICDE);
- OECD Piping Failure Data Exchange (OPDE) (which has now been subsumed by the Component Operational Experience, Degradation and Ageing Programme (CODAP));
- OECD/NEA Fire Incidents Record Exchange (FIRE) Project; and
- OECD/NEA Computer-based System Important to Safety (COMPSIS) Project[3]

All of these projects collect qualitative information that can be useful in the development and review of PSA models. Moreover, several of these projects include specific objectives to support quantification activities. However, to date, WGRISK members, particularly those who are not members of the database projects, have made little use of the data project products (principally reports). To address this challenge, and based on needs expressed by a number of member countries, the CSNI WGRISK initiated a task on "Use of OECD Data Project Products in Probabilistic Safety Assessment" in NEA member countries in 2011 (see Appendix A).

1.2 Purpose and general approach

The main purpose of this task is the development of a comprehensive task report identifying and characterizing current uses of OECD/NEA joint data project products (including a description of data project products relevant to PSA), motivating factors for participation in the various data projects, and recommendations for enhancing the coordination and use of data project outputs. The expected users of this task report include staff who support the various OECD data projects and PSA practitioners who use operating experience data to support probabilistic safety analysis. It is also expected that this report will serve as a useful knowledge management resource on nuclear power plant operating experience data collected under the auspices of OECD/NEA and its application for PSAs. Finally, this task may help to increase industry support for the various OECD data projects by highlighting the potential benefits of these activities.

A main focus of this study was information gathering through the use of a questionnaire to collect information on a variety of topics. Two questionnaires were developed due to the need to survey two different groups (i.e., data project representatives and WGRISK members). The WGRISK survey requested information relating to participation in the various data projects; collection and use of operating experience data; and challenges and benefits associated with data projects. The data project representative survey focused on data collection issues, application of data products for PSA parameter estimation, availability of project reports, and areas where WGRISK could provide additional support for data project activities. Questionnaire responses were received from a wide range of institutions representing a broad cross section of WGRISK members and observers, including: Canada, Chinese-Taipei, the Czech Republic, Finland, France, Germany, Japan, Korea, the Slovak Republic, Spain, Sweden, Switzerland, the United Kingdom, and the United States. The responses were analysed in order to identify common themes and challenges, insights, best practices, and lessons learned. After the survey responses were analysed, a two day task group meeting was held in October 2012 at OECD headquarters in Paris, France. Fourteen

[3] Although the COMPISIS project ended in December 2011, COMPSIS was an active project when this task was initiated and the task leaders felt that the inclusion of COMPSIS would provide a valuable perspective on the use of data project products for safety assessments.

participants attended the task group meeting, representing eight NEA member countries, the NEA secretariat, and the FIRE, ICDE, and CODAP projects. The task meeting agenda included a review of survey results from each data project, open discussions on enhancing participation in data project activities and identification of new data needs, and identification of conclusions and recommendations.

1.3 Process followed in the work

The task consisted of the following major activities:

- Development, distribution, and completion of survey questionnaires
- Analysis of survey questionnaire results at a task workshop
- Preparation of the final task report

To support this task, a core task team was formed that included representatives from both WGRISK in addition to data project representatives from the ICDE and FIRE projects. The core team worked in close coordination with WGRISK and data project members to ensure that diverse perspectives and views were adequately considered as task activities developed. The core team determined that two different survey questionnaires would be developed, one survey intended for WGRISK members and observers and another survey intended for each of the four data projects. This approach enabled the team to craft the questionnaires to more directly address issues associated with data project administration and PSA applications. These draft questions (provided in Appendices B and C) were then circulated among WGRISK members and observers and the data projects for review and comment. After the questionnaires were finalized, it was circulated to the WGRISK membership and representatives from the ICDE, FIRE, COMPSIS, and OPDE/CODAP projects in the spring of 2012.

The task team received survey responses during the summer and fall of 2012. The responses were analysed and characterized to identify common themes, challenges and limitations, best practices, and unique issues. These results were then discussed at a task meeting workshop held in October 2012 in order to identify significant conclusions and recommendations for the task. The workshop also included open discussion periods to identify methods to further enhance participation in the data projects and identify emerging operating experience data needs.

After the October 2012 workshop, core task team members and other supporting staff developed the final report. Because the knowledge management value of this task was well recognized by the task team, it was decided that the final report would also include descriptions of the ICDE, FIRE, COMPSIS, and OPDE/CODAP data projects. These project descriptions would serve as an important vehicle for providing an overview of the administration, content, quality, completeness, and potential uses of data project products.

1.4 Format of the report

This task report consists of the following sections:

- Chapter 1 – Provides a general overview of motivation and approach used for this task.
- Chapter 2 – Describes scope and objectives of the task.
- Chapter 3 – Provides an overview of the ICDE, FIRE, OPDE/CODAP, and COMPSIS data projects. For each project, the project objectives, project history, data collection methodology and quality assurance, project status, example PSA Applications, and information related to project participation is provided.

- Chapter 4 – Describes the methodology used for this task, including a more detailed description of the survey questionnaire and task group meeting.
- Chapter 5 – Summarizes the analysis of survey responses, including discussion of data challenges and best practices. Also included is a discussion of enhancing project participation, new data and analysis needs, data project success factors for PSA applications, and summary of key issues and potential resolutions.
- Chapter 6 – Provides a summary of key conclusions from the surveys and task group meeting.
- Chapter 7 – Summarizes key recommendations.
- Appendices – Several appendices are provided to provide more detailed information on the CSNI activity proposal sheet governing this task, copies of the surveys sent to WGRISK and Data Project representatives, summary results from each survey, the complete survey responses provided by each responding organization, and contact information for task participants. The following information is provided in the Appendices:
  - Appendix A - CSNI Activity Proposal Sheet WGRISK (2011)-1, “Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)”
  - Appendix B - Survey questionnaire for WGRISK members and observers
  - Appendix C - Survey questionnaire for OECD joint data project representatives
  - Appendix D - Summary of OECD joint data project publicly available information
  - Appendix E - Summary of WGRISK member and observer responses
  - Appendix F - Survey responses from OECD joint data project representatives
  - Appendix G - Complete set of WGRISK member and observer survey questionnaire responses
  - Appendix H - Contact information for task participants

2. OBJECTIVES AND SCOPE

The main objectives of this task, as proposed by WGRISK and approved by CSNI, are the following:

- Identification and characterization of the current uses of OECD data project products and data in support of probabilistic safety assessment[4]. In this context, the term 'products' refers to data analysis results, technical reports, and other project outputs.
- Identification and characterization of technical and programmatic characteristics that either support or impede use of data project products in PSA. This includes an assessment of which PSA parameters could be potentially estimated from the various data project products and gaps between available product information and PSA data needs.
- Identification of recommendations for enhancing the usefulness of data project products and the coordination between WGRISK and the data projects.

This project was motivated, in part, by the recognition that accurate data is needed to ensure that probabilistic safety assessment results realistically represent as-built and as-operated nuclear power plants. Further, the OECD data projects can, in principle, support the collection and analysis of data that is highly relevant to probabilistic safety analysis, particularly in the areas of material degradation and aging, common cause failures, fire risk, and digital instrumentation and control systems. All of the projects collect qualitative information that can be useful in the development and review of PSA models. Moreover, several of these projects include specific objectives to support quantification activities (see Table 1).

[4] Probabilistic Safety Assessment (PSA) refers to analysis methods that estimate risk by answering and quantifying the following triplet of questions: (1) what can go wrong?; (2) how likely is it?; and (3) what are the consequences?

Table 1 Summary of Joint Data Project Objectives

Joint Data Project	**Objectives**[5]	**Relevance to PSA**
ICDE	• collect and analyse CCF events over the long term so as to better understand such events, their causes, and their prevention; • generate qualitative insights into the root causes of CCF events which can then be used to derive approaches or mechanisms for their prevention or for mitigating their consequences; • establish a mechanism for the efficient feedback of experience gained in connection with CCF phenomena, including the development of defences against their occurrence, such as indicators for risk based inspections; • **generate quantitative insights and record event attributes to facilitate quantification of CCF frequencies in member countries; and** • **use the ICDE data to estimate CCF parameters**.	CCF is an important contributor to the risk of nuclear power plants. The ICDE data project directly addresses this issue and includes specific objectives for supporting the quantification of PSA parameters and the generation of quantitative insights.
OPDE	• collect and analyse piping failure event data to promote a better understanding of underlying causes, impact on operations and safety, and prevention; • generate qualitative insights into the root causes of piping failure events; • establish a mechanism for efficient feedback of experience gained in connection with piping failure phenomena, including the development of defence against their occurrence; • **collect information on piping reliability attributes and influence factors to facilitate estimation of piping failure frequencies**.	Estimation of piping reliability contributes to the quantification of initiating event frequencies for loss of coolant accidents and internal flooding. Additionally, for new reactor designs that rely on passive safety systems, it is expected that the risk contribution from the failure of passive components will become more significant

[5] As derived from the associated NEA Joint Project Website (accessible from http://www.oecd-nea.org/jointproj/)

Joint Data Project	Objectives[5]	Relevance to PSA
CODAP	• Collect information on passive metallic component degradation and failures of the primary system, reactor pressure vessel internals, main process and standby safety systems, and support systems (i.e., ASME Code Class 1, 2 and 3, or equivalent), as well as non safety-related (non-code) components with significant operational impact; • Establish a knowledge base for general information on component and degradation mechanisms such as applicable regulations, codes and standards, bibliography and references, R&D programmes and pro-active actions, information on key parameters, models, thresholds and kinetics, fitness for service criteria, and information on mitigation, monitoring, surveillance, diagnostics, repair and replacement; and • Develop topical reports on degradation mechanisms in close coordination with the CSNI Integrity and Ageing of Components and Structures Working Group (WGIAGE).	CODAP has subsumed the main objectives of OPDE and extends the scope of the data collection effort to additional passive components. The information collected under the CODAP project provides an important information source for the estimation of initiating event frequencies and passive component reliability (which is expected to increase in importance as passive safety system designs become more widely used).
FIRE	• collect fire event experience (by international exchange) in an appropriate format in a quality-assured and consistent database; • collect and analyse fire events over the long term so as to better understand such events and their causes, and to encourage their prevention; • generate qualitative insights into the root causes of fire events in order to derive approaches or mechanisms for their prevention and to mitigate their consequences; • establish a mechanism for efficient operation feedback on fire event experience including the development of policies of prevention, such as indicators for risk-informed and performance-based inspections; and • **record characteristics of fire events in order to facilitate fire risk analysis, including quantification of fire frequencies.**	Fire is an important contributor to nuclear plant risk. Operating experience from fire events supports estimation of fire initiating event frequencies and provides a qualitative understanding of propagation and mitigation. A specific objective of the FIRE project is facilitating the quantification of fire frequencies.

Joint Data Project	Objectives[5]	Relevance to PSA
COMPSIS	• define a format and collect software and hardware fault experience in computer-based safety critical NPP systems (hereafter called "COMPSIS events") in a structured, quality-assured and consistent database; • collect and analyse COMPSIS events over a long period so as to better understand such events, their causes and their prevention; • generate insights into the root causes of and contributors to COMPSIS events, which can then be used to derive approaches or mechanisms for their prevention or for mitigating their consequences; • establish a mechanism for an efficient feedback of experience gained in connection with COMPSIS events, including the development of defences against their occurrence, such as diagnostics, tests and inspections; • **<u>record event attributes and dominant contributors so that a basis for national risk analysis of computerised systems is established.</u>**	Currently operating and new reactors are making increased use of digital I&C systems. Digital systems have some unique characteristics, result in different failure causes and/or modes than traditional analogue systems. In order to incorporate these systems into PSAs, it is necessary to have access to sufficient operating experience feedback. In addition, COMPSIS included a specific objective to support the risk analysis of digital systems.

As noted above, the objectives of these projects relate directly to the needs of PSAs. However, to date, WGRISK members, particularly those who are not members of the database projects, have made little use of the data project products (principally reports). Therefore, additional work is needed to better understand the obstacles to fully utilizing OECD data project products in PSAs.

OECD DATA PROJECT OVERVIEW

The main objective of this Chapter is to provide an overview of the ICDE, FIRE, OPDE/CODAP, and COMPSIS projects. This material is intended to provide a short overview of the objectives of each of these data projects, in addition to describing the project history, data collection methods, quality assurance, project participation, and previous applications of data project products for PSA.

3.1 International Common Cause Failure Data Exchange (ICDE)

Common-cause-failure (CCF) events can significantly impact the availability of safety systems of nuclear power plants. In recognition of this, CCF data are systematically being collected and analysed in several countries. A serious obstacle to the use of national qualitative and quantitative data collections by other countries is that the criteria and interpretations applied in the collection and analysis of events and data differ among the various countries. A further impediment is that descriptions of reported events and their root causes and coupling factors, which are important to the assessment of the events, are usually written in the native language of the countries where the events were observed. To overcome these obstacles, the preparation for the international common-cause failure data exchange (ICDE) project was initiated.

ICDE is now a mature project that has been running since 1994. There is a significant amount of data over a number of components. ICDE data, which is available to members, can be used to support PSA quantification. Publicly available qualitative information can also inform the development of CCFs in PSA, i.e. what to model and how to model them. In addition to supporting PSA, a significant amount of qualitative insights can be gained from the data and publicly available reports that can be used to improve the defences to CCF.

3.1.1 Project Objectives

The objective with the ICDE activity is to provide a framework for a multinational cooperation to:

1. collect and analyse CCF events over the long term so as to better understand such events, their causes, and their prevention;
2. generate qualitative insights into the root causes of CCF events which can then be used to derive approaches or mechanisms for their prevention or for mitigating their consequences;
3. establish a mechanism for the efficient feedback of experience gained in connection with CCF phenomena, including the development of defences against their occurrence, such as indicators for risk based inspections;
4. generate quantitative insights and record event attributes to facilitate quantification of CCF frequencies in member countries; and
5. use the ICDE data to estimate CCF parameters.

The ICDE project operates with a clear separation between data collection and analysis. The data collection and analysis firstly results in qualitative CCF information that can be used for the assessment of the effectiveness of defences against CCF events and the importance of CCF events in the probabilistic safety assessment framework. The qualitative insights on CCF events generated by the analysis are made available through published OECD/NEA Committee on the Safety of Nuclear Installations (CSNI) reports.

The first, second and fourth objectives are fulfilled by collection of data to defined specifications, analysis of this data, reporting the qualitative insights in public reports and carrying out workshops during regular ICDE meetings. The third objective is fulfilled partially by the analysis and reporting carried out for objectives 1, 2 and 4, but also by members sharing the insights within their countries; the project itself allows such feedback to occur. The fifth objective is fulfilled by recording the data in such a way to allow the estimation of CCF parameters by member countries; this is discussed later.

It is considered the data that is submitted into ICDE is of both sufficient quality and quantity to enable each of the project objectives to be addressed.

Figure 1 provides an overview of the objectives with associated high-level activities that the ICDE Steering Group performs to achieve the objectives.

3.1.2 Project History

ICDE was initiated in August of 1994. Since April 1998, the OECD/NEA has formally operated the project. Phase II had an agreement period that covered years 2000-2002, phase III covered the period 2002-2005, phase IV covered years 2005-2008 and phase V covered 2008-2011. Member countries under the phase VI (2011-2014) agreement and the organisations representing them in the project are: Canada (CNSC), Finland (STUK), France (IRSN), Germany (GRS), Japan (JNES), Korea (KAERI), Spain (CSN), Sweden (SSM), Switzerland (ENSI), United Kingdom (ONR), United States (NRC). In addition the Czech Republic (UZV) has recently joined the project.

Over the duration of the project the components of interest have gradually grown, as have the number of CCF events and the exposed populations.

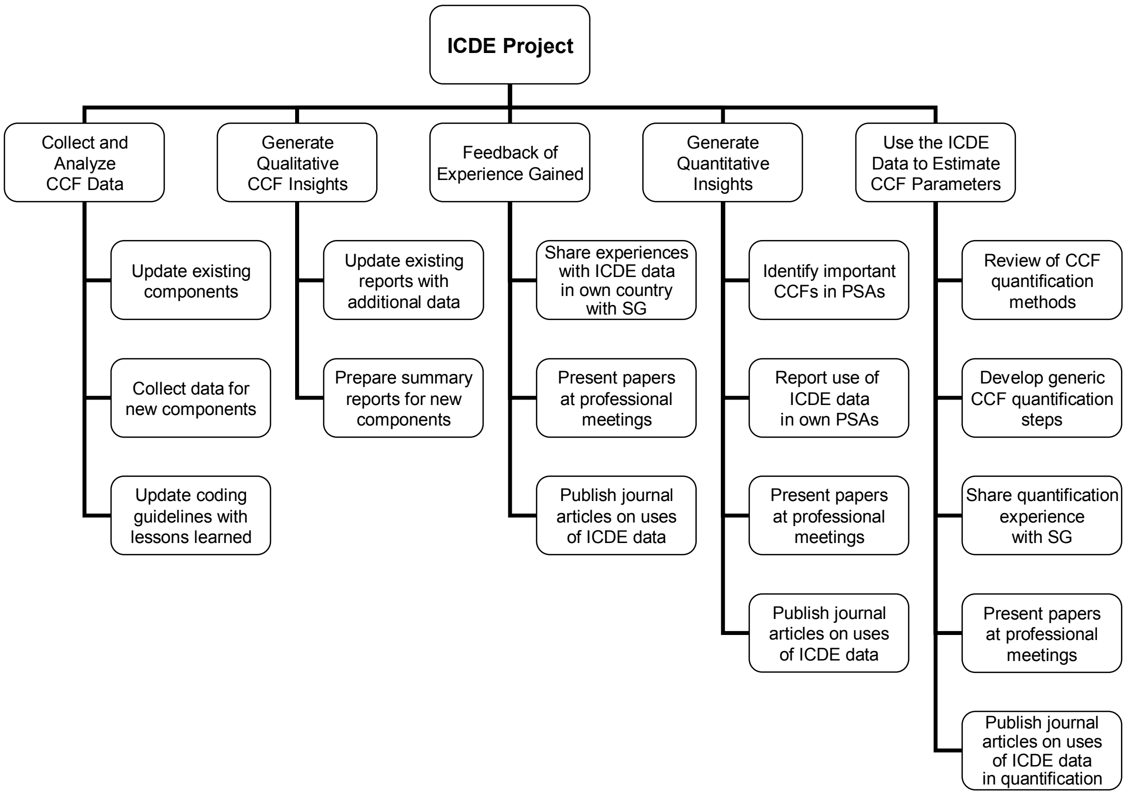

Figure 1 ICDE Project objectives and associated activities to achieve the objectives

3.1.3 Data Collection Methodology and Quality Assurance

Technical scope

The ICDE operates with a clear separation of the collection and analysis activities. In the first stage of the project, emphasis has been on the collection of data. The analysis results mostly in qualitative CCF information. It may be used for the assessment of 1) the effectiveness of defences against CCF events and 2) the importance of CCF events in the PSA framework. The qualitative insights on CCF events generated are made public as CSNI reports [4]–[14]. The member countries are free to use the data in their quantitative and PSA related analyses.

The data collection and qualitative analysis result in a quality assured database with consistency verification performed within the project. The responsibilities of participants in technical work, document control and quality assurance procedures as well as all other matters dealing with work procedures are described in a special ICDE quality assurance programme and the ICDE operating procedures.

The ICDE activity defines the formats for collection of CCF events in order to achieve a consistent database. This task includes the development and revision of a set of coding guidelines describing the classification, methods and documentation requirements necessary for the ICDE database. Based on the generic guidelines, component specific guidelines are developed for all analysed component types as the project progresses. These guidelines are made publicly available as a CSNI report [15]; these are discussed later.

The ICDE Steering Group prepares publicly available reports containing insights and conclusions from the analysis performed whenever major steps (i.e. analysis of a dataset for a certain component type like check valves) of the project have been completed. The ICDE Steering Group assists the appointed lead person in reviewing the reports. Following this, an external review is provided by OECD/NEA CSNI.

ICDE reporting also includes papers to suitable international conferences like PSAM and PSA, and journals [16]–[29]. The intention is to make the lessons learnt known to a large nuclear safety audience. The ICDE time schedules define the milestones of data collection tasks for each analysed component group. The time schedule is reassessed and revised at each ICDE Steering Group meeting. The work starts with drafting the guidelines, getting comments, making a trial data collection, approving the guidelines, making the data exchange, resolving the remaining problem cases and reporting. Generally, it takes between 1.5 and 2 years from the first guideline draft to commencing the data exchange itself. Furthermore, from that point it takes about 2-3 years to approving the final report. Thereafter, new exchange rounds (database updating) are possible.

Figure 2 provides an overview of the project operation, including supporting documentation.

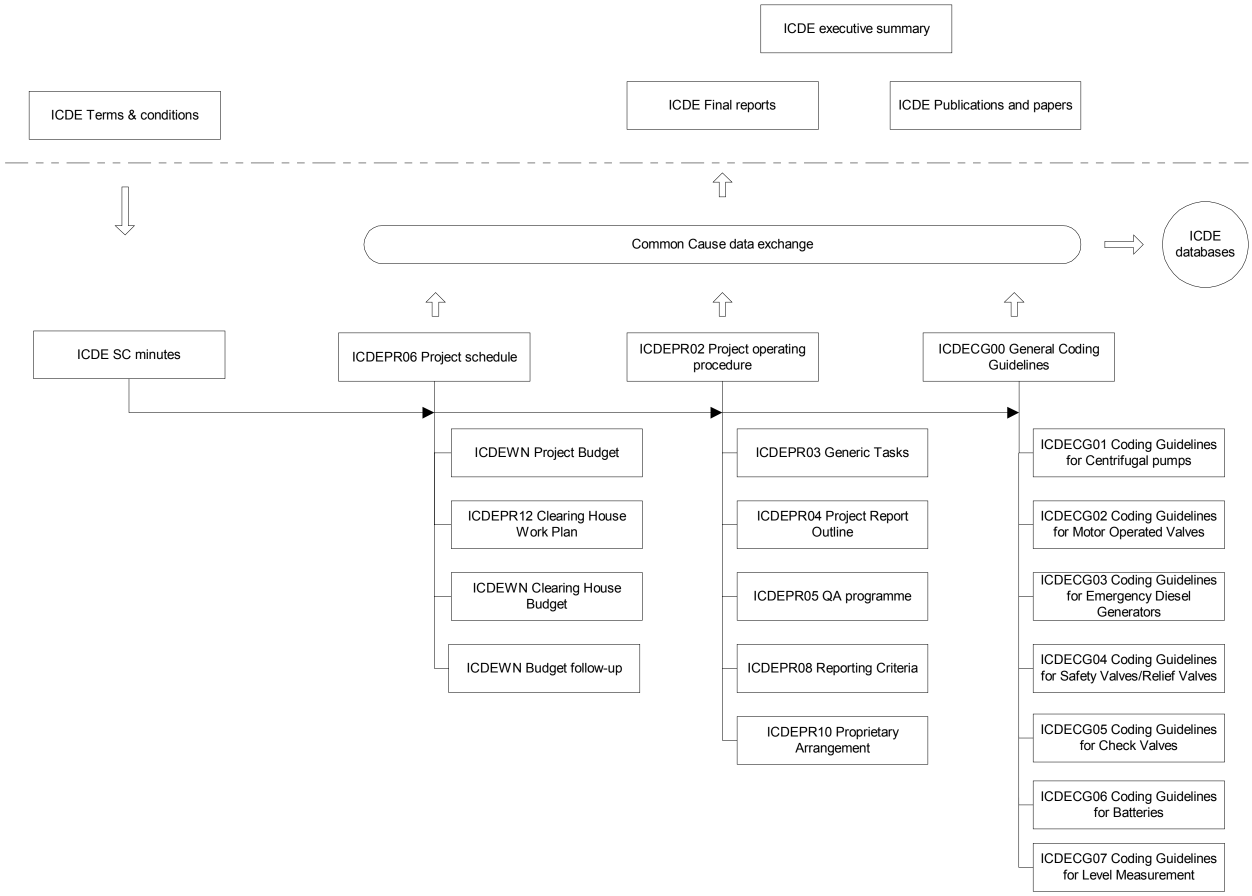

Figure 2 ICDE Operating Procedure Documents Overview

Project documentation

Project documentation consists of the following categories of documentation:

- Coding guidelines (general [15] and specific) – data collection guidelines have been developed during the ICDE project and are continually revised. They describe the methods and documentation standards necessary for the development of the ICDE databases and reports. The format for data collection is described in the general coding guidelines and in the component-specific guidelines. Component-specific guidelines are developed for all analysed component types as the ICDE project evolves. Having clear and strict coding guidelines (including relevant systems, component boundaries and functional failure modes) helps ensure that national differences are resolved.
- Component analysis reports [4]–[14] – these are the main vehicles for sharing the insights from the collected CCF events with a wider audience, and they are made publicly available.
- Operating procedures [30], [31] – a number of operating procedures have been produced that set out how the project is run, including data collection methodologies and quality assurance etc.
- ICDE Tools user guide – this describes in detail how the tool developed to interface with the ICDE data can be used.

Data collection methodology

ICDE procedure, ICDEPR03 [31], "ICDE Generic Tasks: Coding Steps for Common-Cause Failure Events with Examples" describes the process for collecting data for a given component. The key steps in this process are outlined below:

- Development of coding guidelines
- Trial data collection
- Database and coding guidelines finalised
- Data collection
- Quality assurance
- Analysis
- Reporting

The data is recorded in a quality assured and consistent database. The set of coding guidelines describing the methods and documentation requirements necessary for the development of the ICDE databases are a key part of this.

Quality assurance

In terms of data quality, a significant amount of effort is carried out by members when collecting the data, the Operating Agent, who manages the database and the ICDE Steering Group. The Operating Agent verifies whether the information provided by the national coordinators complies with the ICDE coding guidelines, verifies the correctness of the data jointly with the national coordinator who has provided such data, and operates the databank.

Quality assurance of the data that is collected within ICDE is a key activity of the Operating Agent and of the ICDE Steering Group. However, it is also recognised that that data is only as good as that collected within member countries.

Key steps that ensure data quality include:

- General component guidelines are developed;
- Specific component guidelines are developed;
- Trial data collection is carried out that is reviewed by the Operating Agent – this may influence the coding guidelines and the data collection requirements;
- Events are coded and collected consistent with the component coding guidelines;
- Operating Agent reviews all events entered into the database by member countries, which also includes a check against the requirements specified in the coding guidelines;
- Countries iterate with the Operating Agent to resolve comments;
- Workshops carried out within the ICDE Steering Group also add an additional chance for quality assurance;
- Report about generic insights is developed; and
- Completeness statements are provided by member countries – this ensures that members have a clear understanding of the quality of data from any country. Where countries' data is not complete they may only be given partial access to the data from other countries, thus providing an incentive for more complete data collection.

To enable this to occur in a consistent way, ICDE have developed various operating procedures: ICDEPR02 "ICDE Operating Procedures", ICDEPR03 "Generic Tasks: Coding Steps for Common-Cause Failure Events with Examples", ICDEPR04 "ICDE Project Report Outline – A Guidance Note for

Authors", and ICDEPR05 "ICDE Quality Assurance Programme". ICDEPR05 sets out the responsibilities of participants in technical work, document control and quality assurance procedures as well as all other matters dealing with work procedures.

An agreement and an Operating Agent do not alone guarantee good quality results, but data collection and analysis has to be organised at national level. In most countries, the data exchange is carried out through the regulatory bodies. They often delegate this to other organisations, since arriving at the information required by ICDE requires access to plant maintenance data. That data is normally proprietary.

There are also activities to improve the homogeneity of the data. In addition there has been a review of national reporting criteria, which is part of the ICDE documentation: ICDEPR08 "Reporting Criteria".

Applicability to different plant types

ICDE data collections are generally applicable across a wide range of reactor technologies. Firstly, many components are common to many reactor types, secondly a wide range of reactors have been considered in the data collection including PWRs, BWRs, AGRs, Magnox, CANDU, RMBK etc. and finally coding guidelines have been developed to capture CCFs for a range of system types for each component considered.

In addition, it is noted that many of the insights from CCFs, including coupling factors, root causes, etc. are applicable across a range of reactor types.

3.1.4 Project Status

It is intended to include in ICDE the key components of the main safety systems. As of 31 December 2012 ICDE includes the following data collections:

- Batteries [11]
- Breakers [8]
- Centrifugal pumps [4], [14]
- Check valves [12]
- Control rod drive assemblies [6]
- Diesel generators [10]
- Heat exchangers [5]
- Level measurement [9]
- Motor operated valves [13]
- Safety and relief valves [7]

In addition, new data collections have recently started or are being considered for the following components:

- Main steam isolation valves
- Fans
- Digital instrumentation and control

In terms of data quantity, ICDE has collected a significant amount of data as summarised in Table 2 and Figure 3. Figure 3 illustrates how this data has grown with time.

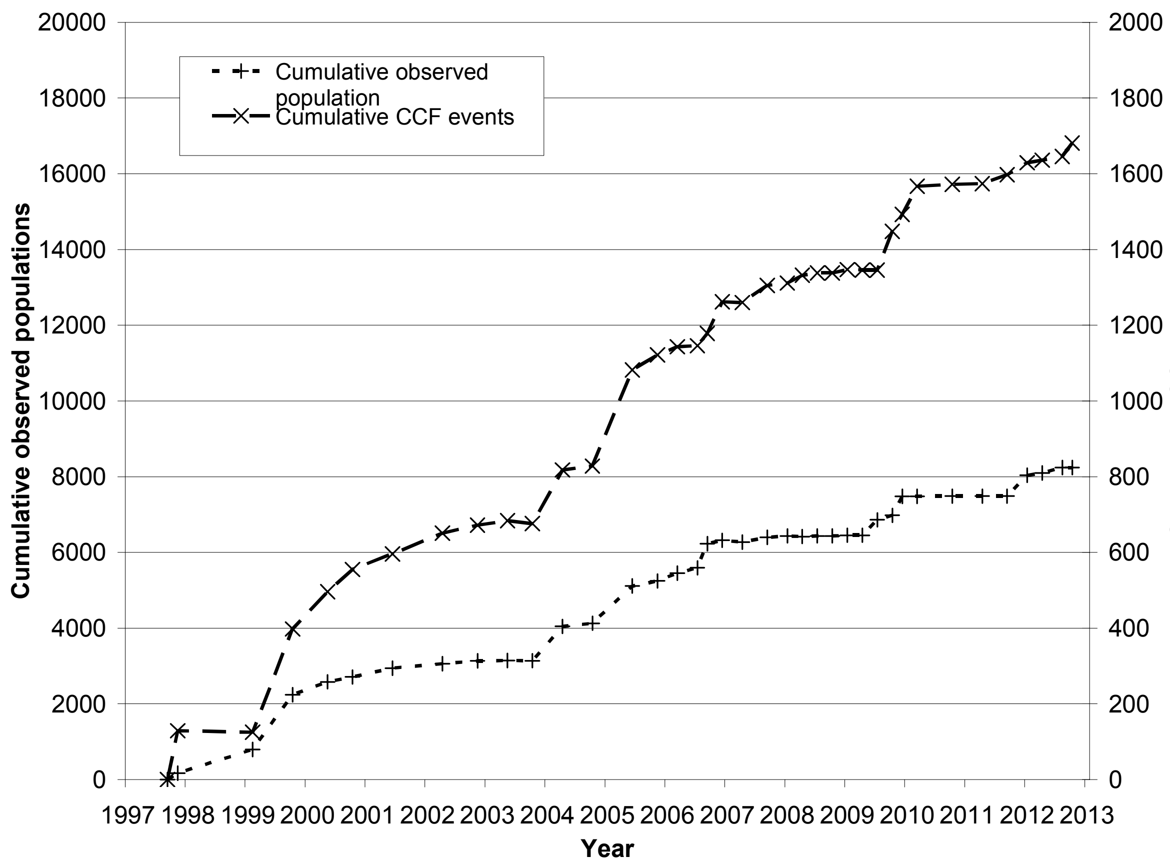

Figure 3 Changes in ICDE Data Over Time

Events included within the scope of the data collection include both full CCF events[6] (CCFs including those involving degraded components and incipient failures are recorded, and not just total CCFs) and potential CCF events. To include all events of interest, an "ICDE event" is defined as follows:

ICDE Event: Impairment[7] of two or more components (with respect to performing a specific function) that exists over a relevant time interval) and is the direct result of a shared cause. In addition the ICDE data analysts may add interesting events that fall outside the ICDE event definition but are examples of recurrent – eventually non-random – failures.

In addition to CCF events, to allow quantification of CCFs the observed population and independent failures are also recorded, that is all component groups of interest within the power stations are identified and recorded in the ICDE database whether or not a CCF event has been observed.

[6] Common Cause Failure Event: A dependent failure in which two or more component fault states exist simultaneously, or within a short time interval, and are a direct result of a shared cause.

[7] See [15] for definition of impairment and relevant time interval.

Table 2 Overview of ICDE Database Content (as of 31 December 2012)

Component	*Number of observed populations*	*Number of CCF events*
Battery	375	75
Breakers	1015	105
Centrifugal pumps	1619	377
Check valves	1222	115
Control rod drive assemblies	490	171
Diesels	303	215
Fans	13	3
Heat exchanger	606	52
Level measurement	578	153
Motor operated valves	1307	161
Safety and relief valves	713	254
TOTAL	8241	1681

Overview of data

The database contains general information about event attributes like root cause, coupling factor, detection method and corrective action taken.

As at the end of phase V (March 2011), data analysis and exchange have been performed for centrifugal pumps, diesel generators, motor-operated valves, safety relief valves, check valves, batteries, level measurement components and switching devices and circuit breakers. Also, first round data collection has been performed for control rod drive assemblies and heat exchangers.

The breakdown of ICDE events in the database, i.e. events involving at least incipient common cause characteristics, across all components is shown in Table 3. Special emphasis is given on CCF events in which each component fails completely due to the same cause and within a short time interval. These events are called “Complete CCF”. Table 3 shows the distribution of ICDE events amongst the different severity of CCF (e.g. complete CCF, partial CCF, etc.), the failure causes and group size.

Table 3 Overview of ICDE CCF Events

Number of events		**Group Size**					
CCF severity	**Failure Causes**	**1**	**2**	**3**	**4**	**≥5**	**Totally**
Complete CCF	Hardware		27	3	11	7	48
	Human		33	15	10	14	72
	Environmental		6		1	1	8
Sum of Complete CCF			**66**	**18**	**22**	**22**	**128**
Partial CCF	Hardware			9	37	89	135
	Human		1	13	26	52	92
	Environmental			2	2	5	9
	Other/Unknown/No Data					3	3
Sum of Partial CCF			**1**	**24**	**65**	**149**	**239**
CCF Impaired	Hardware		50	19	58	75	202
	Human		23	21	53	61	158
	Environmental		3		3	2	8
	Other/Unknown/No Data				3	4	7
Sum of CCF Impaired			**76**	**40**	**117**	**142**	**375**
Complete Impairment	Hardware		77	15	38	131	261
	Human		49	22	33	50	154
	Environmental		4		5		9
	Other/Unknown/No Data		2		3	3	8
Sum of Complete Impairment			**132**	**37**	**79**	**184**	**432**
Incipient Impairment	Hardware			30	51	84	165
	Human	1		12	28	189	230
	Environmental				3	3	6
	Other/Unknown/No Data			1	1	7	9
Sum of Incipient Impairment		**1**		**43**	**83**	**283**	**410**
Single Impairment	Hardware		10		8	2	20

	Human		6			13	19
	Environmental					1	1
Sum of Single Impairment			**16**		**8**	**16**	**40**
No Impairment	Human		2			1	3
Sum of No Impairment			**2**			**1**	**3**
Totally		**1**	**293**	**162**	**374**	**797**	**1627**

Number of events		**Group Size**					
Failure Causes	**CCF severity**	**1**	**2**	**3**	**4**	**≥5**	**Totally**
Hardware	Complete CCF		27	3	11	7	48
	Partial CCF			9	37	89	135
	CCF Impaired		50	19	58	75	202
	Complete Impairment		77	15	38	131	261
	Incipient Impairment			30	51	84	165
	Single Impairment		10		8	2	20
Hardware Sum			**164**	**76**	**203**	**388**	**831**
Human	Complete CCF		33	15	10	14	72
	Partial CCF		1	13	26	52	92
	CCF Impaired		23	21	53	61	158
	Complete Impairment		49	22	33	50	154
	Incipient Impairment	1		12	28	189	230
	Single Impairment		6			13	19
	No Impairment		2			1	3
Human Sum		**1**	**114**	**83**	**150**	**380**	**728**
Environmental	Complete CCF		6		1	1	8
	Partial CCF			2	2	5	9
	CCF Impaired		3		3	2	8
	Complete Impairment		4		5		9

	Incipient Impairment				3	3	6
	Single Impairment					1	1
Environmental Sum			**13**	**2**	**14**	**12**	**41**
Other/Unknown/No Data	Partial CCF					3	3
	CCF Impaired				3	4	7
	Complete Impairment		2		3	3	8
	Incipient Impairment			1	1	7	9
Other/Unknown/No Data Sum			**2**	**1**	**7**	**17**	**27**
Totally		**1**	**293**	**162**	**374**	**797**	**1627**

New initiatives

New initiatives are discussed regularly during ICDE Steering Group meetings. The following new initiatives have recently started or are being explored:

- data collection for new components, e.g. fans, main steam isolation valves, computerised systems;
- update of previous component reports as more data is collected, including examination of any trends since the last report;
- cross component CCFs;
- subtle dependencies; and
- highlighting important events based on criteria that are being developed.

Such initiatives are identified through ICDE members and often explored via workshops during the ICDE meetings.

3.1.5 PSA Applications of ICDE Products

To be able to support PSA, the data must have the following attributes:

- inform how CCFs are modelled in the PSA;
- contain all data required for quantification; and
- the data must be comprehensive and complete.

Each of these factors is considered below.

The publicly issued component reports contain both qualitative and quantitative insights from across all events. Whereas this will not allow CCF parameters to be estimated it is still of value to PSA. For example it highlights specific failure modes, defences and contributory factors that may need to be considered within the PSA.

In terms of the data comprehensiveness and completeness a significant amount of effort is expended by the Operating Agent, ICDE Steering Group and members to ensure that the data is as comprehensive and complete as possible. This is through the ICDE operating procedures, the component coding guidelines and general quality assurance procedures. Therefore, in general it is considered that there is a high level of completeness to the datasets within ICDE. In addition, all members have to produce a completeness statement for each of their data collections on each component. This gives all members visibility of the completeness of data for an individual component from a specific country. In the small number of areas where there are issues with completeness, these data can be easily excluded from any specific application. In summary:

- Data comprehensiveness
    - CCFs across a large number of exposed populations are collected.
    - ICDE is focused on components important to nuclear safety.
    - Data comprehensiveness continues to be reviewed.
    - ICDE data includes incipient, degraded and complete failures.
    - The ICDE project has been operated for a large number of years.
    - Data within ICDE continues to grow.
- Data completeness
    - Data completeness has improved in recent years.
    - Component coding guidelines help improve consistency between events in ICDE.
    - Quality assurance of the data is a significant and important activity, although it is recognised that this is timely and costly.
    - All members are required to produce a completeness statement (both for CCF events and observed populations).

The ICDE project has spent a significant amount of effort in improving the quality and completeness of data within the database. Specific functionality has also been developed within the database tool to identify potential issues within the data.

In terms of CCF quantification, the data is structured to allow quantification. All required information is captured, including the exposure information. It is an expectation that information is recorded on all observed populations of interest to ICDE for a given plant in a country no matter whether a CCF event has occurred or not. The data allows all commonly used CCF quantification approaches, including the impact vector approach in NUREG/CR-5485 [32], to be supported.

Example uses of ICDE data

ICDE data has been used by many members in a range of applications. The following highlights a sample of the many applications.

- Workshops have periodically taken place to discuss the use of ICDE data [33].

- In Germany the ICDE data has been used to analyse the CCF phenomena in the events from other countries. Numerous CCF phenomena were identified not yet observed in national operating experience. This led to recommendations for checking and improving of component specific CCF defence measures in national nuclear power plant. These recommendations led to some back fittings in some German nuclear power plant, e.g. to an improvement of the protection of different air intakes under extreme weather conditions.

- In 1997 IRSN analysed a preliminary version of the PSA carried out by the designers for the European Pressurised water Reactor (EPR) project. In this preliminary version, the designers considered that a CCF between the four Essential Service Water System (ESWS) pumps or

Component Cooling Water System (CCWS) pumps was not possible due to the non simultaneous operation of the pumps during normal plant operation. However ESWS and CCWS are support systems of MPSI and of LPSI in accidental situations, and a CCF between the pumps of these systems could lead to core melt in case of LOCA. At that time ICDE was collecting CCF events relating to centrifugal pumps and several CCF events concerned ESWS or CCWS pumps in PWRs (CCF groups of 4 pumps). This argument was an important input for introducing CCFs between the support systems pumps, leading to dominant contributions and consequently to a design modification.

- Numerous members, particularly regulators, have utilised the data to estimate CCF parameters or probabilities in order to compare with the claims made by licensees in their PSAs. This has led to either challenge of the basis of the licensee's claims or to their claims being accepted.
- In Korea, ICDE data has been used to improved CCF parameter estimates for service water systems. Until now, the USNRC generic values of the CCF parameters have been mainly used in most PSA projects for the Korean nuclear power plants (NPPs). The PSA results for one of NPPs in Korea, called KX NPP, showed that CCF events of emergency service water system (ESWS) pump failure to run were identified as one of dominant contributors to its internal event core damage frequency (CDF). The sum of cutsets including the CCF events of ESWS pump failure to run contributed about 20% of its internal event CDF. Plant specific detailed CCF event analysis was needed to reasonably estimate CCF parameters to incorporate the design, environmental, and operating characteristics of KX NPP. To do this, KAERI developed a CCF analysis program, so called CAFE-PSA (common CAuse Failure Event analysis program for PSA) to analyse CCF events in the ICDE database [34].

  CCF parameters of ESWS pump failure to run for reference plant in Korea were estimated with the CAFE-PSA. The system unavailability of ESWS and the CDF for KX NPP were quantified by using the conventional method and the decomposition method. The conventional method was based on the symmetry assumption that the probabilities of CCF events involving similar components were the same. The decomposition method assumed that the total failure events of a component including the CCF events were divided into their symmetrical and asymmetrical parts. Reasonable values of CCF parameters were obtained through performing detailed plant specific CCF event analysis. The estimated Alpha factor with three out of three failure criterion was about one half of that for recent US NRC CCF parameters[8]. The CCF factor, a multiplier for total failure probability of a component to represent the probability of a CCF event involving three specific components, was estimated under one half of that without detailed analysis of CCF parameters. The re-quantification results on the CDF of KX NPP with the new estimated Alpha factor showed that originally estimated CDF with generic Alpha factor decreased by 16.84% and the contribution of the sum of cutsets for the CCF events of ESWS pump failure to run to internal event CDF decreased from about 20% to 3.29%.
- A qualitative analysis on 10 kV breakers of the French EPR (Flamanville 3) led to the conclusion that intersystem CCF Groups existence cannot be ruled out for these components. The 10 kV circuit breakers of the French EPR are void cut-off breakers, unlike high voltage breakers on French existing nuclear power plants. One coal-fired plant in France uses void cut-off breakers, but no failure involving the cut-off system of its breakers was ever experienced. To get information from operating experience on this kind of breakers, the ICDE database was consulted:
  - countries contributing to this database operate void cut-off breakers between 2 and 11 kV.
  - 2 CCF events and some incipient degradation or degradation were observed.

  Thus, several sensitivity studies were performed to assess the impact of adding intersystem CCF Groups to the French EPR PSA model for 10 kV breakers. Eventually, the studies showed that the

[8] http://nrcoe.inl.gov/results/CCF/ParamEst2007/ccfparamest.htm

impact on the core damage frequency was low enough to justify that adding these intersystem CCF Groups in this PSA was not necessary.

- In order to evaluate batteries CCF parameters for its French EPR PSA, EDF analysed the batteries ICDE report, in which 50 events from 9 countries are examined. These CCF events concern group sizes from 2 to 16 batteries. Most of the quantitative data from this report were used to estimate CCF parameters for EPR batteries group sizes (2 and 4 batteries).

In addition to those reports on the public part of the ICDE website[9], a number of papers have been produced describing use of ICDE data (e.g., see Appendix D). Furthermore, different aspects of ICDE data are examined during ICDE Steering Group meetings using focused workshops, which has included:

- analysing CCF insights across components;
- identifying interesting events, for example complete CCFs, CCFs affecting multiple units at one site, intersystem dependencies, etc.; and
- analysing CCFs associated with external events such as weather, earthquakes, clogging etc.

3.1.6 Project Participation

The ICDE Steering Group (SG) controls the project, which is made up of the member country national coordinators, or their representatives, with assistance from an OECD/NEA Secretariat and the Operating Agent (OA). The ICDE Steering Group meets twice a year on average. The ICDE Steering Group responsibilities include the following types of decisions: secure the financial (approval of budget and accounts) and technical resources necessary to carry out the project, nominate the ICDE project chair, define the information flow (public information and confidentiality), approve the admittance of new members, nominate project task leaders (lead countries) and key persons for the ICDE Steering Group tasks, define the priority of the task activities, monitor the development of the project and task activities, monitor the work of the OA and quality assurance and prepare the legal agreement for project operation. In most countries the data exchange is carried out through the regulatory bodies, with the possibility to delegate it to other organisations.

OECD/NEA is responsible for administering the project according to OECD rules. This means secretarial and administrative services in connection with the funding of the project such as calling for contributions, paying expenses incurred in connection with the Operating Agent and keeping the financial accounts of the project, and issuing publicly available ICDE reports. OECD/NEA appoints the project Secretariat.

To assure consistency of the data contributed by the national coordinators the project operates through an Operating Agent (OA). The OA verifies whether the information provided by the national coordinators complies with the ICDE coding guidelines [15]. It also verifies the correctness of the data included in the database jointly with the national coordinator who has provided such data. The OA is responsible for the database and consistency analysis.

Running an international project requires funding and consequently the participating countries make yearly an agreed ICDE contribution to the NEA for reimbursement of the costs of the Operating Agent and the OECD NEA Secretariat. In addition, each participant bears all other costs, like the ones for data

[9] http://www.oecd-nea.org/jointproj/icde.html

collection and national analysis, associated with participation in the project. These costs are generally much higher that the costs of running the Operating Agent.

ICDE Data Confidentiality and Access

The ICDE database is available for signatory organisations. The only possibility to get access to the working material is to actively take part in the data exchange.

ICDE data is protected by the terms and conditions of the project. CCF event data is only available to project members, and to those who have collected data over a similar period of time, the "in-kind principle". This limited access leads to more open sharing of events by members. Supporting information, e.g. generic component coding guidelines, specific component coding guidelines are fully available to all members.

ICDE follows strict rules relating to access to the proprietary data. In particular, project requirements specify that:

> *"The database or those parts of it containing collected data in ICDE format will be accessible to those Signatories, Associated Members or other organisations that have actually contributed data with a comparable coverage (as described in ICDE Operating Procedures) to the data bank through their country's national coordinators."*

The in-kind principle is followed in the data exchange in that each country gets the dataset corresponding to its own data sent to the Operating Agent. Thus, just participating and paying the fees does not lead to directly receiving any data without a member's own data collection and submittal effort.

Non-members can only access the publicly available component reports and general coding guidelines; there is no access to the ICDE database. However, a significant amount of information is available to non-participants. Whereas the raw data (individual events and observed populations) are not available due to the project data proprietary rules, information is provided in public summary component reports that are produced following the completion of data collection exercises for each component. The component reports do provide some useful information for PSA practitioners, which includes qualitative information about the observed events that is useful for defining the CCF groups in the PSA, failure mechanisms, coupling factors, relevant defences etc. Furthermore, some high level quantitative information is also provided for example, distribution of failure modes, root causes, coupling factors, detection method, corrective actions, timing factor, shared cause factor, observed population, the type of CCF (e.g. complete, partial, etc.).

3.2 Fire Incidents Record Exchange (FIRE)

The OECD FIRE Database is one of the five nuclear power plants (NPP) operational events databases currently developed under the umbrella of the OECD/NEA. The need for such a database emerged in the late 1990s when it became evident that the only international recording of fire events by the International Recording System (IRS) was not suitable for specific analysis and use in risk assessment. In this respect only dedicated databases allow for “topic focused” lessons learned as well as for quantitative analysis.

The purpose of the OECD FIRE Project is therefore to provide a platform for multiple countries to collaborate and exchange fire data and thereby to enhance the knowledge of fire phenomena and in turn improve the quality of risk assessments that require fire related data and knowledge. Applicable to commercial nuclear power plants only, the OECD FIRE Project exchanges fire events data covering all plant operational modes including construction and decommissioning phases[10].

At the end of 2012, the FIRE Database [35] contained 415 fire events, most of them quality assured. The events are from the period from the early 1980s to 2012, with the bulk of the events in the period of the mid-1990s to the end of 2012. Although the reporting of events is not yet exhaustive, the Database provides a good platform for starting the analytical phase.

Data collection is continuing. Approximately 30 new events per year are expected, as can be extrapolated from the operating experience.

3.2.1 Project Objectives

Improving the safety of nuclear power plants by better accounting for feedback from operating experience and by providing common resources for analytical work in the frame of deterministic and probabilistic assessments is the main objective of the OECD FIRE Project. To meet this objective, the Project includes the establishment of a framework for a multi-national co-operation in fire data collection and analysis.

The objectives of the OECD FIRE Project are:

- To collect fire event experience by international exchange in an appropriate format in a quality assured and consistent database (the “OECD FIRE Database”);
- To collect and analyse fire events over the long-term so as to better understand such events and their causes, and to encourage their prevention;
- To generate qualitative insights into the root causes of fire events in order to derive approaches or mechanisms for their prevention and to mitigate their consequences;
- To establish a mechanism for the efficient operational feedback on fire event experience including the development of policies of prevention, such as indicators for risk informed and performance based inspections; and
- To record characteristics of fire events in order to facilitate fire risk analysis, including quantification of fire frequencies.

[10] The FIRE database currently contains a limited number of construction phase fire events and no decommissioning phase events. However, the database infrastructure is capable of handling the reporting of fire events during these phases.

The Database is envisioned to be used to

- support model development, validation, etc.,
- identify all types of events and scenarios for inclusion in PSA models ensuring that all mechanisms are accounted for,
- support fire PSA by real data, in particular to evaluate fire occurrence frequencies
- compare fire event data from member states with the accumulated international data collected within the OECD FIRE Database.

The objectives of the FIRE Database have been further extended during Phase Three of the Project to cover the following analytical topics:

- Further improving the Database providing additional guidance for improving narrative fields by prompting questions and event sequence diagrams,
- grouping events, e.g. “challenging fires”, “potentially challenging fires”, etc.,
- performing trending analysis, e.g. for consolidation of national databases,
- Extending the analysis, e.g. by fire frequency estimation, fire scenario quantification, human performance analysis, fire scenario screening, fire causes and related phenomena, analysis of homogenous event groups, fire brigade response time estimation, HEAF (high energy electric arcing) faults, fire development, growth rate and spreading.

Further extension of the Project scope and objectives is possible and will be discussed in the next phase of the FIRE Database Project. This mainly covers extending the Database also to larger research reactors and other facilities of the nuclear fuel cycle. In the longer term an extension of data collection to data needed in the frame of Fire PSA on fire detection and fire fighting systems and equipment as well as data on those events inducing a leak of explosive gas (notably H_2) may be possible.

3.2.2 Project History

The OECD FIRE Database is one of the nuclear power plants (NPP) operational events databases developed under the umbrella of the OECD/NEA. The need for such database has emerged in the late 1990s when it became evident that the only recording of events having occurred at nuclear plants as managed since 1978 with the International Recording System (IRS) did not allow for specific analysis and use in risk assessment. In this respect only dedicated databases allow for “topic focused” lessons learned as well as for quantitative analysis eventually also covering determination of initiator frequencies.

Fire Hazard Analyses (FHA) and Probabilistic Fire Safety Analyses (Fire PSA) have shown that fire may be an important contributor to core damage and plant damage states, particularly for older NPP designed to earlier standards. Yet, realistic modelling of fire scenarios is difficult due to the scarcity of reliable data for fire analysis.

After the CSNI State-of-the-Art Report on Level 1 PSA methodology [36] had been published, a study on fire risk assessment was started by WGRISK (formerly PWG5), which resulted in the international workshop on fire risk assessment held from 29 June to 2 July 1999 in Helsinki, Finland and in a State of the Art report on “Fire risk analysis, fire simulation, fire spreading and impact of smoke and heat on instrumentation electronics” [37] issued in March 2000. One important concluding remark was the following:

> *“The shortage of fire analysis data is one of the major deficiencies in the present fire risk assessment. In order to facilitate the situation, it would be highly important to establish an*

international fire analysis data bank, similar to that set up by OECD for the CCF data collection and processing system (ICDE/CCF data bank at OECD). Such a data bank would provide fire event data on real fire cases, incipient fires (e.g. smoldering) detected/extinguished before development, dangerous or threatening situations, reliability data on fire protection measures, and the unavailability of fire fighting systems, for example, due to component failures or operational errors."

Based on the above mentioned concluding remark, several OECD member countries agreed to establish a project to exchange fire event data to encourage multilateral co-operation in the collection and analysis of data related to fire events in nuclear power plants. During its 2000 annual meeting, CSNI of the Nuclear Energy Agency of the Organisation for Economic Cooperation and Development (hereinafter referred to as the "OECD/NEA") approved the establishment of an OECD/NEA Fire Incident Records Exchange Project on collection of data on fire events at nuclear power plants. The FIRE Project was formally established in January 2003, initially joined by nine countries.

With emphasis on data validity and data quality, OECD FIRE Coding Guidelines have been developed for collecting and classifying fire event data to ensure consistent interpretations and applications. Operating Procedures and a Quality Assurance Manual complete the Project documentation. This task of document elaboration has been an important part of the first phase of the Project (2003-2005).

Fire data have been continuously delivered to the OECD FIRE project since January 2003. The first data collection concerned the observation period from 2001 to the end of 2002.

The first data collection had the following limited objectives:

- to confirm and, if necessary, improve the design and attributes of the OECD FIRE database,
- to confirm and, if necessary, improve the Coding Guidelines against data,
- to test routines for further data collection.

Since 2004, and based on the feedback from the first years stable routines for reporting and quality assurance are in place.

At the end of the first phase (Phase One, 2003-2005) the Project was successfully continued with three additional Member countries from 2006 to 2009 (Phase Two) under a given set of Terms and Conditions. During the second phase of the project, several Participants started activities for testing the comprehensiveness of the chosen format and its applicability resulting in valuable improvements and retrieving existing information for specific purposes from the Database. For example, ignition mechanisms have been analysed in Japan in order to understand the ignition mechanisms and to identify potential fire sources for Fire PSA. Another activity in Sweden resulted from a switchgear room fire in a Swedish NPP to resolve the task of making the existing pre-incident planning more effective with respect to emergencies. This planning has to a large extent been created on the basis of the identified and most common types of fires and their relevance checked against "real fire events" from the FIRE Database. German applications were triggered by the more recent NPP operating experience in the late 2000s resulting in a comprehensive investigation of events such as "fire and explosion" and "filter fires". Results of the first two Project phases can be found in [38].

The Member countries having participated in the Phase Two of the Project and the Operating Agent currently continue this Project over a further four-year period (Phase Three, 2010-2013) under new Terms and Conditions. The Project is operated under the auspices of the OECD/NEA. Each Participant has nominated a National Co-ordinator (NC) responsible for the administration of the FIRE Project within his/her respective country. In addition, the Project has got an Operating Agent (OA) in charge for tasks defined by NCs.

Currently, twelve OECD member countries (called "Participants") have signed the OECD FIRE agreement (Canada, Czech Republic, Finland, France, Germany, Japan, Korea, The Netherlands, Spain, Sweden, Switzerland and United States). It is intended to continue the Project at the end of Phase Three for another four years from 2014 to 2017.

3.2.3 Data Collection Methodology and Quality Assurance

With emphasis on data validity and data quality, OECD FIRE Coding Guidelines [35] have been developed for collecting and classifying fire event data to ensure consistent interpretations and applications. Operating Procedures (OP) and a Quality Assurance (QA) Manual complete the Project documentation. This task of document elaboration has been an important part of the first phase of the Project (2003-2005), however been continued through the entire Project duration covering the most recent developments in data submission, processing and assessment, in particular for statistical use in the frame of Fire PSA such as revealing compartment as well as component specific fire frequencies.

The Project is in principle able to support Fire PSA providing quantitative insights to be used for fire risk analysis in general. The information on fire events in the OECD FIRE Database is principally available in a format allowing for quantifying fire specific PSA parameters, such as component and/or compartment specific fire frequencies for different reactor types and/or plant operational states, failures of fire detection and/or extinguishing means. Furthermore, the OECD FIRE data can meanwhile be principally applied to plant specific fire event trees [39].

Compartment specific as well as component specific fire occurrence frequencies can be estimated for all plant operational states (full power as well as low power and shutdown states) from fire event data at NPP in those countries providing all fire events from NPP to the Database without specific reporting criteria and/or thresholds. Information on numbers of different types of components and/or compartments to be considered for PSA use has to be completed by different member countries.

At the time being, the collection of accumulated generic information (e.g. number of components/compartments per reactor type and/or plant operational state, number of plant operating years, etc.) is ongoing. As soon as all this information is available it will be provided to all participants in anonymous generic form. Completion is foreseen up to the end of the third Project phase (December 2013).

However there are still limitations for PSA use of the FIRE data:

- Due to inconsistencies in reporting between member countries database is still relatively small for statistical use. For example, there are differences between the reporting criteria for providing fire event data in the different member countries. Some countries do report all fire events having occurred in NPP (e.g. Czech Republic, Finland, and Sweden). Other countries are only able to provide those events to the Database which have to be obligatory reported to the national authorities according to the national reporting criteria in place (e.g. Germany, Japan, USA). And these criteria and/or reporting thresholds may even vary over time. The users of the FIRE Database are made aware of these differences by an Appendix to the Coding Guideline [35], where for each country the reporting criteria are provided in detail.
- Not all project data are readily accessible and available in a format for direct use in PSA.

Efforts to improve the Database in this direction have already been started and will be continued.

3.2.4 Project Status

The OECD FIRE Database contains as far as practicable complete information on fire events reported from nuclear power plants in participating member countries over the entire operational lifetime of the installations covering all plant operational states.

One challenge in setting up an international database on fire events is to ensure a consistent reporting level between countries in order to capture all events meeting the objectives of the Project.

Regulatory and utilities' reporting levels are different between member countries (e.g., did it or did it not affect safety equipment, different duration thresholds, etc.), and, in addition, the reporting criteria may have changed with time. For events from the past, the database includes for reference the evolution with time of reporting levels. For future events, one objective of this first three years phase is to define a project reporting level, which will account for the countries' policies while correctly addressing the technical objectives of the project.

Fire[11] events considered in the OECD FIRE Database are defined as follows:

- Any process of combustion characterized by the emission of heat accompanied by (open) flame or smoke or both;
- Rapid combustion spreading in an uncontrolled manner in time and space.

The datasets are essentially complete. The only issue to be mentioned is that, unfortunately, not all member countries do report all fire events to the OECD FIRE Database. For PSA use this represents a limitation because a statistically significant amount of data is required to support reliable fire risk assessments (particularly for incipient fires). This gap can only be closed if the database is further extended and inconsistencies can be stepwise excluded. In addition, the level of detail and quality of project data from events farer in the past is sometimes insufficient for application within Fire PSA. However, the quality of data provided to the Database is continuously increasing with the number of events provided.

The information on fire events in the OECD FIRE Database is principally available in a format allowing for quantification of fire specific PSA parameters, such as component and/or compartment specific fire frequencies for different reactor types and/or plant operational states, failures of fire detection and/or extinguishing means. At the time being, the collection of accumulated generic information, e.g. number of components/compartments per reactor type and/or plant operational state, number of plant operating years, etc., is still ongoing and will be provided to FIRE participants in anonymous generic form.

In particular, the Database entries for each fire event cover the following information according to the Code Guidelines:

[11] Note that the term "fire" as used in this context includes incipient fires as well as fully developed fires. Fires shall be included in the database if they are relevant to safety and also if the same type of fire has the potential to be relevant/significant for safety under different boundary conditions (such as different ventilation conditions, other plant operating states (POS), same components affected in other locations, etc.). Explosions not resulting in an open flame shall be excluded

- General event data (e.g. event title, Plant (anonymized), registrar, data and time of detection, date of event description and potential revision, FIRE event description, event sequence and interpretation, operation mode prior to the event, confirmation and suppression time);
- Data on the ignition phase (e.g. building and room/plant area where the fire started, type of room and component where the fire occurred, ignition mechanism, root cause(s), type of fire detection, detector type, detection system performance, combustibles/fire loads involved);
- Data on the extinguishing phase (e.g. type of fire extinguishing, extinguishing equipment performance (fixed as well as portable), manual fire fighting performance);
- Data on consequences and corrective actions (e.g. operation mode due to the fire, fire influence/effects due to heat, hot gases, or pressure build-up or due to consequential effects on component functions, smoke influence, secondary effects, impact to safety trains, corrective actions);
- References;
- Relevance index.

In addition, appendices provide a glossary of technical terms, information on reporting levels and thresholds in the participating member countries, and a relevance index definition.

The FIRE DB also contains fire event analysis support data. The Reporting Threshold Module defines thresholds for reporting fire events:

- LER (Licensee Event Report) level fires,
- All fires (only some member countries).

The Fire Brigade Organisation Module contains the general description of on-site and off-site fire brigade organisation.

3.2.5 Example PSA Applications

In the following, a list of topics already proposed by PRG members to be analysed in the frame of the OECD FIRE Project is provided:

- High Energy Arcing Fault (HEAF) fire events;
- Combinations of fires and other hazards, such as seismic, flooding, or explosions;
- Apparent cause analysis;
- Challenging fires in areas relevant to safety, such as switchgear fires, relay room fires, MCR fires;
- Fire suppression analysis;
- Rare events;
- Database use in front of the background of modernization projects and changes in regulations;
- Application of FIRE Data in fire event tree analyses.

A Topical Report on “Analysis of High Energy Arcing Fault (HEAF) Fire Events” was been prepared under the leadership of Canada and Germany and has been published [68]. Further analytical applications with regard to topics mentioned above, such as combinations of fires and other hazards and FIRE data application in the frame of plant specific event tree analysis, are ongoing. Combinations of hazards, with either a causal relationship or that occur independently, have been systematically addressed and are also covered within the PSA framework as a lesson learned from the Fukushima Dai-ichi reactor accidents. Last, but not least, a Topical Report on "Comparison of Fire Protection Standards in Member Countries" to be prepared under the leadership of Switzerland and the United States is foreseen to be prepared during Phase Three of the Project.

First attempts for using data from the FIRE Database have been made on a national basis. One example is the application of the Database for plant specific fire event trees (see [39]). As derivation and quantification of plant specific fire event trees for determining conditional probabilities of fire induced component damages is a major item of Fire PSA an analytical approach has been developed how to use FIRE data for receiving information for the branch point probabilities needed, distinguishing between applications of plant specific fire event trees within screening and detailed fire sequence analyses. In this context, derivation of a preferably comprehensive generic fire event tree has been proposed. All fire events stored in the OECD FIRE Database have to be mapped on this generic tree. The corresponding sequence number represents an additional characteristic of any fire event record. In this way, any sample of fire events can be analysed using the generic event tree for reflection.

The entire events of the FIRE Database have to be classified with respect to this given generic fire event tree, i.e. each fire event of the database gets a further characteristic. It is assumed that a fire event is a realization of the stochastic process described by this prescribed generic fire event tree. The new characteristic is the sequence number of the fire event in the generic fire event tree. This is the basis for a comprehensive analysis of sets of fire events.

This probabilistic application i.e. demonstrated that the FIRE Database user must be able to handle the data in a very flexible manner. The probabilities determined can be applied either as pure information to support the decision process of the analysis; as a conservative assessment directly within the screening process; or as prior value within detailed analysis depending on scope and quality of the plant specific data being available.

Further activities are ongoing to better enable the determination of frequencies from fire event data. In this context, the FIRE Database has been re-structured to provide easier search capability access to support statistical use of fire event data. A screenshot the most recent version of the database is shown in Figure 4. Associated nuclear plant operating modes have also been included (summarized by reactor type and country) to allow differentiation between fires occurring during power operation, low power and shutdown states, and decommissioning activities.

Based on reported mode operating times, it is possible to calculate compartment- and component-specific fire occurrence frequencies as well as assignment of fire events to various plant areas and buildings. **Table 4** summarises the compartments and plant areas currently included in the FIRE Database and Table 5 lists the component type codes available for fire event reporting. In this context, it has to been clearly stated the cable specific fire occurrence fire occurrence frequencies are still difficult to estimate due to differences in the approaches used to account for cables across the member countries.

Using the reported fire event data described in Figure 4, **Table 4**, and Table 5, it is possible to search event data by plant operational state, reactor type, and member country and generate fire occurrence frequencies. In this way, the FIRE database is capable of supporting the application of the fire event data in the frame of Fire PSA.

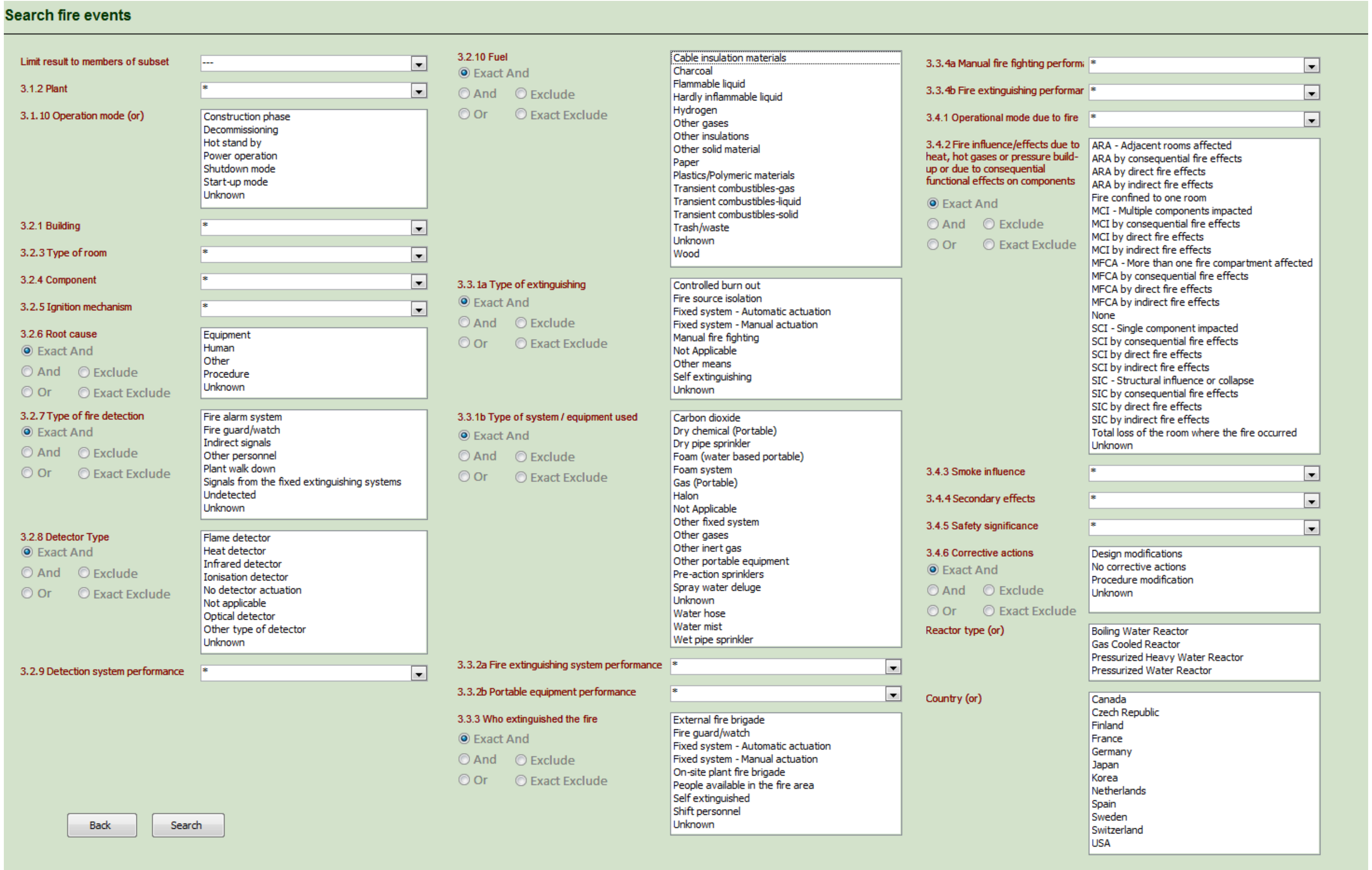

Figure 4 OECD FIRE Database Screenshot for Event Search

Table 4 Assignment of Compartment Fire Occurrence to Buildings and Plant Areas

	Process Rooms	Diesel Generator Rooms	Trans-former Rooms / Bunkers	Switchgear Rooms	Rooms for Electrical Control Equipment. (including Main Control Room)	Workshop	Office	Battery Rooms	Cable Rooms	Storage Rooms	Rooms for Ventilation	Other types of Rooms, (including staircases and corridors)	Total
Turbine building													
Diesel Generator Building													
Auxiliary Building													
Reactor Building													
Containment													
Electrical Building													
Intake Building													
Switchyard													
Independent Emergency Building													
Outside the Plant													

Spent Fuel Building													
Others													
Total													

Table 5 Components Associated with Fire Occurrence

Codes	Definitions	Number of components per plant unit
Battery	Each bank of interconnected sets of batteries located in one place (often referred to as "Battery Room") should be counted as one battery set. Cells may not be counted individually.	
Compressor	This code covers the large air compressors that provide plant instrument air included in the Internal Events PRA Model. Note that compressors associated with the ventilation systems are not part of this code. Small air compressors used for specialized functions are also not part of this code.	
Diesel generator	Diesel generators are generally well-defined items that include a set of auxiliary subsystems associated with each engine. All diesel generators that are included in the electric power recovery model should be counted here.	
Electrical cabinet:	Electrical cabinets represent such items as switchgears, motor control centers, DC distribution panels, relay cabinets, control and switch panels (excluding panels that are part of machinery), fire protection panels, etc. Electrical cabinets in a nuclear power plant vary significantly in size, configuration, and voltage. Electrical cabinets shall be separated based on the classification of the fire (high energy arcing faults (HEAF) or non-HEAF and by voltage ranges).	
High or medium voltage (non-HEAF, $\geq$ 1 kV)	This code shall be used for fires occurring in high or medium voltage electrical cabinets which do not produce a high energy arcing fault. Typically these are cabinets used for 6 kV breakers or 400 V motor breakers. Normally this type of cabinet is located in the switchgear room.	
High or medium voltage (HEAF, $\geq$ 1 kV)	This code shall be used for fires occurring in high or medium voltage electrical cabinets which do produce a high energy arcing fault Typically these are cabinets used for 6 kV breakers or 400 V motor breakers. Normally this type of cabinet is located in the switchgear room.	
Low voltage (non-HEAF, < 1 kV)	This code shall be used for fires occurring low voltage electrical cabinets which do not produce a high energy arcing fault Typically these are cabinets used for instrumentation and control, logic build-up, regulation, etc. The type of cabinet can be described in narrative description fields. Normally this type of cabinet is located in relay rooms.	

Codes			Definitions	Number of components per plant unit
	Low voltage (HEAF, < 1 kV)		This code shall be used for fires occurring low voltage electrical cabinets which do produce a high energy arcing fault Typically these are cabinets used for instrumentation and control, logic build-up, regulation, etc. The type of cabinet can be described in narrative description fields. Normally this type of cabinet is located in relay rooms.	
Hydrogen containing vessel			Hydrogen storage tanks are generally well-defined items. Multi-tank hydrogen trailers, because they are interconnected, should be counted as one unit.	
Main feedwater pump			Main feedwater pumps are generally well-defined entities. If there are ancillary components associated with each pump, it is recommended to include those items as part of the pump.	
Pumps			It is assumed that above a certain size, fire ignition is the same for all pumps. Pumps below 5 hp are assumed to have little or no significant contribution to risk. Do not count small sampling pumps.	
	Electrically driven or turbine driven		This code includes motors, pumps and support equipment for cooling, lubrication, etc. This code excludes pumps with a rating of 5 hp or less. Turbine driven pump, such as auxiliary feed water pump (BWR, some PWR)	
	Reactor coolant pump (RCP, for PWR)			
	Main feedwater pump			
Transformer:				
	High voltage (voltage $\geq$ 50 kV)		High-voltage power transformers typically installed in the yard belong to this code. They include plant output power transformers, auxiliary-shutdown transformers, and startup transformers, etc.	
	Medium or low voltage (voltage level < 50 kV)		Examples of transformers accounted for in this code include transformers attached to AC load centers, low voltage regulators, and essential service lighting transformers.	
		Dry	Dry medium or low voltage transformers are typically cabinet external transformers with lower fire load.	
		Oil filled	Oil filled medium or low voltage transformers are typically cabinet external transformers using oils as coolant.	
Turbine generator				

3.2.6 Project Participation

The FIRE Project is operated under the auspices of the OECD/NEA. For this purpose, the OECD/NEA Secretariat has nominated a technical secretary from among the administrators of its Nuclear Safety Division who is responsible for the management of this Project.

Each Participant nominates a National Coordinator (NC) being responsible for the administration of the FIRE Project within his/her respective country. All NCs together constitute the OECD FIRE Project Review Group (PRG). Technical support to the PRG is provided by the technical secretary. The PRG does convene on an as required basis, but not less than once per year. Clearly defined Rules of Procedure of the PRG are set out in the Operating Procedure (OP).

Coding Guidelines and a Quality Assurance (QA) Manual, which describe the database framework and data input needs, have been developed within the PRG and may be revised within that same forum. In the event of any inconsistency between the CG or the QA Manual and the Terms and Conditions, the latter will prevail.

Each Participant is required by the Project Terms and Conditions to submit data on fire events that have occurred in his country through its NC. The data are being collected in the OECD FIRE Database. The data will be entered according to a coding format specifically developed for the FIRE Database and which is explained in the CG and the QA Manual. The Database is to be updated regularly and is designed to facilitate searches.

FIRE Data Confidentiality and Access

Data accessibility and confidentiality agreement are fixed in the Terms and Conditions of the OECD FIRE Project. The purpose of the confidentiality agreement is to protect the data in general against being used in an inappropriate way and, in particular for those member countries not reporting all fire events having occurred but only those having been reporting according to national reporting criteria and thresholds, keeping the data anonymous.

Each Participant is exclusively responsible for its use of information generated under the Project. It is the responsibility of each NC to identify proprietary information supplied by his respective country as such and to ensure that it is appropriately marked. Such information, when included in the OECD FIRE Database, is password protected and accessible only to the Participants, provided however, that nothing in the Terms and Conditions will in any way restrict the owner of that data from disclosing or distributing it to whomever it wishes.

Where a NC accesses any data from the FIRE Database that has been provided by another Participant, that NC will mark such data as "Confidential OECD FIRE Project" and may not disclose or disseminate that data outside of his/her organisation except that:

- Any such data may be disclosed to any other entity with the prior consent of the PRG,
- any such data that does not allow the identification of the nuclear power plants may be disclosed to any other entity which has contributed data to the database without prior consent of or notice to the PRG, and

- any such data that does not allow the identification of the nuclear power plants may be disclosed to any other entity with the prior notice to the PRG provided that in each case an appropriate non-disclosure agreement is first entered into between the Participant whose NC is disseminating the data and the entity which is to receive the data.

Any publication or paper discussing the data and/or findings of the Project will be submitted to the PRG for approval before distribution.

Although in general the Database is accessible only to FIRE Project Participants, some events included have also been publicly reported on an international basis. Information on these events is also available by non-participants to the Project. In addition, all information published (e.g., see Appendix D) is available also to non-participating PSA developers such that they may benefit from Project activities.

FIRE Resource Commitment

According to the Terms and Agreement the OECD FIRE Project is completely funded by the Participants. The funding of the Project is equally shared amongst Participants. Participation fees are to be paid to the OECD/NEA for reimbursement of the costs incurred by the Operating Agent· and the Secretariat, it being agreed that the NEA has a right to receive a moderate administrative fee for its services in an amount to be decided by the PRG.

The schedule for payment of contributions is determined by the PRG. Contributions from Participants due under the schedule have to be paid in full, on the dates specified, in Euros to an account designated by the OECD/NEA. Funds are then transferred from this account to an account designated by the Operating Agent upon its written request to the OECD/NEA.

The budget for the actual Phase Three of the FIRE Project is based upon a fee of 28,000 Euros per Participant for the four-year period corresponding to a yearly fee of 7,000 Euros per Participant. The financial year is from 1 January to 31 December. A financial report covering the previous year shall be submitted by the Operating Agent to the PRG not later than two months after the end of each financial year.

New Participants acceding to the Project will be required to pay an entrance fee of 10,000 Euros plus a participation fee equal to the total of the participation fee that such Participant would have had to pay if it had joined the Project at the beginning of Phase Three, unless decided otherwise by the PRG. Thereafter, that Participant will be required to pay the annual participation fee. Extra funding generated from the accession of new Participants will be managed by the PRG.

Within the total operating budget, the OA and the PRG jointly define specific tasks (such as database management, updating of Project documentation, and quality assurance of submitted data) and elaborate the budget which corresponds to each such task.

The OA has to document its activities for each task. The documentation provided by the OA has to contain the necessary information to allow approval by the PRG.

The OECD/NEA Secretariat provides secretariat and administrative services in connection with the funding of the Project such as calling for entrance or participation fees and paying expenses to the OA, preparing overall budgets, keeping the financial accounts of the Project and submitting them to the PRG. The OECD/NEA Secretariat does also provide support for the web interface with the database. .

Each Participant has to bear all costs of its participation in the Project other than common costs funded by the budget of the Project. Withdrawal of a Participant from the Project does not entitle that Participant to any reimbursement of its entrance fee or participation fee paid.

3.3 Component Operational Experience, Degradation and Ageing Programme (CODAP)

Structural integrity of piping and non-piping passive components is important for plant safety and operability. Throughout the history of PSA, steps have been taken to incorporate passive component reliability considerations in nuclear power plant systems reliability models. Passive component reliability modelling is complex. It entails consideration of structural integrity, metallurgy, operating environment (e.g., water chemistry, flow conditions), loading conditions, in-service inspection (e.g., probability of flaw detection), and leak detection capability. The potential role of service experience data in assessments of passive component reliability has been explored by researchers worldwide during the past five decades. To address this need, the OECD Pipe Failure Data Exchange Project (OPDE) was established in May 2002 to produce an international database on the piping service experience applicable to commercial nuclear plants. Similarly, in June 2006, the “Stress Corrosion Cracking and Cable Ageing Project” (SCAP) was established to assess stress corrosion cracking (SCAP-SCC) and degradation of cable insulation. In May 2011, the OPDE Project Review Group (PRG) approved the transition of OPDE to a new, expanded “Component Operational Experience, Degradation and Ageing Programme” (CODAP). The CODAP Project builds on the success of OPDE and the related SAP-SCC database project. At the end of 2011, the OPDE and SCAP-SCC databases were merged to form the new CODAP event database; an entirely web-based system for data entry and analysis.

3.3.1 Project Objectives

Information on degradation and failure of piping components and systems as well as non-piping passive components (e.g., reactor pressure vessel) is collected and evaluated by regulatory agencies, international organizations (e.g., IAEA and OECD/NEA) and industry organization worldwide to provide systematic feedback for example to reactor regulation and research and development programs associated with aging phenomena, non-destructive examination (NDE) technology, in-service inspection (ISI) programs, leak-before-break evaluations, Risk-informed ISI, and PSA applications involving passive component reliability.

The OECD/NEA in 2002 established the "OECD Pipe Failure Data Exchange Project" as an international cooperative effort to systematically collect and exchange service experience data on metallic piping degradation and failure. In 2011 the scope of the OPDE was expanded to encompass service experience data on metallic, non-piping passive components; the CODAP Project. This section of the report is a summary of how the two database project products relate to PSA.

3.3.2 Project History

Reviews of service experience with safety-related and non-safety-related piping systems have been ongoing ever since the first commercial nuclear power plants came on line in the 1960’s. In 1975 the U.S. Nuclear Regulatory Commission established a Pipe Crack Study Group (PCSG) charged with the task of evaluating the significance of stress corrosion cracking in boiling water reactors (BWRs) [40] and pressurized water reactors (PWRs) [41]. Service experience review was a key aspect of the work by the PCSG. Major condensate and feedwater system piping failures (e.g., Trojan and Surry-2 in the U.S.) due to flow accelerated corrosion (FAC) resulted in similar national and international initiatives to learn from service experience and to develop mitigation strategies to prevent recurrence of pipe failures [42]–[44]. Early indications of the significance of thermal fatigue phenomena evolved in the 1970s, and, again, systematic reviews of the service experience enabled the introduction of improved piping design solutions, NDE methods, and operating practices.

The team of analysts responsible for the seminal Reactor Safety Study (WASH-1400) [45] performed a limited evaluation of nuclear power plant piping reliability based on service experience from the then (early 1970s) approximately 150 U.S. commercial nuclear reactor operating years. This evaluation was aimed at estimation of loss-of-coolant-accident (LOCA) frequencies for input to the two PSA models of WASH-1400. After the publication of WASH-1400 in 1975 many other R&D projects have explored the roles of structural reliability models and statistical evaluation models in providing acceptable input to PSA. Furthermore, during the past 20 years efforts have been directed towards establishment of comprehensive pipe failure event databases as a foundation for exploratory research to better understand the capabilities and limitations of today’s piping reliability analysis frameworks.

In parallel with these efforts to evaluate service experience data and to correlate the occurrence of material degradation with piping design and operational parameters, initiatives have been presented to establish an international forum for the systematic collection and exchange of service experience data on piping. An obstacle to the use of the database by other countries of national qualitative and quantitative pipe failure information is that criteria and interpretations applied in the collection and analysis of events and data differ among the various countries. A further impediment is that the descriptions of reported events and their root causes and underlying contributing factors, which are important to the assessment of the events, are usually written in the native language of the countries where the events were observed.

To overcome these obstacles, the preparation for the OECD Pipe Failure Data Exchange (OPDE) Project was initiated in 1994 by the Swedish Nuclear Power Inspectorate (SKI)[12]. In 1994 SKI launched a 5-year R&D project to explore the viability of creating an international pipe failure database and a related analytical basis for deriving reliability parameters for use in PSA. During this period SKI hosted meetings to present results of the R&D and to discuss the principles of database development and maintenance[13]. In September 2000 and, again in April 2001, the OECD/NEA organized preparatory meetings to explore the feasibility and interest in forming an international cooperative effort to systematically collect, evaluate and exchange service experience data.

Since May 2002, the OECD/NEA has formally operated the project under the coordination of the Committee on the Safety of Nuclear Installations (CSNI). The starting point for the Project was an in-kind contribution by SKI in the form of an international pipe failure database in Microsoft® Access. This database included pipe failure data for the period 1970 to 1998, and it contained approximately 2,300 records. During the first term of OPDE the emphasis was on validating the content of the SKI in-kind contribution, improving and streamlining the database structure and data input format, and populating the database with new failure data for the period 1999 to the present, as well as with pre-1998 records. The data validation benefitted from multi-disciplinary considerations, including material science, structural

[12] Swedish Radiation Safety Authority (SSM) as of July 1, 2008

[13] In September 1996 SKI organized the “Initial Meeting of the International Cooperative Group on Piping Performance” with participants from thirteen countries. Again, in September 1997 SKI organized the “Seminar on Piping Reliability” (SKI Report 97:32); this time with participants from eleven countries.

integrity and PSA. The first term of the Project covered the years 2002-2005, the second term covered the period 2005-2008 [46], and the final term covered the period 2008-2011 [47].

In 2006 the SCC and Cable Ageing Project (SCAP) was established under the auspices of the OECD/NEA to assess, due to their implication on nuclear safety and their relevance for plant ageing management, two subjects: stress corrosion cracking (SCC) and degradation of cable insulation. The project ran successfully from June 2006 to June 2010 [48].

Following the completion of the SCAP project, SCC Working Group participants were interested in some form of continuation and discussions were initiated to explore possible alternatives. It was recognized that there are many aspects very similar to those existing in OPDE and the concept of a new project was envisaged to combine the two projects into the "Component Operational Experience, Degradation & Ageing Programme" (CODAP). The objective of CODAP is to collect information on passive metallic component degradation and failures of the primary system, reactor pressure vessel internals, main process and standby safety systems, and support systems (i.e., ASME Code Class 1, 2 and 3, or equivalent). It also covers non safety-related (non-Code) components with significant operational impact. It is intended that CODAP will also include information on age-related degradation of buried tanks and plastic piping.

In May 2011 the Project Review Group (PRG) approved the transition of OPDE to a new, expanded "OECD-NEA Component Operational Experience, Degradation & Ageing Program (CODAP)." A first CODAP National Coordinators Meeting was held at NEA Headquarters in November 2011. The CODAP PRG Membership corresponds to that of the OPDE (eleven member countries), with two additional member countries (Slovak Republic and Chinese Taipei). The CODAP project builds on the success of OPDE and a related OECD-NEA data project, the SCAP-SCC Working Group.

During the three OPDE Project Terms (2002-2011), the event database was maintained and distributed as a Microsoft® Access database. This database was distributed on a CD to the National Coordinators twice per calendar year. Towards the end of the first Project Term, a web-based database format was developed to facilitate data exchange. The web-based OPDE resided on a secure server at the NEA Headquarters. With the 2011 transition from OPDE to CODAP, a new and enhanced web-based database format was implemented. As of mid-2012, the entire CODAP event database resides on a secure server at NEA Headquarters. Provisions exist for online database interrogation (e.g., reviews, reviews, QA, validation) as well as downloading selected event records or entire database to a local computer or computer network. In addition to the event database, CODAP includes a web-based Knowledgebase (KB) that contains relevant national and international reference material on passive metallic component damage and degradation mechanisms. Included in the KB are codes and standards, R&D results, regulatory frameworks, and country-specific aging management programs. As for the event database, the KB resides on a secure server at NEA Headquarters.

3.3.3 Data Collection Methodology and Quality Assurance

Data Collection

The CODAP Project exchanges data on passive component degradation and failure, including service-induced wall thinning, non-through wall crack, leaking through-wall crack, pinhole leak, leak, rupture and severance (pipe break caused by external impact). For non-through wall cracks the OPDE scope encompasses degradation exceeding design code allowable for wall thickness or crack depth as well as such degradation that could have generic implications regarding the reliability of in-service inspection (ISI) techniques. The following failure modes are considered:

Non-through wall defects (e.g., cracks, wall thinning) interpreted as structurally significant and/or exceeding design code allowable;

Through-wall defects without active leakage (leakage may be detected following a plant operational mode change involving depressurization and cool-down, or as part of preparations for non-destructive examination, NDE);

- Small leaks (e.g., pinhole leak, drop leakage) resulting in piping repair or replacement;
- Leaks (e.g., leak rates within Technical Specification limits);
- Large leaks (e.g., flow rates well in excess of Technical Specification limits);
- Major structural failure (pressure boundary "breach" or "rupture").

In other words, the CODAP event database collects data on the full range of degraded conditions, from "precursors" to observed structural failures. The structural integrity of a pressure boundary is determined by multiple and interrelated reliability attributes and influence factors. Depending on the conjoint requirements for damage and degradation, certain combinations of material, operating environment, loading conditions together with applicable design codes and standard, certain passive components are substantially more resistant to damage and degradation than others. This is illustrated in Figure 5, which is a high-level summary of observed damage and degradation mechanisms and their manifestations. As an example, for stabilized austenitic stainless steel pressure boundary components, there are no recorded events involving active, through-wall leakage. By contrast, for unstabilized austenitic stainless steel, multiple events involving through-wall leakage have been recorded, albeit with relative minor leak rates. Flow-accelerated corrosion (FAC), if unmonitored, is relatively aggressive degradation mechanism that has produced major structural failures, including double-ended guillotine breaks (DEGB). From a PSA perspective, a unique analytical complexity relates to the estimation of reliability parameters potentially based on precursor data alone; how does one extrapolate precursor data to determine the frequency of a major structural failure? This question is addressed in Section 0.

The types of events included in CODAP are:

- Event-based failures caused by damage mechanism and local stresses. Examples include high-cycle vibration fatigue due failed pipe support, and hydraulic transient (e.g., water hammer) acting on a weld flaw (e.g., slag inclusion).
- Failures caused by environmental degradation such as stress corrosion cracking due to combined effects of material properties, operating environment (e.g., corrosion potential, irradiation) and loading conditions.

CODAP is a relational database, consisting of ca. 100 uniquely defined data fields. It is a mix of free-format fields for detailed narrative information and fields defined by drop-down menus with key words (or data filters) or related tables. The "related tables" included information on material, location of damage or degradation, type of damage or degradation, system name, safety class, etc. The event database structure, database field definitions and data input requirements are defined in a Coding Guideline, which is central to the project; database maintenance, data validation and quality control [49], [50].

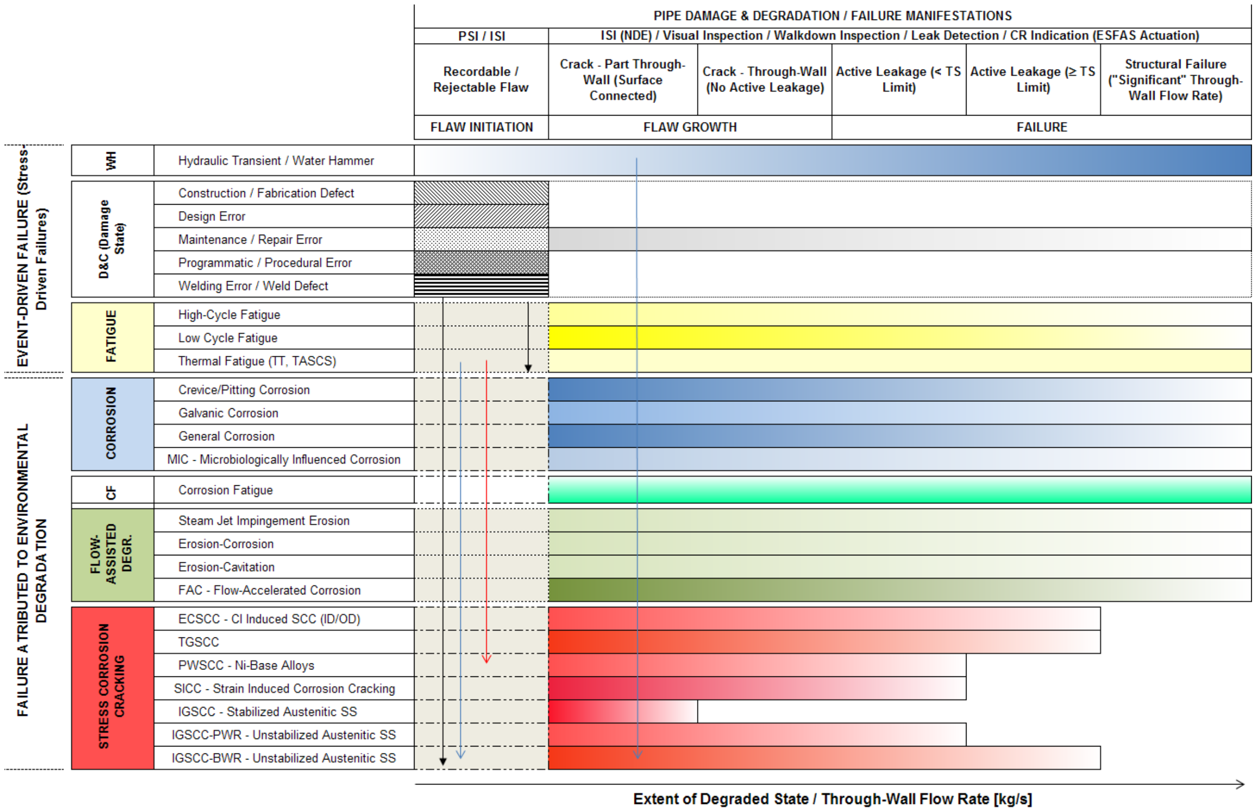

Figure 5 Examples of Pipe Damage & Degradation Manifestations

Quality Assurance

The CODAP Quality Assurance Program (CODAP-QAP) [50] establishes the organizational and technical principles and measures for quality assurance and monitoring of the work during operation of the CODAP Project to ensure high quality of the end product (the database with companion reports). To achieve the objectives established for the CODAP database a Coding Format has been developed.

This Coding Format is reflected in the Coding Guidelines. The Coding Guidelines are built on established pipe failure data analysis practices and routines that acknowledge the unique aspects of passive component reliability in heavy water reactor and light water reactor operating environments (e.g., influences by material and water chemistry). An "Applications Handbook" [50] has been prepared as a companion document to the Coding Guideline.

For an event to be considered for inclusion in the CODAP event database it must undergo an initial screening for eligibility. An objective of this initial screening is to go beyond the abstracts of event reports to ensure that only passive component degradation and failures according to the work scope definition are included in the database [51].

Data quality is affected from the moment the service data is recorded at a nuclear power plant, interpreted, and finally entered into a database system. The service data is recorded in different types of information systems ranging from work order systems, via ISI databases and outage summary reports, to licensee event reports or reportable occurrence reports. Consequently the details of a degradation event or failure tend to be documented to various levels of technical detail in these different information systems.

Building a CODAP database event record containing the full event history often entails extracting information from multiple sources.

The term “data quality” is an attribute of the processes that have been implemented to ensure that any given database record (including all of its constituent elements, or database fields) can be traced to the source information. The term also encompasses “fitness-for-use”, that is, the database records should contain sufficient technical detail to support database applications.

In CODAP, a “Completeness Index” (CI) is used for database management purposes. It distinguishes between records for which more information must be sought and those considered to be complete (Table 6). Each record in the database is assigned a CI, which relates to the completeness of the information in the database relative to the requirements of the Coding Guidelines.

Table 6 CODAP Completeness Index (CI) Definitions

Completeness Index	**Description**
1	Validated – all source data have been reviewed – no further action is expected
2	Validated – source data may be missing some non-essential information – no further action anticipated. The term “non-essential” implies that information about piping layout (including location of a flaw) may not be known exactly but can be inferred based on other, similar events (at same or similar plant)
3	Not validated – validation pending

The “Completeness Index” is also intended as a database filter for determination of the ‘fitness-for-application.’ The range of possible database applications covers advanced applications (e.g., the study of effect of different water chemistries on specific degradation susceptibilities), risk-informed applications (e.g., technical basis for degradation mechanism assessment in risk-informed ISI program development, or statistical parameter estimation in support of internal flooding PSA), and high-level summaries of service experience trends and patterns. Advanced database applications would normally rely on queries that are based and the subset of the overall database content consisting of those records for which CI = 1. By contrast, high-level database applications would draw on information from the entire database content.

Applicability to Different Plant Types

A typical application of CODAP involves consideration of plant system, material, pipe size and damage and/or degradation mechanism (DM) susceptibilities. Defining a specification for an application requires in-depth knowledge of piping design, metallurgy, conjoint requirements for degradation, plant system design, plant operations, in-service inspection, etc. Therefore an event population and corresponding exposure term must preclude illogical combinations in event data query definitions.

Estimating the frequency of high-energy line break involves the consideration of pipe failure attributed to flow accelerated corrosion (FAC). The FAC susceptibility of BWR plants and PWR plants are quite different. One parameter of interest in determining FAC-susceptibility is the oxygen content of secondary side process medium. BWRs and PWRs operate with different levels of oxygen content. As an another example, estimating the reliability of branch connections in PWR primary system piping needs to acknowledge the fundamentally different materials used in plants of Westinghouse design versus Babcock & Wilcox design. These two examples represent Nuclear Steam Supply System (NSSS)-centred applications.

Certain piping systems operate in an environment decoupled from the NSSS. Examples include fire protection water system and portions of raw water systems. For such systems, an event population and exposure term with corresponding estimated reliability parameters may apply to multiple plant types.

3.3.4 Project Status

The CODAP event database currently (January 2013) includes in excess of 4,500 records on metallic passive component failures in BWR, PHWR (CANDU) and PWR commercial nuclear power plants, covering the period 1970 to date. Table 7 and Table 8 provide high-level summaries of the event database content.

Table 7 Database Content by Completeness Index

CODAP Event Database - 10-January-2013				
PLANT TYPE	Total Number of Records in DB	Completeness Index (CI)		
		1	2	3
BWR	2095	963	961	171
PHWR	158	47	110	1
PWR	2259	727	1261	271
Totals:	4512	1737	2332	443
CI = 3; data validation pending or in progress				

Table 8 Database Content by Failure Manifestation

ASME III Code Class	Recordable / Rejectable Indication	Crack-Full	Crack-Part Through-Wall	Wall Thinning	P/H-Leak	Small Leak	Leak	Large Leak	Structural Failure (Break, Rupture)
1 - Reactor Coolant Pressure Boundary	25	259	898	8	51	245	53	11	12
2 - ECCS, Post-Accident Containment Heat Removal	18	71	350	55	130	337	45	20	31
3 - Auxiliary Cooling Systems		43	73	57	226	572	51	26	54
4 - Non-Code (e.g., Balance-of-Plant Piping)		11	25	142	47	305	56	21	184
Totals:	43	384	1346	262	454	1459	205	78	281

The CODAP and OPDE event databases have been extensively applied by Member Organizations in support of PSA [52]–[56].One line of PSA R&D has focused on development of "hybrid piping reliability models" that incorporate probabilistic fracture mechanics results and insights, service experience considerations and expert judgment [57]–[59].

As opposed to structural integrity evaluation to determine the “fitness for continued operation” given the presence of a recordable indication, a piping reliability analysis is concerned with the failure rate of a piping system component (for example, bend, elbow, or weld) and the probability that, given a certain susceptibility to degradation, it fails in a specific way as determined by the resulting through-wall flow rate. The former type of evaluation is concerned with the question whether a certain flaw will continue to grow, and, if so, by how much. The latter type of evaluation determines the likelihood of failure given certain operational parameters and design conditions. In this paper the focus is on piping reliability analysis according to the requirements for risk-informed decision support. Piping reliability analysis is based on one or more of the following methods:

- Analytical method; for example probabilistic fracture mechanics and Markov model applications
- Expert judgment (or informed data interpretation), for example the “Thomas model” or similar approach
- Statistical analysis of service experience data, including application of hazard plotting techniques and Bayesian modelling
- Combined approach using insights derived from analytical, expert judgment and data analysis. An expert elicitation format as documented in NUREG-1829 [60] is an example of a “combined approach.”

3.3.5 PSA Applications of OPDE/CODAP Products

The piping systems of commercial nuclear power plants are subjected to stringent design, manufacturing, fabrication and installation requirements, as well as mandatory and owner-defined in-service inspection (ISI) program requirements that account for past and current service experience. Also important to piping reliability are the aging management programs that have been implemented throughout the nuclear industry to mitigate or eliminate certain types of pipe degradation susceptibilities. Regardless of a chosen approach to piping reliability analysis, independent peer review processes invariably raise questions about the achieved level of realism and statistical uncertainty of quantitative results. How well do the results compare with the applicable service experience data? A particularly challenging peer review question is the one posed when no relevant service experience data is available. How should an analysis best be performed in view of zero major structural failures? Is there a preferred way to condition an assessment by what is known about certain combinations of degradation mechanism, operating environment and loading conditions?

PSA models that are developed to support certain risk-informed applications require passive component reliability parameter input data of certain validity. Examples of applications in which realistic assessment of passive component reliability is important include internal flood risk assessment, high-energy line break (HELB) assessment, LOCA frequency estimation, interfacing systems LOCA assessment, and risk-informed ISI (RI-ISI) program development.

Since the completion of WASH-1400 in 1975, R&D has been directed to the development of piping reliability analysis methods and techniques to support the requirements that have been defined by nuclear safety policy makers and PSA practitioners. This R&D has evolved along two paths, both of which have seen significant progress, and to the point where potential synergistic conditions have evolved with respect to enhancing the analytical capabilities of certain methods. One such “path” involves probabilistic fracture mechanics (PFM) code development, the other “path” involves the development of pipe failure databases combined with tools for statistical parameter estimation.

The likelihood of a pipe flaw propagating to a significant structural failure (SF) is expressed by the conditional failure probability pSF|DC where "DC" represents degraded condition. With no service data available to support a direct statistical estimation of the conditional probability the assessment can be based on probabilistic fracture mechanics (PFM), expert judgment, or a combination of service data insights, expert judgment and PFM. Different PFM algorithms have been developed, but with a focus on fatigue growth and stress corrosion cracking. There remain issues of dispute with respect to reconciliation of results obtained through statistical estimation versus the physical models of PFM, however. Results from studies to benchmark PFM calculations against field experience have shown PFM computer codes to over-predict pipe failure rates by more than an order magnitude relative to statistical estimates of field experience data [61]. In general, the results obtained with PFM computer codes are quite sensitive to assumptions about weld residual stresses, crack growth rates, and correlations of crack initiation times and growth rates.

In earlier applications a simple Beta distribution formulation has been used to estimate the conditional probability of different pipe rupture modes. The main issue with assuming a prior Beta distribution is the estimation of its parameters. Several "constrained" approaches have been proposed. Methods to determine the parameters of the prior Beta distribution include: the method of moments, the PERT approach or the Pearson-Tukey approach. In the absence of data, non-informative priors appear to be a straightforward solution. However, there is often a good knowledge on one constraint, such as the mean probability. The approach described in this paper is the use of a constrained non-informative prior. This approach seems to be especially relevant to situations where limited failure data are available to assess the probability that a structural failure occurs, given a degraded condition. In the Pearson-Tukey approach a subject matter expert (SME) is asked to provide the 5th, 50th, 95th percentiles (noted C05, C50 and C95, respectively) and these statistical estimates are used to determine the parameters of a Beta prior distribution [59].

The OPDE database has also been used to evaluate LOCA (Loss of Coolant Accident) initiating event frequencies. As one example, the Korea Atomic Energy Research Institute (KAERI) in 2005 performed an evaluation of 'very small loss of primary coolant event', 'small LOCA' and 'medium LOCA' frequencies [57]. According to the 2004 Edition of the OPDE database, there were eight (8) leak events related to the very small LOCA and 149 "precursor events" related to the small and medium LOCA for Combustion Engineering (CE) and Westinghouse (WE) type plants. The very small LOCA frequency was evaluated by using a Bayesian approach with the Jeffreys non-informative prior. However, the rupture frequencies for the small and medium LOCA were estimated from the precursor events, and the conditional rupture probability was obtained from the Win-PRAISE code. The results obtained in this study were compared with those of NUREG/CR-5750, Appendix J [62]. The results of the analysis are summarized in Table 9 and Table 10. Insights from the applications include:

1) The frequency of the very small LOCA event was estimated to be 3.5E-3/yr. This is similar to the result of the NUREG/CR-5750, but with a smaller uncertainty band than that of the NUREG/CR-5750.
2) The frequency of the medium LOCA was estimated to be 1.3E-6/yr, which is one order of magnitude less than the result of NUREG/CR-5750, Appendix J. The NUREG/CR-5750 used a simplified Beliczey-Schultz correlation as an expression for the conditional rupture probability; $P_{R|TW}$ = 2.5/DN, where DN is the nominal pipe diameter in [mm]. By contrast, the cited application [57] used the Win-PRAISE code to obtain the conditional rupture probability. The conditional probability obtained from Win-PRAISE code approaches zero for pipe sizes greater than 150 mm, while the conditional probability obtained from the simplified Beliczey-Schulz correlation linearly decreases as the pipe diameter increases.

Table 9: Very Small Pressure Boundary Breach

Study	Mean Frequency [1/yr]	Lower Bound	Upper Bound
OPDE (CE + WE)	3.5E-3	1.7E-3	5.7E-3
NUREG/CR-5750	6.8E-3	2.5E-3	1.3E-2

Table 10: Estimated Small and Medium LOCA Frequencies

Reactor Type	LOCA	Pipe Diameter [inch]	LOCA Frequency	Mean Frequency [1/yr]	Lower Bound	Upper Bound
CE	Small	0.5	3.1E-2	7.7E-2	2.8E-3	2.8E-1
		0.75	3.7E-2			
		1	6.2E-3			
		2	7.8E-6			
	Medium	3	4.0E-6	4.0E-6	1.5E-7	1.5E-5
WE	Small	0.5	4.5E-3	2.0E-2	7.8E-4	7.8E-2
		0.75	1.4E-2			
		1	1.9E-3			
		1.5	4.3E-6			
		2	7.7E-4			
	Medium	3	3.4E-7	3.4E-7	1.3E-8	1.3E-6
CE+ WE	Small	0.5	8.9E-3	3.0E-2	1.1E-3	1.1E-1
		0.75	1.8E-2			
		1	2.6E-3			
		1.5	3.6E-6			
		2	6.5E-4			
	Medium	3	1.3E-6	1.3E-6	3.9E-8	3.9E-6

3.3.6 Project Participation

Participation in the CODAP Project is governed by the Terms & Conditions [51] and is open to the Government of any country, whether or not a member of the OECD, or to any national agency, public or private organization proposed by such Government, which indicates its agreement to these Terms and Conditions and which assumes the same rights and obligations as the Participants in the Project. Countries wishing to participate in the CODAP Project may indicate their interest to exchange data and general information on component degradation and failures and shall indicate its agreement to participate in the CODAP Project in accordance with these Terms & Conditions by written correspondence.

CODAP Data Confidentiality and Access

According to the CODAP Operating Procedures [63], event data and KB content are accessed and exchanged on an in-kind participation basis. That is, those countries that input data and provide KB material and information get access to event database and KB content from other countries.

Thirteen countries participate in the CODAP Project. The event database and the KB content are password protected and only accessible to project participants. Where a National Coordinator accesses any data in the CODAP database that has been provided by another Participant, that National Co-ordinator shall mark such data as "Confidential-CODAP Project" and may not disclose or distribute that data outside of his/her organisation except that:

- Any such data may be disclosed to an organisation in his/her country that has itself contributed data to the CODAP database. Where either the National Co-ordinator or the organisation to which data has been disclosed or distributed, wishes to disseminate that data to any other entity, the consent of the PRG shall be obtained first;
- Any such data that does not allow the identification of the nuclear power plant may be disclosed to any other entity which has contributed data to the database; and
- Any such data that does not allow the identification of the nuclear power plant may be disclosed to any other entity with the prior notice to the Project Review Group.
- Provided that in each case an appropriate non-disclosure agreement is first entered into between the participant whose National Coordinator is disseminating the data and the entity which is to receive the data.

The cost of operating the CODAP Project is €10,000.00 per participating country and calendar year. The funds collected by OECD-NEA cover the cost of administration, work by the Operating Agent, the KB Coordinator and the preparation of topical reports as defined by the Project Review Group.

3.4 Computer-based Systems Important to Safety (COMPSIS) Project

Software and hardware faults in safety-critical systems are typically rare events and, consequently, most countries do not experience enough faults to draw meaningful insights about computer-based system performance. However, it was hoped that combined information from several countries would yield sufficient data to help draw conclusions. As such, the Computer-based Systems Important to Safety (COMPSIS) project was initiated to exchange information on computer-based system reliability in a structured way. The COMPSIS project was active from 2005 through 2011 and is no longer an active project.

3.4.1 Project Objectives

The main objectives of the COMPSIS project were to [64]:

- define a format and collect software and hardware fault experience in computer-based safety critical NPP systems (i.e., "COMPSIS events") in a structured, quality-assured and consistent database;
- collect and analyse COMPSIS events over a long period so as to better understand such events, their causes and their prevention;
- generate insights into the root causes of and contributors to COMPSIS events, which can then be used to derive approaches or mechanisms for their prevention or for mitigating their consequences;
- establish a mechanism for an efficient feedback of experience gained in connection with COMPSIS events, including the development of defences against their occurrence, such as diagnostics, tests and inspections;
- record event attributes and dominant contributors so that a basis for national risk analysis of computerized systems is established.

The scope of the COMPSIS project covered failure events of computer-based systems important to safety in nuclear power plants and includes both the hardware and software components of these systems. The project did not specify reportability criteria, but instead relied upon the national reporting criteria of member countries to identify events that should be submitted to the database. This was intended to take full benefit of the experience gained in national event databanks and reporting collection systems.

3.4.2 Project History

As discussed in [65], during the mid-1990s a Task group was formed within the Organisation for Economic Cooperation and Development/Nuclear Energy Agency (OECD/NEA), to exchange information on events involving computer-based systems. In 2005 the OECD/NEA Steering Committee agreed to establish the international Computer-Based Systems Important to Safety (COMPSIS) project to encourage multilateral cooperation in the collection and analysis of data relating to computer-based system events in nuclear facilities.

Development of the project database analytical frame work was the focus of the first COMPSIS project period (which ran from 2005 to 2007). Participating organisations included Finland, Germany, Hungary, Japan, the Republic of Korea, Slovak Republic, Sweden, Switzerland, the United States and Chinese Taipei. At the end of the first project period in 2007, 40 events[14] had been entered into the COMPSIS database. The project was renewed for a second project period, which ran from 2008 to 2011. The major focus of the second project period was data collection as countries gained experience with the COMPSIS data coding guidelines and reporting process. The project was ended in 2011, with a total of 90 events in the database.

3.4.3 Data Collection Methodology and Quality Assurance

Coding guidelines [66] were developed for collecting and classifying computer-based I&C system failure event data to ensure consistency in the event database. The coding guidelines provided reporting guidance to address the following event characteristics:

- Nuclear plant status at the time of the event
- Description of failed system and component
- Cause of failure
- Impact on plant operations
- Characteristics of failure (e.g., degradation of fission product barrier, safety function)
- Nature of failure (e.g., single failure, multiple failure, common cause event)
- Recovery from failure (e.g., recovered through human or automatic action, not recoverable)

Project members were expected to submit failure events identified through their national reporting programs to the COMPSIS database. Each event entered into the COMPSIS database followed a specific life cycle [64]. The life cycle process specified quality control activities such as version control of COMPSIS events, user access rights, event approval, and traceability of event revisions or changes. In addition, the project included an Operating Agent tasked with implementation and maintenance of project

[14] Of these 40 events, approximately 20 events were fully characterized.

infrastructure and a Steering Group. The Steering Group was composed of the National Coordinators from each project member and additional experts and is responsible for all project decisions.

3.4.4 Project Status

The COMPSIS project completed two operating phases and ended in 2011. At the conclusion of the second operational phase (2008-2011), the database contained 99 events. In addition to data collection activities, the project also completed several infrastructure development activities including issuance of data coding guidelines [66] and implementation of a web-based data structure to provide the user interface to the database.

The COMPSIS Steering Group recognized that the database had not accumulated a substantial number of failure events, particularly in comparison to other joint OECD data projects. In [65], the Steering Group provided the following perspective on the situation:

To understand the situation of the COMPSIS project it is necessary to take specific conditions into account that result from computer technology like:

- *Computerized systems important to safety are not yet implemented in all existing NPPs. Thus, lots of NPPs are still operated with several hard wired safety I&C systems.*
- *Computerized I&C systems are redundant systems. Single failures of e.g. one CPU in a redundant system are not always a failure of the system and may be not reported. For other equipment like pipes each leakage is a leakage also in redundant systems.*
- *Computerized I&C systems are complex systems. Root cause analyses may take much more time compared to less complex equipment.*

In addition there exist specific conditions of the project like:

- *Some countries operating large numbers of NPPs with digital I&C systems e.g. France, Japan, Canada are not participating in the project.*
- *In single member states of the COMPSIS project, National Coordinators have not enough resources to feed the database promptly.*

Additionally, it has been noted that computerized systems are becoming more common on the balance of plant systems in nuclear power plants, and this is possible area for further investigation. Experience gained from these systems may provide important insights for safety systems applications.

3.4.5 Example PSA Applications

No PSA applications for COMPSIS data were identified during this task. In particular, the project noted that some stakeholders expressed excessive expectations regarding the usability of the short-term results of the COMPSIS project in probabilistic risk assessments [65]. However, the COMPSIS project has completed several qualitative analyses of project data which may provide useful background information for PSA applications. This studies are documented in project reports ([64], [65]) and address:

- Root causes (e.g., quality assurance, design defects, human factors, maintenance, and communications);
- Temporal behaviour (transient, intermittent, permanent)

- Dependencies (e.g., systemic, independent, multiple)
- Consequence analysis

3.4.6 Project Participation

As discussed in [64], participation in the COMPSIS Project was open to the Government of any OECD NEA member country, including public or private organisation proposed by member countries, which agreed to the terms and conditions of the project. The project recognized two types of project participants: signatories and associate Members. Project signatories led data collection and reporting tasks, steered the development of project infrastructure, and had representation and voting rights within the project Steering Group (SG). Associate members could participate in certain project activities, but were not expected to take a leading role and did not have voting rights within the Steering Group. The collected data was accessible to those signatories, associated members or other organisations that have actually contributed data with a comparable coverage to the data bank through their country's national co-ordinators. Each project participant nominated a national co-ordinator who is responsible for the administration of the COMPSIS Project within his/her respective country. All national co-ordinators form the signatory participants constituted the SG. The SG met a minimum of once per year. An operating agent was established to administer the project database and ensure consistency of project data[15]. Project participants were required to pay an annual fee of 10000 € which was used, in part, to cover the expenses of the operating agent.

COMPSIS Data Confidentiality and Access

Each national co-ordinator was responsible for protecting and maintaining proprietary rights in the information provided by him or her to the Project, including marking or otherwise indicating that such information is confidential. He or she was also responsible for ensuring that any necessary legal arrangements were made in his/her own country to protect those proprietary rights

Data included in the COMPSIS database was password protected and accessible only to those authorized project members. In addition, the Operating Agent was required to maintain the security of proprietary information and was not permitted to disclose this information to any non-participant.

[15] The Norwegian Institute for Energy Technology served as the Operating Agent for the COMPSIS project.

4. ACTIVITY METHODOLOGY

This task consisted of three main activities:

- Development, issuance, and analysis of a survey questionnaire;
- Organization of a task group workshop to evaluate survey responses and identify key issues for consideration; and
- Development of a final report which, in addition to describing the result of task activities, also provides background information on each of the joint OECD data projects included within the scope of the task.

This task was carefully coordinated with representatives from each of the joint data projects considered (i.e., ICDE, FIRE, OPDE/CODAP, and COMPSIS) and the data projects served as a valuable source of information for the task.

4.1 Survey Description

It was recognized during the early stages of the task, that care was needed to ensure the survey questionnaire addressed not only the perspectives from data project members and non-members, but was also capable of adequately addressing the perspectives of the data projects themselves. Therefore, a survey instrument was developed in collaboration with representatives from WGRISK and each of the data projects. To better focus the questionnaires and improve the efficiency of the survey process, two surveys were developed: one that was intended for members of the PSA community, and the second intended for each of the data projects. The draft surveys were circulated among WGRISK members and observers and data project representatives for review and comment prior to being finalized. The surveys focused on the task objectives and requested information pertaining to project participation, data access, uses of data project products for PSA, challenges in data collection and use, and best practices in use of data project products.

<u>WGRISK Representative Survey</u>

The WGRISK representative survey consisted of 43 questions, ten for each of the four data projects, and three questions to identify issues of general applicability. The WGRISK survey can be found in Appendix B. Since an important objective of this task was identifying obstacles to increased data project participation, the WGRISK survey questions were intended to be answered by both data project participants and non-participants. For each of the four projects, the questionnaire solicited information on the following topics:

- For respondents who do not participate in the associated joint data project
  - Reasons for not participating or terminating participation in the project

  - Prospects for future participation (e.g., what could be done to encourage participation, availability of information to support decision about joining the project)
  - Availability of sufficient publicly available data project information for non-participant PSA developers to benefit from the project (e.g., for non-participants, is enough project information available to support PSA applications)

- For respondents who do participate in the associated joint data project
  - Reasons for participating in the project, including the benefits you have received from your participation.
  - A summary of data that has been submitted to the project, the source of the data, and if the data has been used to support PSA applications
  - Level of resources that has been applied to support the project (including collecting, coding, submitting data, etc.)
  - Application of data project products for supporting PSA applications (e.g., accessibility, formatting, and availability of user manuals)
  - Consistency between respondent's data collected/coded for national programs versus the data project
  - Previous experience applying data project data to support PSA activities
  - Challenges experienced using data project data and recommendations for improvement

- General Questions
  - Ongoing data activities to address the limited operational experience with new and advanced reactors
  - New data needs that could be addressed through a joint OECD/NEA data project
  - Other general comments

<u>OECD Joint Data Project Representative Survey</u>

The OECD joint data project survey questionnaire consisted of twelve questions. The survey was provided to a representative from each of the four data projects considered by this task (i.e., ICDE, FIRE, OPDE/CODAP, and COMPSIS). The questionnaire was intended to collect information on data quality, collection activities and consistency with national operating experience programs, experience with PSA applications of collected data, availability of project reports, and activities that WGRISK could perform to support the data projects. The data project survey is provided in Appendix C and addressed the following specific topics:

- Sufficiency of the quality and quantity of data being submitted to the project
- Consistency of national data collection with data project requirements
- Availability of exposure information (needed to calculate PSA parameters)
- Accessibility and formatting of data for the purposes of PSA (including availability of user and coding manuals)
- Experience with quantifying failure rates, failure probabilities, or other PSA parameters
- Availability of project reports and data
- Completeness of the data sets that have been provided to the data project
- Feedback on the uses of data project products for the purposes of supporting PSA
- New initiatives for the future and ways that WGRISK could provide assistance and/or support
- Availability of information about the project for non-participants

– How WGRISK can help to address data project challenges

Response Statistics

The surveys were distributed in the Spring of 2012. Good participation completing the survey was noted, with 22 organizations representing 14 member countries (out of 21 WGRISK member countries and observers) providing survey responses for the WGRISK targeted survey. Survey responses were also obtained from the ICDE, FIRE, OPDE/CODAP, and COMPSIS data project representatives. A summary of the WGRISK survey responses are provided in Appendix E. The completed surveys from the OECD data project representatives are provided in Appendix F and the complete WGRISK surveys are provided in Appendix G. An analysis of the survey results is provided in Section 5.1 of this report.

4.2 Task Group Meeting

On October 15-16, 2012, a task group meeting was held at OECD Headquarters. The purpose of the meeting was to: (1) review survey responses from data project representatives and WGRISK members and affiliates, (2) discuss best practices for use of project data in PSA, (3) identify potential new data needs or analyses, and (4) develop a task report outline and a strategy for expediting the report generation. The meeting included fourteen participants, representing eight countries, each of the data projects (i.e., ICDE, OPDE/CODAP, COMPSIS, and FIRE), and the NEA secretariat.

The first day of the meeting focused on a review of survey responses for each of the data projects included within scope of the task. Twenty-one survey responses were received from WGRISK members or affiliates along with a survey response from each of the data projects. The survey responses provided a good cross section from both project members and non-members and highlighted several key insights. Significant challenges to data project participation by non-members included:

- Costs associated with data collection, analysis, and reporting
- Perception that collected data is not applicable to certain design types (e.g., WWER, Gas reactors)
- Proprietary data concerns – probably needs more investigation to determine issue since confidentiality agreements exist to mitigate this concern
- Desire for “trial use” of data to determine if project participation is worthwhile
- Availability of publicly available information to determine details of the project

Main issues and challenges for project members included:

- Long time needed to develop mature database
- Completeness/comprehensiveness of data project data (requires diligence and resources on the part of members to submit data)
- Resources required to achieve data quality (but cost is outweighed by benefits of participation)
- Resource needs to translate event descriptions into English
- Need to evaluate how sharing of data is done within individual countries to support maximum use of data products by interested parties
- Access for contractors who reside outside of a member country

The second day involved general discussions associated with enhancing participation in data projects and identifying new PSA data needs and analyses. At the conclusion of the workshop, participants identified a number of best practices, including development of success criteria for data projects use in

PSA applications. The participants also agreed on a draft outline and key sections of the report were assigned to various section leads. Overall, the workshop discussions benefitted greatly from the diverse range of highly motivated representatives who participated in the meeting and successfully identified key issues, challenges, and best practices. Analysis

5 ANALYSIS

The section provides a summary and analysis of survey responses received from the PSA and data project communities. For each joint data project considered, a summary of WGRISK and data project representative survey responses are provided. Additionally, this section includes discussions of approaches to enhance data project participation, new operating experience data needs, and data project success factors for PSA applications.

5.1 Survey Results

A summary of survey results obtained from the WGRISK PSA community is provided in Section 5.1.1 and a summary of data project survey perspectives is provided in Section 5.1.2. Overall, 21 survey responses were provided from PSA practitioners and 4 surveys from data project representatives (one from each joint project considered).

5.1.1 WGRISK Member Survey

Good participation for completing the survey was noted, with 22 organizations representing 14 member countries providing survey responses[16]. A summary of the WGRISK survey responses are provided in Appendix E. The completed surveys from the OECD data project representative are provided in Appendix F and the complete WGRISK surveys are provided in Appendix G.

5.1.1.1 ICDE Data Project

At the time the task survey was distributed, there were eleven participants in the ICDE data project: Canada, Finland, France, Germany, Japan, Republic of Korea, Spain, Sweden, Switzerland, United Kingdom, and the United States. All of the eleven ICDE member countries responded to the survey, in addition to nine organizations that did not participate in ICDE project. A summary of survey responses follows:

1. **Why did you choose not to participate or terminate your participation in the project?**

   The reasons listed in various responses include: the benefits of participation do not justify the cost, that other organizations in the country are acting as the delegates to the project, new OECD/NEA member,

[16] One survey represented the consolidated responses from two organizations from the Slovak Republic (i.e., UJD and RELKO)

resources associated with collecting and coding data are excessive, and proprietary/confidentiality concerns with data.

2. With regard to the potential for future project participation:

a) What can be done to encourage the participation of your organization in the ICDE data project?

- not familiar with the project and would need more detailed information before deciding to participate
- new member of OECD/NEA and has not yet decided if their organization is interested in participating in the project
- unsure whether they could provide valuable information for the other partners in the project (although they are now considering the potential to participate and the possibilities of joining.)
- access rights to the data would encourage participation

b) What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

- Advantages to project participation:
  - transfer of know-how
  - to be more aware of international practices and sharing of data
  - getting information about CCF events (which is difficult to get otherwise)
  - being one of the partners for forming a consistent, integrated approach to CCF
  - providing the necessary data to develop reliability data analysis methods
  - One organization stated that they could provide useful information about long term treatment of CCF data and methodological developments and problems encountered, along with their events and precursors
- Disadvantages to project participation:
  - Potential inapplicability of the results to WWER type plants
  - Perceived lack of access to proprietary information

c) Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

Most respondents stated that they had sufficient information to make a decision on participation or that the decision to join the project was not theirs. One organization responding stated that they would value a more detailed description about the methodology used, data collection and analyses, implementation of the results, and what was done in the past as well as plans for future use. One organization asked if the project aimed at proposing estimates for CCF parameters.

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project?

Some responding organizations felt that the information was sufficient. Other responding organizations felt that

- the information available for non-participants was very limited and that publicly available reports are not enough to make a decision about participation

- while the information available is suitable for understanding mechanisms connected with the occurrence of common cause failures and the distribution of various CCF coupling factors that influence the strength of the CCF potential, the information was mostly qualitative and does not help with quantification of parameters
- generic data for Bayesian updating would be useful, as well as concrete information about CCF events at specific conditions

4. Please describe your reasons for participating, including the benefits you have received from your participation.

- Gain access to a comprehensive international database of CCF events, and provides raw CCF data to obtain specific CCF parameters.
- Supporting the safety case and continued operation.
- Provides a comparison to the parameters derived from a domestic database.
- Stay informed about and improve techniques for
  - current CCF analysis approaches
  - tools and best practices in terms of management, engineering, and modelling
  - root cause of events
  - preventive countermeasures
  - identification of CCF groups
  - risk-based inspections
  - early identification of unknown or little known CCF phenomena
  - quantitative assessment of CCF probabilities
- Provides a forum to share knowledge with international experts, and gives access to relevant papers prepared by international experts. This aids in forming relationships with other organizations within the nuclear industry in other countries, including the regulatory bodies.

5. In relation to the national data provided to the project:

a) What national data have you already provided to this project?

Component	**Number of Countries Providing Data**
Batteries	6
Breakers	6
Centrifugal Pumps	6
Check valves	6
Diesel Generators	6
Heat Exchangers	4
Motor Operated Valves	6
Safety and Relief Valves	5

Control Rod Drive Assembly	4
Level measurement	5
No data given	2

b) What is the source of the data that you have submitted?

- As a part of the PSA data analysis, utilities make a qualitative and quantitative CCF data analysis. The qualitative analysis is sent to the ICDE project.
- National database on reportable events including the underlying information on these events by the licensees.
- Event reports submitted to the regulatory agency by the utilities pursuant to the related laws.
- Nuclear power plant operating experience.
- CCF events from licensees' maintenance records for the specific campaign of data collection.

c) Have you used this data to support PSAs in your country?

- There was a mixed response to this question, with some respondents using the data, and other not using it.
- Uses given include:
  - comparison to the national CCF database
  - technical documents supporting the national PSA Guideline as well as for most of the PSA having been performed for NPP in the frame of Periodic Safety Reviews and other PSA studies by the utilities
  - the collected data has been reviewed for qualitative lessons and these have been shared with the licensees
  - the public reports are used along with other information (non-ICDE) to support assessment of licensees' PSAs and safety cases

d) Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

- Most respondents stated that there was no national data that was not submitted due to proprietary/confidentiality concerns.
- Some respondents indicated that in their country suitable data is not routinely collected by the licensees, and specific work and significant effort would be required to collect this data.

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

- The level of resources varied between 200 staff-hours to over 1000 staff-hours per year.
- Some respondents used contractual support to collect and provide data to the project.
- Some respondents established a working group with responsibility to collect relevant CCF event records from the past, and to submit them according to ICDE component specific coding guidelines.

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

- Most respondents had no proposals for changes or improvements at present, although some respondents stated that the data generally requires further analysis to be of use or that the description, scope of components, groups of analysis, etc., were not the same as in the national PSA.
- The database is able to support different quantification methods. This is seen as a good thing by some respondents, as participating countries may have different approaches for performing CCF quantification; and a negative one by others, as there is not a single internationally used approach for quantification.

8. **Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?**
   - Most respondents stated that there were no consistency issues between national programs and the ICDE data project, while some simply said that there were difficulties in matching data between the two programs.
   - A few respondents stated that they changed their national database to more closely match ICDE.
   - One respondent stated that the most important issue is that all event and component descriptions must be translated into English.
   - One respondent noted that the ICDE project has established a general coding guidelines document to address consistency issues

9. **Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).**
   - Most respondents stated that the database has not been used to support PSA activities, or that it has only been used to develop general CCF insights.
   - Other respondents stated that the CCF Database was used in regulatory matters
   - The ICDE data were used to compare CCF parameters for certain components where the amount of national data available is limited.
   - Used in developing improvements in CCF quantification methods.
   - The coupling model has been developed with insights from the ICDE project

10. **Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?**
    Many respondents stated that there have not been significant challenges to using the data and that they had no suggestions for improvement, or that most significant challenges to using the data have already been resolved.

    Challenges identified included the following:
    - The collection and interpretation of not only CCF event information but also independent failures and observed population information is a difficult problem.
    - The data remains fairly heterogeneous, which is expected for data collected over many countries and licensees.
    - It takes time to reach final results from the ICDE component studies, and then on a national level to create new/updated CCF parameters.

    Recommendations for improvement:

- Estimate generic CCF parameters. The generic CCF parameters could be used as a reference for most countries which don't have the database, and could encourage countries which are not participating in the project to join.
- A wider range of components and greater number of participants would aid the project.
- A summary report giving an overview (in a condensed format) of the ICDE database with more qualitative analysis and insights as well as more detailed guidance may be useful.

Observations and Issues

The ICDE survey had good representation from both participants and non-participants. In general, non-participants cited the cost of participation and concerns with data access as main drivers for not joining the project. However, non-participants also recognized several key benefits of participation, indicating that information about the project was generally available to the broad PSA community. Some concerns were identified by non-participants with the applicability of ICDE data to some plant types, such as WWER designs and gas-cooled reactors. For participants, there were not significant issues associated with use and consistency of the data, though respondents reported between 200 – 1000 staff-hours needed to support the project. Although project data has not been used extensively to estimate PSA parameters, participants generally indicated that sufficient information was available to do so. The primary use appears to be gaining qualitative insights on common-cause failure. Recommendations include providing more information about the project and increasing data scope to include additional components.

5.1.12 FIRE Data Project

At the time the task survey was distributed, there were twelve participants in the FIRE data project: Canada, Czech Republic, Finland, France, Germany, Japan, Republic of Korea, Spain, Sweden, Switzerland, the Netherlands, and the United States. Eleven of the twelve FIRE member countries responded to the survey, in addition to eight organizations that did not participate in the project. A summary of survey responses follows:

1. Why did you choose not to participate or terminate your participation in the project?

The main issues cited included the benefits of participation not justifying the cost, proprietary/confidentiality concerns with data, or simply being a relatively new OECD/NEA member. Other issues included the scope and content of fire data captured by the project, including:

- events such as smoke generation, consequences of fire, fire services intervention, fire near miss events, and outage related fires are not always captured within the database
- limited numbers of fires in nuclear plant worldwide to base nuclear safety related claims upon, especially when it comes to larger fires that could threaten more than one train of protection

2. With regard to the potential for future project participation:

a) What can be done to encourage the participation of your organization in the FIRE data project?

- One respondent stated that they were not familiar with the project, and that more detailed information was needed about the project to make a decision.
- If the aspects of data gathering and reporting in the project were changed to be more applicable to the national reporting criteria already in place.

b) What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

- Several respondents stated that they had information that they could share, but they felt it was not of interest due to different types of reactors or nuclear installations.

Advantages:

- transfer of know how
- greater sharing of knowledge relating to fire events worldwide
- greater international co-operation between member countries

Disadvantages:

- potential under or over reporting of fire events leading to results from a particular country being skewed
- the lack of resources to adequately contribute and have oversight of the FIRE data project
- the potential impact on the existing level of reporting should the level of reporting be reduced

c) Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

- Some respondents stated that they felt there was sufficient information available.
- Other respondents felt that sufficient information is not available, and that detailed information is needed about the
  - methodology used
  - data collection and analyses
  - implementation of the results
  - what was done in the past
  - what will be done in the future
- One respondent felt that they would be happy to contribute to such a project providing that it would not lead to a reduction in the level of reporting already undertaken by licensees.

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project?

- Some respondents stated that there was sufficient information available
- Others stated that there was very limited information available about the project for non-participant PSA developers, and that the publicly available reports are not enough to make decisions about participation (although they do provide useful qualitative insights.)

4. Please describe your reasons for participating, including the benefits you have received from your participation.

Reasons for participating:

- provides a cost effective method for collecting operational experience
- allows member organizations to share their experiences
- helps quantify fire occurrence frequencies for a Fire PSA
- aids in the understanding of the phenomena, consequences, preventative measures, and consequence mitigation used

Benefits Received:

- provides an additional source of fire event information for comparison with a national database

- acts as a reference for fire events when the fire protection program licensees develop are reviewed
- aids in creating fire PSAs
- the fire statistical analysis and fire scenario studies were useful for deterministic safety assessment

5. In relation to the national data provided to the project:

a) What national data have you already provided to this project?
Most responses stated that all reportable fire events that were documented were provided to this project, or that all fire data (including small fires and precursors to fire such as smoke generation) was included.

b) What is the source of the data that you have submitted?
- Most respondents stated that the data was obtained from LERs and other event reports provided to the government by licensees based on laws and their ordinances.
- Plant specific database of information about plant specific safety related events (not only fires) and additional discussions with utility experts oriented to fire safety.

c) Have you used this data to support PSAs in your country?
- Some respondents have not used this data to support PSAs, while others have.
- Uses stated included:
  - identify trends and any possible changes to the fire ignition frequency
  - periodic safety reviews
  - part of a fire PSA methodology enhancement
  - deterministic assessments and analysis

d) Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
- Most respondents stated that they had not withheld data due to proprietary/confidentiality concerns. The NRC and GRS stated that because they have no process or mechanism for providing results that do not meet the threshold for reporting, there may be events that the licensees did not report.
- One respondent stated that one event is not in the database because the event is in litigation for a death, and will go into the database upon completion of the trial.

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
- Most countries did not seem to be worried about the level of resources needed to support the project being too high.
- On average, somewhere between two to four staff work on the project, with help from licensees and senior fire experts.
- One respondent stated that they had formed a working group with the licensees to aid in the categorization and submission of fire events.
- One respondent stated that the submission of one event takes about half of a day for a person, while another stated that the total effort per year is estimated at 80 hours.

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

Data readily accessible:

- Most respondents felt that the data was readily available and complete.
- Steering meetings have helped to ensure that there are no problems about accessibility and availability.
- Some improvement is possible, notably the search by key word (search by reactor type, events in a given time period, etc.)

Formatting and data collection changes:

- Most respondents stated that they had no changes or suggestions.
- Sufficiently detailed information about a fire event has to be present in the database to determine whether an event is relevant for specific operating conditions typical for a plant, since fire risk analysis is highly plant specific.

8. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?

- Some respondents stated that there were no issues or obstacles, while a few stated that the results need to be prepared by a specialist prior to the use of the data.
- There are consistency issues between how data is collected/coded for national programs versus this project.

Suggestions:

- try to gather event data from non-reportable fire events
- Additional collection of fire protection features failures (reliability data) would be highly beneficial

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

Most respondents stated that the project database has not been used to support PSA activities to date. However, some PSA uses were identified including:

- fire frequencies have been developed and used in a FIRE PSA
- to identify trends and possible changes to the fire ignition frequency and mechanisms
- experience feedback is continuously being used to account for additional issues up to now not being covered in PSA
- a better general understanding of fire events
- up-dating fire risk analysis
- fires induced by electrical cables
- fire scenarios caused by human actions during maintenance

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

- No significant challenges to using the data project data, and had no recommendations for improvement, although several stated that this was because the number of fire event data is too small to use in a fire PSA.
- Some coded fields were sometimes incomplete or could be misleading, and that additional codes and/or coded field were needed.

- One recommendation is to apply this database not only to commercially operated nuclear power plants but also to research reactors.
- Add information about the type of detection system and the organization of the fire fighting team in each country or NPP.
- Long term: get results from certain FIRE analysis or topics on the agenda, and communicating these findings in a reasonable timeframe to the licensees.

Observations and Issues

The FIRE survey had good representation from both participants and non-participants. In general, non-participants cited the cost of participation and concerns with data access as main drivers for not joining the project. However, non-participants also recognized several key benefits of participation, indicating that information about the project was generally available to the broad PSA community. Some concerns were identified by non-participants with the scope and content of FIRE data, including lack of events that do not meet reporting thresholds (e.g., events related to smoke generation, fire near misses, or that occur during shutdown conditions) and the lack of information about large fires due to their relative rarity. For participants, there were not significant issues associated with use and consistency of the data, though several respondents noted the lack of less significant non-reportable events. Although project data has not been used extensively to support PSA (in part due to a relatively small number of events currently in the database), some participants have used project data to support PSA activities. The primary use of project data appears to be estimating fire, trending, obtaining a better qualitative understanding of fire events (including fire scenarios caused by human actions during maintenance). Recommendations include providing more data codes to clarify ambiguities, adding detection and fire fighting information to the database, and attempting to gather non-reportable fire events.

5.1.1.3 OPDE/CODAP Data Project

At the time the task survey was distributed in the Spring of 2012, there were twelve participants in the CODAP[17] data project: Canada, Chinese Taipei, Czech Republic, Finland, France, Germany, Republic of Korea, Japan, Spain, Sweden, Switzerland and United States of America. All twelve of the CODAP member countries responded to the survey, in addition to seven organizations that did not participate in the project. A summary of survey responses follows:

1. Why did you choose not to participate or terminate your participation in the project?

Reasons given include:

- Benefits of participation do not justify the cost.
- Need convincing that data would be sufficiently extensive, generic and applicable to provide meaningful input to regulatory decisions.
- Data is unlikely to be already collected by licensees in the form required making it resource intensive to collect information to feed into the project.
- Lack of awareness of this project.

2. With regard to the potential for future project participation:

[17] The OPDE project was completed in May 2011 and included all member countries as CODAP with the exception of Chinese Taipei.

a) What can be done to encourage the participation of your organization in the OPDE data project?

- Provide more detailed information about the project
- Need to have sufficient resources and also be able to convince licensees of the benefit to them.

b) What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

- The advantages are in transfer of know how in this area. The disadvantages are regarding the applicability of the results for the WWER plants.
- One respondent stated that they can see potential advantages in joining the OPDE/CODAP project, but that they do not retain sufficient data of statistical quality to be able to contribute in their own right.

c) Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

Most respondents stated that sufficient information was available. However, some respondents felt that there was not enough information available and requested a detailed description of

- the methodology used
- data collection
- analyses
- implementation of the results
- what was done in the past
- what will be done in the future

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project?

Respondents stated that they felt there was very limited information available about the project for non-participant PSA developers.

- Some respondents noted that while publicly available information provides some information that may be able to support PSA activities, it appears to be at a relatively high level.
- It would be helpful if failure rates were also published. None of the respondents have used this information to support PSA activities to date.

4. Please describe your reasons for participating, including the benefits you have received from your participation.

Reasons for participation:

- access to a centralized operational experience database with standardized coding guidelines
- To obtain information on root cause of events, experience feedback of events, preventive countermeasures, reliability attributes, and structural integrity evaluation
- To understand aging mechanisms and determine an effective aging management program
- extensive generic information, which will be used in the process of frequencies derivation
- low power and shutdown operation estimation of frequencies

Benefits received:

- having a database of piping failure at international level with a large number of events
- getting reports prepared by the participants or by the clearinghouse on related issues
- Platform for discussion of relevant issues with experts from other countries

- Extending the knowledge base
- The OPDE/SCAP/CODAP databases have been used to inform regulatory decision making.

5. In relation to the national data provided to the project:

a) What national data have you already provided to this project?
The number of submitted piping degradation and failure events submitted varies greatly. One respondent stated that every relevant event report from 1970 onward was included, while others stated that they provided information from anywhere between 20 to 50 events.

b) What is the source of the data that you have submitted?
In general, the sources of data submitted varied from
- licensee event reports , other licensee data,
- corrective action reports, root cause reports,
- replacement program reports,
- periodic inspection reports,
- open access information,
- conference proceedings, journal publications

c) Have you used this data to support PSAs in your country?
Some respondents stated that they used this data, while others did not. Respondents who used this data to support PSAs used it for the following:
- Analysed pipe failure data for the very small LOCA, feedwater line break events, and flood events. The resulting pipe rupture frequencies were used as initiating event frequencies for the PSA
- All the data were analysed by the PSA specialists and the relevant events were included into application of Bayesian approach for frequency estimation

d) Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
- Most respondents stated that there was no additional national data that could be used, although a few stated that it is possible that licensees could provide additional information on replacement and repair activities, given an agreement from the nuclear industry.
- One respondent stated that there is additional data on piping failure events that could be provided to the project, but that the cost to collect data from past events was prohibitive.

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
- The resources used vary greatly by country, from just one person part time to more than one full time equivalent.
- It was stated that the resources required to participate in the project are minimal compared to the benefits.

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?
- The project data is accessible and is in a useable format. Although it has not been extensively used in PSA applications, the format does not prevent it from being used.

- There are different approaches in the participating countries for data submission, due to the different reporting criteria in each country. It would be helpful to establish the consistent reporting criteria for all participating countries
- the database does not include the number of areas, piping length, component populations, etc., so probabilities cannot be determined

8. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the OPDE project?

Most respondents stated that there were few issues and that national databases are structured similarly. One respondent said that they modelled their own database after the CODAP project requirement, so they were similar, while others stated that the CODAP database had more detail than other national databases. The OPDE project developed a cross-reference table based on input of all national coordinators. Despite differences the OPDE data can be used across the industry, countries and reactor technologies.

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

Most respondents stated that the data was not directly used to support PSA models, although there were some exceptions:

- Calculating flooding frequency and RCS and feedwater piping rupture frequency for PSA activities[18].
- Some information from the database was discussed during the process of searching for the best and most complete data sources about loss of piping integrity.
- Used the OPDE database information to prepare state-of-the-art reports on fatigue management.

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Challenges

- The format of the database is not necessarily well known by the technicians that could be interested in the use of this database

Recommendations:

- Improving awareness of methods and approaches for using the data to estimate failure probabilities and frequencies.
- The secondary effects of pipe breaks and leaks could be a possible application. Assessment of the alleviated Code rules and need of supplementary rules (better protection, supporting, routing etc.) for small bore components might be also possible
- The project should prepare reports on topics suggested by National Coordinators
- Pipe population data (i.e. total number of welds with similar condition etc.) is needed to evaluate a pipe failure frequency

[18] Since exposure data is not collected by the OPDE/CODAP project, frequency estimation requires additional information not available from the project.

- A general discussion with participation of PSA experts and database/project developers with the subject "how to make the database/project the most useful for PSA" would be helpful.

Observations and Issues

The OPDE/CODAP survey had good representation from both participants and non-participants. In general, non-participants cited the cost of participation, concerns with applicability of data to national regulatory issues, and a lack of awareness of the project as reasons for not joining. For participants, there were not significant issues associated with use and consistency of the data, but some respondents reported that significant resources are required for certain data project activities (such as collecting information for historical events). Although project data has not been used extensively to support PSA (in part due to a relatively small number of events currently in the database), some participants have used project data to support PSA activities. Examples of PSA applications include calculating flooding frequency and piping rupture frequency for PSA activities and development of state-of-the-art reports on fatigue management. Recommendations include providing more information about how project data can be applied to PSA activities, developing more exposure information to aid in the calculation of PSA parameters.

5.1.1.4 COMPSIS Data Project

At the time the task survey was distributed, there were eight participants in the FIRE data project: Chinese Taipei, Finland, Germany, Hungary, Republic of Korea, Sweden, Switzerland and the United States. Seven of the eight COMPSIS member countries responded to the survey, in addition to nine organizations that did not participate in the project. A summary of survey responses follows:

1. Why did you choose not to participate or terminate your participation in the project?

- No computer based systems important to safety are installed
- New OECD/NEA member
- Proprietary/confidentiality concerns with data
- The way the project is oriented is not consistent with needs
- Benefits of participation do not justify the cost
- Awareness of project was limited amongst computer system specialists. It is uncertain if data would provide meaningful input to regulatory decisions.
- Data is unlikely to be already collected by licensees
- Unlikely that the output from the data project would be able to support PSA

2. With regard to the potential for future project participation:

a) What can be done to encourage the participation of your organization in the COMPSIS data project?

- More detailed information is needed about the project.
- The project should be oriented more towards collecting information needed for PSA, or, that the information for PSA can be derived from.
- Instead of just detailed description about failure events, the information should be well structured (failure modes taxonomy necessary) and all PSA related items should be collected (number of demands, for example).
- Specific communication about the background to the project, the benefits of membership and data available would be required as well as a clear case that the benefits of membership outweighed the disadvantages.

b) What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

One respondent stated that they could contribute detailed information about NPP I&C components failures, but the issue of proprietary/confidentiality of relevant information would have to be solved.

Advantages:
- transfer of know how in this area

Disadvantages:
- applicability of the results for the WWER plants
- the perceived resource requirements to be actively involved

c) Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

Some respondents felt that sufficient information is available to support an informed decision.

Others felt that sufficient information is not available, and that a detailed description was needed for:
- the methodology used
- data collection and analyses
- implementation of the results
- what was done in the past, and what will be done in the future
- The resource implications of participation
- key benefits

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project?

- Very limited information is available about the project for non-participant PSA developers, especially in comparison with the other projects considered in the questionnaire. The publicly available reports are not enough to make decision about the participation.

- Given the variety and number of variables in digital I&C systems (e.g. differences in development methods), it is unclear as to whether it is possible to gather data with sufficient quality and quantity to affect PSA judgments.

4. Please describe your reasons for participating, including the benefits you have received from your participation.

Reasons for participating:
- Reduce the uncertainties involved in determining the reliability of digital safety I&C and therefore the uncertainties in the licensing process.
- It is difficult to analyse or find the failure mechanisms and root causes because of the complexity of these systems.
- Enlarge the information base for early identification of non or little known failure phenomena including their causes and effects

Benefits received:

- Becoming familiar with different classification systems, better understanding of fault classification and root cause analysis.
- Some feedback and some lessons learned from international operating experience
- Provides a forum for an exchange of information, and allows members to share the experience from different equipment families and applications.

5. In relation to the national data provided to the project:

a) What national data have you already provided to this project?
For respondents who provided a specific response, the number of events provided to this project varied between a single event and 8 events. Some respondents simply said that they submitted a complete set of events without giving any concrete numbers.

b) What is the source of the data that you have submitted?
- Fault reports and reparation plans drawn up by the licensees
- National system to collect event data
- Digital-induced trip occurrence data for commercial operating NPP
- National LER

c) Have you used this data to support PSAs in your country?
Most respondents stated that the data have not been used, or not been used yet. There was one effort to quantify failure rates; however, this only included a limited number of data points (22 events).

d) Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
Some participating countries had restrictions limiting the data that was shared with the project. These issues were not identified or addressed in the early stages of developing the project.

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
- The COMPSIS webpage and data processing system took the project Operating Agent a significant amount of time to set up, verify and finalize.
- The quality of the data processing and validating of event information was very high, and the requirements for having data accepted were very stringent.
- The effort to complete the entry of one event was a minimum of 4 to 5 hours using senior I&C experts. This caused limitations for several countries.

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?
- The COMPSIS data project did not develop to the point where it could be easily used for the purposes of supporting a PSA. There was never a way to collect the final number of exposed systems, as this was information that participating countries were not willing to release.
- The database is readily available including documentation such as the Coding Guideline. However, it can only be used for qualitative assessments. It is unsuitable for quantification purposes, as information on the observed equipment populations has not been part of the data collection. Failure modes have also not been coded in COMPSIS.

8. **Are there any consistency issues between how your data is collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the COMPSIS project?**
   - The COMPSIS project database process provided a very well defined method to mix different events reported from different standards and then segment them accordingly. However, due to other limitations of the project the implementation of this feature was never fully tested and verified.
   - COMPSIS data has been collected in the limited scope of high-level events, e.g., digital-failure-induced trip events, In other words, there are no low-level events such as safety-related digital I&C component failure data. It is the significant limitation to the use of the data for digital I&C PSA.

9. **Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).**
   - Most respondents stated that they had not used the project database to support PSA activities. Additional comments are below.
   - The NRC is performing its own database collection and review of operational experience. This will provide a way to include outside sources of event types and relate lessons learned at nuclear power plant environments.
   - Data in the project database has been used to support general digital I&C equipment performance insights activities, and is helpful for understanding failure mechanisms for digital I&C components and systems.

10. **Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?**

    Recommendations:
    - Would be useful to require some more statistical information along with the data, such as operation times of similar equipment and demand frequencies for them.
    - Continue collecting data.
    - Include low-level operational failure data, e.g., safety-related DI&C component failure data.
    - For future digital I&C event collection efforts an effort should be made to utilize simpler coding.
    - Develop a technique to obtain digital I&C system failure rate with limited data to support PSA activities

Observations and Issues

The COMPSIS survey had good representation from both participants and non-participants. In general, non-participants cited the cost of participation, lack of awareness of the project, lack of computer based systems in national nuclear plants, and low likelihood that data could be applied to PSA activities. Concerns were identified by non-participants with the applicability of project data to certain plant types such as WWERs. For participants, there were not significant issues associated with use and consistency of the data, though the relatively high resource cost associated with development of project infrastructure and data reporting were noted. No applications of project data to PSA studies were noted. The primary use of project data appears familiarization with fault classification and root cause analysis, lessons learned from international operating experience, and having a forum for an exchange of information. Recommendations include including more statistical information along with the data (such as operation times of similar equipment and demand frequencies for them), inclusion of low-level operational failure data, simpler coding, and additional work to obtain digital I&C system failure rate with limited data to support PSA activities.

5.1.1.5 General Issues

In addition, the project specific questions discussed in Section 5.1.1.1 through 5.1.1.4, the WGRISK survey included three general questions to address operating experience data for new reactors, new operating experience data needs, and other general comments. A summary of the responses to these questions follows:

1. **Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?**
   - The comments most often stated was that there are no data activities ongoing for new and advanced reactors, or stated that such activities still needs to be organized. The respondents generally felt that a project to address the limited operational experience with new and advanced reactors was desirable, and should be organized as soon as practicable.
   - It will be useful if the current database projects would treat specifically the new and evolutionary components and systems (e.g., passive components, computerized systems, advanced human interfaces, and highly redundant systems with large common cause failure groups).

2. **Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?**

   Most respondents stated that they would be interested in supporting a project if a new data need is identified.

   Data needs and suggestions:
   - Extending the existing projects, e.g. the FIRE Data Project, might be necessary to some extent.
   - Human reliability data (particularly the data from simulator exercises, but also other categories - maintenance failures, for example) collection could be very useful.
   - operating experience related to external events, especially the impact on the water intake and/or power supply
   - getting “population” information to complement the event centred database

3. **Other general comments?**
   - The data projects are an important part of OECD/NEA work. They are especially important to member states with a small number of nuclear installations and limited national databases.
   - In the long term data collection should be developed so that the data can be more easily used in PSA applications.
   - The possibilities for future co-operation between OECD/NEA and, e.g., the EU Clearinghouse[19] and IAEA should be examined.

[19] More information on the European Clearinghouse on NPP Operational Experience Feedback can be found at: https://clearinghouse-oef.jrc.ec.europa.eu/ .

- Human factors are generally implicated in accidents but human actions are not always negative for nuclear safety. Indeed, humans can analyse the situation and act to prevent an accident or permit a better availability of the installation (in situations of control-command inopportune signals, for example).
- How to document all work and applications as well as benefits for the regulator stemming from our participation in this project? Dealing with few resources, time and support is an issue.

5.1.1.6 Overall Conclusions and Insights – WGRISK Survey

Non-Participant Perspective

- Concerns with benefit compared to cost of participation
- Desire for more information about project activities including methodology, quality assurance, and completeness.
- Lack of awareness of publicly available information pertaining to project activities
- Concerns about scope of data and applicability to a broad range of plant types (such as gas-cooled reactors and WWERs)

Participant Perspective

- The data projects are an important part of OECD/NEA work, particularly for member states with a small number of nuclear installations and limited national databases.
- Limited use of project data for PSA, but participants noted benefits for participation
- Resource commitment needed to support project
- Would be useful if the current database projects would treat specifically the new and evolutionary components and systems (e.g., passive components, computerized systems, advanced human interfaces, highly redundant systems with large common cause failure groups).
- Getting “population” information (i.e., exposure information) to complement the event centred database.
- Longer term data collection should be developed so that the data can be more easily used in PSA applications.

General Issues

- New operating experience data needs
    - Project to address data for new and advanced reactors was desirable, and should be organized as soon as practicable.
    - Human reliability data (particularly the data from simulator exercises, but also other categories - maintenance failures, for example) collection could be very useful.
    - Operating experience related to external events, especially the impact on the water intake and/or power supply.
- The possibilities for future co-operation between OECD/NEA and, e.g., the EU Clearinghouse and IAEA should be examined.

5.1.2 Joint Data Projects Survey

Survey responses were also obtained from the ICDE, FIRE, OPDE/CODAP, and COMPSIS data project representatives. The complete survey responses are provided in Appendix F, but are also summarized in the following Sections. Additionally, a summary overview of each data project is provided in Sections 3.1 through 3.4.

5.1.2.1 ICDE Data Project

Summary of ICDE project survey response:

1. **Is the quality and quantity of data being submitted to the project currently adequate to support project objectives? If not, what could WGRISK do to assist the project in addressing your data needs?**
   It is considered the data that is submitted into ICDE is of both sufficient quality and quantity to enable each of the project objectives to be addressed. In terms of data quantity, ICDE has currently collected a significant amount of data (e.g., see Section 3.1.4). In terms of data quality, a significant amount of effort is expended by members when collecting the data, the Operating Agent, who manages the database and the ICDE steering group. The Operating Agent verifies whether the information provided by the national coordinators complies with the ICDE Coding Guidelines, verifies the correctness of the data jointly with the national coordinator who has provided such data, and operates the databank.

   Data quality is considered at the outset for each data collection exercise. Coding guidelines have been developed during the project and are continually revised. They describe the methods and documentation requirements necessary for the development of the ICDE databases and reports. The format for data collection is described in the general coding guidelines and in the specific component coding guidelines including the information that has to be collected (mandatory information). A thorough quality assurance process is followed for data collection that includes various quality assurance stages. Key steps that ensure quality include:
   - General component guidelines are developed;
   - Specific component guidelines are developed;
   - Trial data collection is carried out that is reviewed by the Operating Agent – this may influence the coding guidelines and the data collection requirements;
   - Events are coded and collected consistent with the component coding guidelines;
   - Operating Agent reviews all events entered into the database by member countries;
   - Countries iterate with the Operating Agent to resolve comments;
   - Workshops carried out with the steering group also add an additional chance for quality assurance;
   - Report about generic insights is developed; and
   - Completeness statements are provided by member countries.

2. **How are national differences in (a) component safety classifications, (b) system boundaries, functional requirements, and (c) failure reporting criteria among project participants resolved to ensure consistent data reporting (i.e., how are consistency issues between how data is collected/coded for national programs and the data project resolved)?**
   National differences are resolved by having clear and strict coding guidelines (including relevant systems, component boundaries and functional failure modes), numerous operating procedures and a thorough quality assurance process as was outlined in the response to question 1. These are aimed at trying to get data that is as homogeneous as possible.

3. **PSA parameter estimation generally requires knowledge of both observed failure events and exposure (e.g., number of components demands, hours of exposure) in order to calculate a failure probability or failure rate. Does your project collect this type of exposure information?**
   ICDE does collect exposure information. The ICDE project was designed such that information would be collected to enable all commonly used CCF quantification approaches to be supported. The completeness statements also provide visibility of the individual country information collected on exposure. It is an expectation that information is recorded on all observed populations of components

with ICDE data collected on for a given plant in a country no matter whether a CCF event has occurred or not.

4. **Do you believe that project data (e.g., events, component failure data, and exposure information) is readily accessible and in a format that can be easily used by participants for the purposes of PSA (including availability of user and coding manuals)? Is all accumulated project data available to participants, or is data access restricted in certain cases (if so, please describe the project's data access policy).**
   For those members of the project that have contributed to a given component data collection exercise over a similar time period they have full access to all information collected in all countries for that component. In addition, all supporting information, e.g. generic component coding guidelines, specific component coding guidelines are fully available to all members, and also publicly available. However, there are strict rules within ICDE relating to access to the proprietary data. Specifically, the ICDE terms and conditions state that "[t]he database or those parts of it containing collected data in ICDE format will be accessible to those Signatories, Associated Members or other organisations that have actually contributed data with a comparable coverage (as described in ICDE Operating Procedures) to the data bank through their country's national coordinators." Therefore, not all accumulated data is therefore available to all members if they have not collected data on a specific component or for a similar time period.

5. **Has the project attempted to quantify failure rates, failure probabilities, or other PSA parameters? If so, please provide examples and/ or references.**
   As a group the project has not attempted to produce PSA parameters, e.g. CCF probabilities or CCF parameters for various models. However, the data is collected and recorded in a way to enable such quantification to be carried out by members if they wished. There are a number of problems with producing a set of parameters for them to be used 'blindly' e.g. the heterogeneous nature of some of the data, the different approaches to CCF quantification used internationally, which require individual countries to understand the applicability of individual events before they are used as part of quantification. These are some of the reasons that this has not been pursued by the group as a whole. It is noted that there has been much discussion of this within the ICDE meetings.

   Although the project has not produced CCF parameters or direct estimates, individual countries have used the data in this way and have shared their analysis regularly during the ICDE steering group meetings. Quantification has also been the subject of a number of workshops during ICDE meetings.

6. **What project reports have been made publicly available and are available to both participants and non-project participants? Where can these reports be found (e.g., data project website, NEA publication webpage…)?**
   See Appendix D for a complete list of publicly available documents for the project.

7. **Is any project data available to non-participant PSA developers such that they could still benefit from project activities (e.g., information that could support probabilistic parameter estimation or derivation of quantitative equipment performance insights)?**
   A significant amount of information is available to non-participants. Whereas the raw data (individual events and observed populations) are not available due to the project data proprietary rules, information is provided in public summary component reports that are produced following the completion of data collection exercises for each component. The component reports do provide some useful information for PSA practitioners, which includes qualitative information about the observed events that is useful for defining the CCF groups in the PSA, failure mechanisms, coupling factors, relevant defences etc. Furthermore, some high level quantitative information is also provided for

example, distribution of failure modes, root causes, coupling factors, detection method, corrective actions, timing factor, shared cause factor, observed population, the type of CCF (e.g. complete, partial etc.).

8. **How comprehensive/complete are the data sets that have been provided to the data project? Are there any major data gaps that WGRISK could assist the project in addressing?**
   Each member country is required to provide a completeness statement for each of the components they have collected data. This ensures that members have a clear understanding of the quality of data from any country. Where countries' data is not complete they may only be given partial access to the data from other countries, thus providing an incentive for more complete data collection. Additionally (and as described in the responses to questions 1 and 2) it is considered that a significant amount of effort is expended by the Operating Agent, ICDE steering group and members to ensure that the data is as comprehensive and complete as possible. This is through the ICDE operating procedures, the component coding guidelines and general quality assurance procedures. Therefore, in general it is considered that there is a high level of completeness to the datasets within ICDE.

9. **Have you received feedback on the uses of your data project products for the purposes of supporting PSA? If yes, how was this feedback received? How would you prefer to receive this type of feedback?**
   Feedback on the use of ICDE data to support PSA is regularly discussed at the bi-annual ICDE steering group meetings. Each country representative provides an update on the use of ICDE data within their country at ICDE meetings – this is a standing agenda item. Other groups in other countries also discuss use of ICDE data, for example the Nordic PSA group. Any feedback is predominantly brought back to and discussed at the ICDE steering group meetings. Specific workshops on use of ICDE data have also been arranged in connection with ICDE meetings where this issue has been discussed in depth.

   It is also considered that feedback from WGRISK on use of ICDE data would be useful, for example by having a specific agenda item at both WGRISK and data project meetings where this could be discussed and key messages shared. Feedback can also be provided via the ICDE chair, vice chair, NEA secretariat or other ICDE members. Contact details are provided on the public parts of the ICDE websites.

10. **Are you planning any new initiatives for the future? In what ways can WGRISK provide assistance and/or support**
    New initiatives are discussed regularly during ICDE Steering Group meetings. The following new initiatives have recently started or are being explored:
    - Data collection for new components, e.g. fans, main steam isolation valves, computerised systems;
    - Update of previous component reports as more data is collected, including examination of any trends since the last report;
    - Cross component CCFs;
    - Subtle dependencies; and
    - Highlighting important events based on criteria that are being developed.

    WGRISK can always provide assistance/support by feedback of areas of particular interest or issues from within the wider PSA community. Any new dependency related issues could then be considered and explored by ICDE.

11. How can WGRISK members and observers who currently do not participant in the project learn more about your activities and the process for becoming a project participant?
Non-members with interest in joining ICDE are welcome to attend ICDE meetings as observers. There is also a significant amount of information available on the ICDE websites and in the public reports that can be found at www.eskonsult.se/ICDE/ and www.oecd-nea.org/jointproj/icde.html.

12. What could WGRISK do to help address other data project challenges?
Better links with WGRISK could be beneficial
WGRISK can provide feedback on areas of particular interest and help promote the project and available reports.

WGRISK could assist in the following ways:
- Promoting the ICDE project
- Promoting the publicly available reports
- Providing input on dependency issues from the wider PSA community
- With more members, the quantity and quality of data will improve such that it is able to be used for more applications
- A more formal link between WGRISK and the database projects may be beneficial
- Standing agenda items at both WGRISK and data project meetings on the WGRISK/database project link

5.1.2.2 FIRE Data Project

Summary of FIRE project survey response:

1. Is the quality and quantity of data being submitted to the project currently adequate to support project objectives? If not, what could WGRISK do to assist the project in addressing your data needs?
Yes. With emphasis on data validity and data quality, OECD FIRE Coding Guidelines have been developed for collecting and classifying fire event data to ensure consistent interpretations and applications. Operating Procedures (OP) and a Quality Assurance (QA) Manual complete the Project documentation. This task of document elaboration has been an important part of the first phase of the Project (2003-2005), however been continued through the entire Project duration covering the most recent developments in data submission, processing and assessment, in particular for statistical use in the frame of Fire PSA such as revealing compartment as well as component specific fire frequencies.

2. How are national differences in (a) component safety classifications, (b) system boundaries, functional requirements, and (c) failure reporting criteria among project participants resolved to ensure consistent data reporting (i.e., how are consistency issues between how data is collected/coded for national programs and the data project resolved)?
There are differences between the reporting criteria for providing fire event data in the different member countries. Some countries do report all fire events having occurred in NPP (e.g. Czech Republic, Finland, and Sweden). Other countries are only able to provide those events to the Database that are obligated to be reported to the national authorities according to the national reporting criteria in place (e.g. Germany, Japan, and USA). And these criteria and/or reporting thresholds may even vary over time. The users of the OECD FIRE Database are made aware of these differences by an Appendix to the Coding Guideline, where for each country the reporting criteria are provided in detail.

3. **PSA parameter estimation generally requires knowledge of both observed failure events and exposure (e.g., number of components demands, hours of exposure) in order to calculate a failure probability or failure rate. Does your project collect this type of exposure information?**

   For PSA parameter estimation based on the OECD FIRE Database in principle event occurrence numbers (number of fires at a specific component or in a specific compartment related to rector type and/or plant operational state and reactor operational duration for each plant state) are required. In principle, this information is available in the Database, information collection on type specific numbers of components and compartments as well as plant operational years for the different plant operational states is ongoing at the time being, and the information is being included as generic information in the Database. In addition, the total number of components per fire ignition source per plant is intended to be collected (with the exception of cables, for which this is difficult). Hours of exposure are not recorded.

4. **Do you believe that project data (e.g., events, component failure data, and exposure information) is readily accessible and in a format that can be easily used by participants for the purposes of PSA (including availability of user and coding manuals)? Is all accumulated project data available to participants, or is data access restricted in certain cases (if so, please describe the project's data access policy).**
   The information on fire events in the OECD FIRE Database is principally available in a format allowing for quantifying fire specific PSA parameters, such as component and/or compartment specific fire frequencies for different reactor types and/or plant operational states, failures of fire detection and/or extinguishing means. At the time being, the collection of accumulated generic information (e.g. number of components/compartments per reactor type and/or plant operational state, number of plant operating years, etc.) is still ongoing. As soon as all this information is available it will be available to all participants in anonymous generic form.

5. **Has the project attempted to quantify failure rates, failure probabilities, or other PSA parameters? If so, please provide examples and/ or references.**
   The OECD FIRE Database Project has already started to quantify compartment and component specific fire occurrence frequencies for different reactor types and for full power as well as low power and shutdown states [67]. However, the information of plant specific numbers of compartments and/or components is not yet complete from all member countries´ NPP at the time being. Completion is foreseen up to the end of the third Project phase (December 2013). Due to the data inconsistencies mentioned in the answer to question 2 such PSA parameters are up to now only meaningful for data from those countries reporting all fire events. In addition, the Database can meanwhile principally be applied for establishing plant specific fire event trees [39].

6. **What project reports have been made publicly available and are available to both participants and non-project participants? Where can these reports be found (e.g., data project website, NEA publication webpage…)?**
   See Appendix D for a complete list of publicly available documents for the project.

7. **Is any project data available to non-participant PSA developers such that they could still benefit from project activities (e.g., information that could support probabilistic parameter estimation or derivation of quantitative equipment performance insights)?**
   The Database is accessible only by OECD FIRE Project members. However, some events have also been publicly reported on an international basis. Information on these events is also available by non-participants to the Project. In addition, all information published (see reports/publications not limited

to OECD/NEA members) is available also to non-participant PSA developers such that they may benefit from project activities.

8. **How comprehensive/complete are the data sets that have been provided to the data project? Are there any major data gaps that WGRISK could assist the project in addressing?**
The datasets are essentially complete. The only issue to be mentioned is that, unfortunately, not all member countries do report all fire events to the OECD FIRE Database. For PSA use this represents a limitation. For a reliable probabilistic assessment of the fire risk with an as far as possible high level of confidence a meaningful statistical database with as much as possible data, in particular starting with incipient fires, is required. This gap can only be closed if the database can be further extended and the inconsistencies stepwise excluded. In addition, the level of detail and quality of project data from events farer in the past is sometimes insufficient for use within Fire PSA. However, the quality of data provided to the OECD FIRE Database is continuously increasing with the number of events provided.

9. **Have you received feedback on the uses of your data project products for the purposes of supporting PSA? If yes, how was this feedback received? How would you prefer to receive this type of feedback?**
At present, the OECD FIRE Project products are used for resolving more generic questions by the regulatory body and partially as additional information and/or data source for Fire PSA in the frame of periodic safety reviews. Feedback on the project can be provided via the OECD NEA secretariat (Alejandro.Huerta@oecd.org).

10. **Are you planning any new initiatives for the future? In what ways can WGRISK provide assistance and/or support**
In the short-term, no new initiatives are planned. In the long-term, the data needed on fire detection and fire fighting systems could be collected as well as data on those events inducing a leak of explosive gas (notably hydrogen).

11. **How can WGRISK members and observers who currently do not participant in the project learn more about your activities and the process for becoming a project participant?**
A CSNI report on the project is available as well as several publications which can be provided to WGRISK members and observers not participating in the project via OECD NEA secretariat (Alejandro.Huerta@oecd.org). Moreover, so-called Topical Reports on specific issues such as HEAF fire events, comparison of fire protection standards in member countries or combinations of fires with other hazards, are being or will be prepared and provided to CSNI. See Appendix D for more details on FIRE project publications.

12. **What could WGRISK do to help address other data project challenges?**
At the time being, no specific action by WGRISK is needed. However, potential support of WGRISK to OECD FIRE could include:
    - Promotion of OECD FIRE Project activities and PSA related output
    - Providing a link between PSA expert community in member countries and OECD FIRE Project
    - Assisting OECD FIRE in promoting results also to other OECD/NEA groups (CNRA, further CSNI sub-groups)

5.1.2.3 OPDE/CODAP Data Project

Summary of OPDE/CODAP project survey response:

1. **Is the quality and quantity of data being submitted to the project currently adequate to support project objectives? If not, what could WGRISK do to assist the project in addressing your data needs?**
   Yes. Early in the project, a detailed coding guideline (CG) was developed and subsequently approved by the project review group (PRG). In addition, a quality assurance program (QAP) has been established for the project (OPDE & CODAP). The QAP defines the roles and responsibilities of the project members. In the opinion of the respondent, the CG and QAP have been key to addressing data quality. However, it is important to recognize that the PRG consists primarily of non-PSA experts/ practitioners, and, therefore, it has been challenging to instil in the PRG body the importance of data completeness and coverage combined with a sustained data collection effort.

2. **How are national differences in (a) component safety classifications, (b) system boundaries, functional requirements, and (c) failure reporting criteria among project participants resolved to ensure consistent data reporting (i.e., how are consistency issues between how data is collected/coded for national programs and the data project resolved)?**
   This is handled via the coding guideline. The (a) through (c) considerations were the subject of significant work by the PRG membership throughout the first and second terms of the OPDE project. It was essential to the development of the coding guideline, which includes a number of appendices defining national differences in classifications, material designations/specifications, and so on. An ongoing and quite challenging issue concerns failure reporting criteria. For passive components, the reporting criteria are undergoing periodic changes (defining failure reporting criteria is challenge for passive components). It is an evolving process making the "data mining" increasingly cumbersome since multiple sources of information must be screened for applicable event data. The vast majority of records on degraded material conditions remain the property of the plant owners/operators. It is of utmost importance to put in place a sustained and focused data collection effort. This requires additional resources outside the 'jurisdiction' of OECD/NEA.

3. **PSA parameter estimation generally requires knowledge of both observed failure events and exposure (e.g., number of components demands, hours of exposure) in order to calculate a failure probability or failure rate. Does your project collect this type of exposure information?**
   No, it does not and for the reasons noted in the response to survey item #1. However, this topic was discussed from the outset and it has been revisited during each national coordinator's meeting. Some countries have developed their own "exposure term" databases; e.g., the Republic of Korea (KINS & KAERI).

4. **Do you believe that project data (e.g., events, component failure data, and exposure information) is readily accessible and in a format that can be easily used by participants for the purposes of PSA (including availability of user and coding manuals)? Is all accumulated project data available to participants, or is data access restricted in certain cases (if so, please describe the project's data access policy).**
   No. The event data is readily available, but exposure term data is not. Seminars & workshops on database applications have been organized in conjunction with the OPDE national coordinator meetings. Additionally, noteworthy contributions in terms of sponsoring applications workshops have been made by CSN (Spain, May 2008), the Nordic PSA group (NPSAG, Sweden, June 2008), and CNSC (Canada, February 2011). The data access policy is very clearly specified in the operating procedure (OP), which elaborates on the "confidentiality commitment." starting in the fall of 2005, a

transition is underway to a fully internet-based database. This means, that effective April of 2012 the entire OPDE/CODAP database will reside on a secure server at NEA headquarters. Data access is very carefully managed by NEA-IT and the operating agent. A shared understanding of access rules exists among the full PRG membership. In short, NEA secretariat, NEA-IT and operating agent have full access to all data at all time. The national coordinators have full access to all data that has undergone the full QA process. A confidentiality agreement must be in place between an organization seeking full data access and a national coordinator.

5. **Has the project attempted to quantify failure rates, failure probabilities, or other PSA parameters? If so, please provide examples and/ or references.**
   No. However, some countries have established/supported national efforts to quantify passive component reliability parameters; e.g., Canada, Japan, Republic of Korea, Sweden, and Switzerland. In the case of the Republic of Korea and Sweden, public domain technical reports are available that document these attempts; several published reports and papers associated with these applications are listed in Appendix D.

6. **What project reports have been made publicly available and are available to both participants and non-project participants? Where can these reports be found (e.g., data project website, NEA publication webpage…)?**
   See Appendix D for a complete list of publicly available documents for the project.

7. **Is any project data available to non-participant PSA developers such that they could still benefit from project activities (e.g., information that could support probabilistic parameter estimation or derivation of quantitative equipment performance insights)?**
   Yes! The process for accessing data is specified in the operating procedures and the quality assurance program.

8. **How comprehensive/complete are the data sets that have been provided to the data project? Are there any major data gaps that WGRISK could assist the project in addressing?**
   In general, the comprehensiveness of submitted data is quite high. The internet-based database includes provisions for uploading supporting information (e.g., photographs, P&IDS, isometric drawings). The completeness of the data varies significantly, on a country-by-country basis as well as on a system-by-system basis. Major structural failures are covered quite well. For other types of failures and degraded/rejectable conditions the database coverage is "spotty." A new data collection philosophy is being tried in CODAP. During the first year of its operation a focused effort is directed at event information specific to flow-accelerated corrosion (FAC). There are many gaps in the database. Filling in these gaps would require quite diligent efforts at the respective national level.

9. **Have you received feedback on the uses of your data project products for the purposes of supporting PSA? If yes, how was this feedback received? How would you prefer to receive this type of feedback?**
   Yes. Regular communications with actual and prospective data users provide good feedback. The operating agent is using his contact network to promote the OPDE/CODAP projects. The respective national coordinators are the conduit for feedback from users and interested parties at large.

10. **Are you planning any new initiatives for the future? In what ways can WGRISK provide assistance and/or support**
   The operating agent for OPDE/CODAP has ongoing discussions with EPRI to encourage active project participation (last discussion was on March 5, 2012). In the U.S., few organizations & individuals outside the NRC know much about the OECD/NEA database projects. True, OPDE/CODAP have

been presented at international conferences (ASME PVP, PSAM, ANS PSA Topical Mtg., etc.), but at the plant-level there is still little-to-no awareness of the projects. It is an ongoing communications issue. In Germany, good progress has been made to actively engage the VGB in the project work. It is essential to engage EPRI. Preserving knowledge about passive component integrity and reliability remains extremely important and ought to be a strong motivation for expanding project participation. The OPDE operating agent has volunteered time to support the work of the European 'APSA network,' and participated in the November 2010 network meeting at kernkraftwerk gősgen-däniken. A unique feature of CODAP is the establishment of a knowledge base (KB) to ensure access to relevant reference material on codes and standards, mitigation practices, research. This particular initiative builds on insights gained from the SCAP-SCC project (2006-2010).

11. **How can WGRISK members and observers who currently do not participant in the project learn more about your activities and the process for becoming a project participant?**
Starting with the December 2004 OPDE national coordinators meeting, the PRG has invited WGRISK members and observers from academia and industry to participate in ½-day to 1-day workshops. This has been very successful in terms of communicating our results to the outside world.

12. **What could WGRISK do to help address other data project challenges?**
From a U.S. perspective, initiate contact with the ASME/ANS JCNRM (PSA Standard) and EPRI R&R users group and inform respective group/organization about the OECD/NEA database projects. A critical issue is to address how to best organize and support a sustained data collection effort. It is important to ensure that the full knowledge base for passive component reliability is maintained and continuously updated as the existing plant fleet enters into long-term operation. It is equally important to ensure a sustained data collection effort as new plants are being constructed and commissioned.

5.1.2.4 COMPSIS Data Project

Summary of COMPSIS project survey response:

1. **Is the quality and quantity of data being submitted to the project currently adequate to support project objectives? If not, what could WGRISK do to assist the project in addressing your data needs?**
The quality of this main level entry was very high and the requirements were very stringent in passing the COMPSIS process and the final verification by the Operating Agent (OA). The actual COMPSIS webpage and process system took the OA significant amount of time to set up, verify and finalize. The quality of the data process would prove as a lead method for collecting and validating the event information; however the effort to complete the entry of one event was a minimum of 4 to 5 hours. This caused limitation issues for several countries when entering their events, and although the design of the COMPSIS website provided high quality event collection, the flexibility of sorting the events was limited.

2. **How are national differences in (a) component safety classifications, (b) system boundaries, functional requirements, and (c) failure reporting criteria among project participants resolved to ensure consistent data reporting (i.e., how are consistency issues between how data is collected/coded for national programs and the data project resolved)?**
The COMPSIS project database process provided a very well-defined method to inter-mix different events from one standard or another and then segment them accordingly. However, this feature was never proofed for the COMPSIS group.

3. **PSA parameter estimation generally requires knowledge of both observed failure events and exposure (e.g., number of components demands, hours of exposure) in order to calculate a failure probability or failure rate. Does your project collect this type of exposure information?**
   No. There was never a way to collect the final number of exposed systems. This was information that participating countries were not willing to release.

4. **Do you believe that project data (e.g., events, component failure data, and exposure information) is readily accessible and in a format that can be easily used by participants for the purposes of PSA (including availability of user and coding manuals)? Is all accumulated project data available to participants, or is data access restricted in certain cases (if so, please describe the project's data access policy).**
   No. The data collected was not always specific to safety systems. Part of the data basis process problem in relationship to the framing concept was the lack of understanding of the nuclear power plant (NPP) environment. In the US, most NPPs are in transition from analogue to digital and have a limited set of safety systems that are considered digital, while other participants in COMPSIS have restrictions involving the public's perception. For example one country provided only the events that occurred in operating plants, but did not include any events from closed plants. The COMPSIS data process did not consider the working environment and restrictions involved before building the functionality of a high quality database process.

5. **Has the project attempted to quantify failure rates, failure probabilities, or other PSA parameters? If so, please provide examples and/ or references.**
   Yes, for quantifying failure rates only. However this was on a minimum of 22 data points.

6. **What project reports have been made publicly available and are available to both participants and non-project participants? Where can these reports be found (e.g., data project website, NEA publication webpage…)?**
   See Appendix D for a complete list of publicly available documents for the project.

7. **Is any project data available to non-participant PSA developers such that they could still benefit from project activities (e.g., information that could support probabilistic parameter estimation or derivation of quantitative equipment performance insights)?**
   No. This data is proprietary to the owners of the COMPSIS working group based on what the charter states.

8. **How comprehensive/complete are the data sets that have been provided to the data project? Are there any major data gaps that WGRISK could assist the project in addressing?**
   The data events are within 70 to 90 percent of quality completion.

9. **Have you received feedback on the uses of your data project products for the purposes of supporting PSA? If yes, how was this feedback received? How would you prefer to receive this type of feedback?**
   No. The events are not completely about safety systems. There were only a couple safety types out of 90 some events. The final report does not recommend a PSA approach.

10. **Are you planning any new initiatives for the future? In what ways can WGRISK provide assistance and/or support**
    No. The NRC is performing its own database to collect and review the operational experience events. This provides a way to include outside sources of event types and will help relate on a much broader scale of understanding for lessons learned at a NPP environment.

11. How can WGRISK members and observers who currently do not participant in the project learn more about your activities and the process for becoming a project participant?
Not possible as the project has been closed out. During the COMPSIS project there was a lack of support from some member countries due to other work obligations.

12. What could WGRISK do to help address other data project challenges?
The lessons from COMPSIS can help identify the interesting challenges of a digital safety system database project. In order to succeed, a project must have a reasonable concept expectation and a better understanding of the resources that will be required to participate. If sufficient safety grade events do not exist for a PSA calculation, then the project course should be corrected to find the next best situation within the limitations and the experiences.

5.1.2.5 Conclusions and Insights – Data Project Community

Each of the data projects included substantial quality assurance activities that were generally documented in project procedures (and in some cases were publicly available). The data projects provided a substantial number of publicly available resources that described the project scope, status of the project, and application examples (this information has been summarized in Appendix D). A limitation for the use of certain project data (e.g., CODAP, COMPSIS, and to some extent FIRE) is the availability of exposure information needed to estimate PSA parameters. Additionally, all projects highlighted the importance of data completeness and coverage combined with a sustained data collection effort. Several important organizational and communications issues were also noted, including development of a PSA "perspective" through interaction with WGRISK community, identification and interaction with national stake holders (including dissemination of results and insights to local industry groups).

A number of significant lessons learned were obtained from the experience with the completed COMPSIS data project. Key insights include the following:

- The project charter should consider the potential difficulty associated with collecting event data.
- The data collection process should provide flexibility in achieving the end goal. Quality assurance activities should balance the desired accuracy and completeness of data with the resources needed to submit and share data.
- Data collection activities should consider when technology is in a transitional state. For example, the ongoing transition from analogue control to digital control systems could not be easily accommodated within the COMPSIS database.
- The data structure should allow for flexibility in searching and analysing event data.

Finally, the need to ensure that knowledge developed through years of experience in data project management is retained, managed, and shared was noted. This includes documentation of project material and ensuring sustained commitment to the joint project.

5.2 Enhancing project participation

As discussed in Section 4.2, in addition to the surveys summarized above, this task involved a two-day task group meeting following the collection and initial analysis of the survey results. One of the objectives of the meeting was to discuss possible approaches for enhancing participation in the data projects. Towards this end, on the second day of the meeting, the meeting participants engaged in a onehour, facilitated discussion entitled "Enhancing Participation in and Application of OECD Data Projects for PSA." In this discussion, the participants were asked to address three primary questions.

- What are the PSA uses and benefits (potential or actual) of the data projects for data project members and non-members?
- How best to promulgate best practices for enhancing the accessibility of data project products for members and non-members?
- What are the barriers for new countries to join a data project? How can they be overcome?

Each of these questions was supplemented with a number of more detailed questions (see Table 11). In addition, the participants were provided with an overview of relevant survey responses (see Table 12). Roughly twenty minutes was spent on each primary question.

Note that since all of the discussion participants (aside from the OECD/NEA staff) represented organizations that are members of at least one of the data projects, all participants were positive about the concept of OECD/NEA data projects. However, a number of the participants' organizations were considering whether or not to join additional data projects, and many were also familiar with current arguments (perhaps from other organizations) against joining the projects. Thus, the meeting's discussions included viewpoints from sceptics as well as advocates.

The following subsections list the principal points raised in the group discussion. Note that these points were generally raised by individual participants and do not necessarily represent a group consensus. Key points of agreement across the group are provided at the end of this section.

PSA Uses and Benefits

- Recognizing that the triplet definition of risk includes both qualitative and quantitative information, the value of the qualitative information currently provided by all of the data projects should not be discounted. Qualitative information is important to support searches for possible failure scenarios and assessing the plausibility of these scenarios. In particular, such information is needed to understand causal mechanisms associated with dependent failures.
- The CODAP database has potentially valuable historical data on a number of dependent failure scenarios, including: a) seismically-induced failures, and b) intersystem CCFs caused by long-term degradation (with long incubation periods).
- CCFs associated with digital I&C have created significant problems in non-nuclear events, and have been found in dominant cutsets in NPP PSA studies. With the termination of the COMPSIS project, these CCFs should be addressed in the ICDE data project.
- Detailed data records provide important information for data mining. Experience from the mining of old events indicates that some issues considered to be fixed are still problems.
- Targeted reviews of events captured by the data projects, similar in spirit to the review of fire events performed in NUREG/CR-6738, could be quite useful.

Table 11 Detailed Questions for Discussion Group

<table>
<tr><th>PSA Uses and Benefits</th></tr>
<tr><td>

What insights can data projects provide regarding current scenarios/issues, e.g.,

MCR abandonment
Multiple spurious operations
Trends/aging
Intersystem CCF
Seismically-induced internal floods

What “surprises” (if any) have been identified? (Really nasty events? Weird events?) What are the implications for PSA models?
How do these play against event data not included in the data projects?
How far off are we regarding a harmonized approach? Is this a feasible or desirable target?
Can we speed up the process of identifying and alerting others of insights?

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<tr><th>Best Practices for Enhancing Accessibility of Products</th></tr>
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In cases where PSA staff were unaware of data project existence, objectives, scope, types of products, etc., what was done to increase awareness?
How are specific data project insights/results promulgated and internalized within PSA organizations?
Would benchmark studies be worth pursuing as a means to increase knowledge of and interest in the data projects?
Should more be done with conferences (e.g., plenary sessions, workshops?)
How to get attention of decision makers?

</td></tr>
<tr><th>Barriers for New Members</th></tr>
<tr><td>

Are the identified technical changes (e.g., heterogeneity, population data) “deal breakers?” (Do they need to be resolved before non-members would consider joining?)
Are there programmatic initiatives or changes that would be persuasive? Are they feasible?

“Advertising campaign”
Trial membership (as part of benchmarking study?)
External support (e.g., for event analysis and entry)
Analysis-for-data exchange

</td></tr>
</table>

Table 11 Survey Response Summary

Potential Benefits
• Sharing state-of-the-art, know-how • Harmonization, supporting comparisons • Supporting national analyses
Programmatic Challenges
• Unclear benefit/cost – more information (methodology, results) might help • Participation resources (collection, coding, analysis) • Sharing proprietary data
Technical Challenges
• Heterogeneity of data sources, national collection programs • Applicability of data to specific reactor types, PSA • Population data • Statistical significance of national data

Best Practices for Enhancing Accessibility of Products

- Currently, some licensees are involved in some of the projects. Licensees should be encouraged to participate.
- The project meetings provide one vehicle for informing licensees of the project activities and results. At present, meeting invitations are left to the initiative of the national coordinators for each project.
- At least in some countries, it can be difficult to get licensees to participate. They don't see value in the projects (they don't use the qualitative information, sometimes getting this from other sources) and have to expend resources to collect information they don't ordinarily collect.
- It would be useful for national coordinators to share their approaches in distributing information within their countries.
- It would be worthwhile to pursue the use of technical conferences as a means to increase the visibility of the data projects.

Discussion Points – Potential Barriers for New Members

- The group was not aware of any technical barriers that would have to be overcome before non-members would consider joining.
- It would be useful to identify "appetizers," i.e., useful information available from the data projects that could be used when discussing the projects with non-members.

Major Points of General Agreement:

- There is a need for "appetizers" (including topical reports addressing questions of major interest, as well as demonstrated uses of data).
- There is a need for data supporting human reliability analysis (HRA) and digital I&C reliability analysis.
- The projects should work to increase industry participation.
- The projects should consider an array of tools (including conference plenary sessions and workshops) to supplement their reports as means to reach and inform potential participants.
- Efforts to grow and sustain the data projects need to recognize the importance of the initiative of individual contributors (not just organizations) and the long timeframe needed for projects to reach maturity and for strong communities of practice to develop.

5.3 New Data and Analysis Needs

The task group meeting participants identified many of the attributes that make the existing OECD data projects useful to the participating countries. Each of the existing projects has well-defined scope and objectives, and the data projects are effective in meeting those objectives. However, there are other areas of PSA where needs are not being met. There are areas that could possibly benefit from a new data project. The meeting participants considered if there are new data needs that should be addressed. The key questions for the discussion of new data project needs were:

- What data needs exist that are not met by current OECD data projects?
- Could an international project help address existing data needs?
- How best to address data needs for new technologies and plant designs (e.g., new reactors)?
- Could new data projects help address areas of high uncertainty in PSAs?

The meeting participants discussed these questions and considered options for new data projects. The meeting participants considered what new data needs exist that are not being met by current OECD data projects. Some possible data needs were identified and discussed (e.g., human reliability data); however the group did not identify any specific near-term needs for new OECD data projects. The discussion identified some of the challenges that can be associated with data collection and making effective use of data. The group also explored ways that new data needs could be identified in the future. Certain activities could be pursued that would help to establish the basis for new OECD data projects.

During the discussion, the group considered areas that could possibly benefit from new data projects. These included data to support HRA, external hazards analysis, and new technologies associated with new reactor designs. These areas are recognized as being important for PSA development, but the discussion highlighted challenges that could hinder data collection. For example, collecting data on very rare events can be difficult. There may not be enough historical data available to develop robust results. In cases where ample data are available, questions still remain about the applicability of the data. For example with external hazard analysis, much of the analysis may depend on the plant-specific layout, location and design. It may not be possible to develop meaningful results from a data project that would be applicable to many different plants. In recognizing these challenges, the group did not identify any immediate PSA needs that could be readily addressed by a new data project.

The meeting participants considered ways that the need for a new OECD data project could be identified. There were suggestions for working group activities that could help with identification of new data needs. These suggestions included:

- Hosting expert meetings to discuss possible new data projects
- Establishing a new working group for new data needs
- Staying informed about existing national, bilateral, or other international data projects.

The group agreed that these options should be continued to be evaluated and re-visited periodically to ensure that emerging data needs will be met. In particular, staying aware of on-going operating experience activities can help to inform the need for new data projects. The NEA maintains a Working Group on Operating Experience and co-sponsors the IAEA/NEA Incident Reporting System. While these activities do not directly support reliability estimates for PSA studies, they do provide insights into events that are important to nuclear safety. The results and insights from these activities should be considered in assessing new data projects. It was also suggested during the discussion that the existing data projects may be able to help address some areas of uncertainty. New tasks could be defined to explore the existing data projects for information on topics such as, human errors or failures due to ageing. For example, the ICDE project recently initiated a task to study common cause failure events related to weather and extreme external environments. These types of focused tasks could review an individual data project or look for data and trends across multiple data projects. Exploring these topics with the existing data projects could be an effective way to address new data needs.

5.4 Data Project Success Factors for PSA Applications

During the task group meeting in October 2012, the meeting participants identified a number of notable best practices for data project activities that support successful application of OECD data project products to PSA activities. These factors are summarized in Table 12.

Table 12 Success Factors: Data Project Attributes Supporting Successful PSA Applications

1. **Addresses important/risk significant issue**. Ultimately, successful application of project data to PSA applications will require a long term commitment of resources, which will generally only be possible for significant issues.
2. **Demonstrated methods for application of data exist** (though demonstration may be outside scope of the data project). Although there are advantages for the data project itself to not advocate specific approaches for the quantitative application of project products to PSA, it is necessary for the project to consider the availability of state-of-practice methods for use of project data. This will also help identify specific data collection needs that must be met to apply data to PSA activities (e.g., exposure data, failure categorization, etc.).
3. **Sustained interest from multiple countries** (with active national projects related to the issue). A major objective of the joint OECD projects is to leverage national data collection programs in order to obtain more data than would be available within a single country. This requires a minimum number of members (typically at least ten) who have a sustained commitment to reporting all available data.
4. **Participants strive to address completeness and comprehensiveness** (commensurate with qualitative or quantitative application). Data completeness and comprehensiveness has a strong influence on the suitability of data project products to support specific safety applications (including PSAs). Therefore, in addition to maximizing participation in data collection activities, a strong commitment from each data project participant to ensuring complete and high quality data is essential for ultimate success of a project. This can be done, in part, through completeness statements provided by member countries, but ultimately relies on a commitment from member counties to reporting all available data to the data project.
5. **Participants fully understand project objectives, limitations, and resource implications**. In particular, it is necessary that project participants understand that a sustained multi-year commitment is needed in order to build sufficient operating experience data to support PSA applications.
6. **Broader PSA community aware of the project**. In order to successfully apply data project products to PSA, it is necessary for the broad community of PSA practitioners to know that the data is available. This can be achieved through participation in PSA-focused conferences, publication of NEA reports, and issuance of other publicly available papers and articles. Coordination with WGRISK can also help to promulgate knowledge of data project activities.

6. OBSERVATIONS AND FINDINGS

In general, the OECD joint data projects represent mature data collection efforts and have enjoyed substantial support from the NEA membership. These projects have endeavoured to ensure that data collection activities have a high level of completeness and quality. This commitment to quality has resulted in the development of project-specific programmatic requirements intended to ensure quality. However, there remain some challenges when attempting to apply data project products to PSA activities (e.g., data completeness and exposure information needed to calculate PSA parameters). As such, data applicability and completeness should be fully assessed prior to applying data project products to a specific application. Despite these challenges, experience has been developed by a number of NEA members in applying ICDE, FIRE, and ODPE/CODAP data to PSA initiatives. Examples include CCF parameter estimation, fire frequency calculation, and estimation of piping rupture frequencies. It should be noted that survey responses did indicate some variability in views regarding the technical usability of the data project products in PSA quantification. Overall, the data projects are an important OECD/NEA activity, particularly for member states with a small number of nuclear installations and limited national databases.

A number of significant lessons learned were obtained from the experience with the completed COMPSIS data project. Key insights include the following:

- The project should consider the potential difficulty associated with collecting event data, particularly data that may have a higher degree of sensitivity to the data owner.
- The data collection process should provide flexibility in achieving the data project's end goals. Quality assurance activities should balance accuracy and completeness of data with resources needed to submit and share data.
- Data collection activities should consider when technology is in a transitional state. For example, the ongoing transition from analogue control to digital control systems could not be easily accommodated within the COMPSIS database
- The data structure should allow for flexibility in searching and analysing event data.

As a result of this task, several success factors for applying data project products to PSA applications were identified. These factors include:

1. Data project addresses important/risk significant issue
2. Demonstrated methods for application of data exist
3. Sustained interest from multiple countries
4. Participants strive to address completeness and comprehensiveness
5. Participants fully understand project objectives, limitations, and resource implications
6. Broader PSA community aware of the project

Based on the results of the survey questionnaire analysis and task group workshop discussions, a number of key issues were highlighted and potential resolutions were identified. These issues and resolutions are described in

Table 13 Identified Issues and Potential Resolutions

Issue	Potential Resolution
• Costs associated with data collection, analysis, and reporting impact participation • Achieving data quality requires resources (but cost is outweighed by benefits of participation) • Some issues identified with resource needs to translate events to English	• Important for project participants to understand resource commitment associated with data project participation • Important to periodically verify data completeness and comprehensiveness • Develop a standard glossary of terms to facilitate translation of events, template records. Identify best practices for streamlining translation of event data.
• Perception that collected data is not applicable to certain design types (e.g., WWER, Gas reactors)	• Encourage practical applications of data project data and sharing of experience. • Consider the generalizability of data when collecting operational data.
• Proprietary data concerns	• Need to determine specific issues of concern by non-members. • Confidentiality agreements exist to help ensure participation by data owners – need to ensure this aspect is well understood.
• Desire for "trial use" of data to determine if project participation is worthwhile • Availability of publicly available information to determine "details" of project	• Develop limited scope "Benchmark" activity that would allow non-participants to share certain data and exercise application of data to PSA related problem (may still involve challenges with proprietary data) • Promote/advertise information associated with the various data projects (the report for this task may be a good vehicle). Include application examples (for a variety of plant types) and use of different venues to promote data projects (conferences, workshops, etc.) • Inform interested parties that they may observe certain data project meetings • Make all publicly available documents, papers, and other references more easily accessible through the data project websites • Develop a more systematic feedback mechanism with the PSA community (e.g., PSA/Data project forum, cross participation in meetings)
• Long time is needed to develop mature database	• Have a clear roadmap for meeting project objectives and strong commitment from members • Improve knowledge management for new participants (particularly important as current participants retire or move to new positions)

Issue	**Potential Resolution**
• Data project data may not be complete/comprehensive (requires diligence and resources on the part of members to submit data)	• Consider moving the data project meetings out of Paris to build support from a wider range of utilities • Investigate use of other data sources (such as WGOE, IRS, or INES data) to compare data completeness (e.g., ensure noteworthy events have been recorded) • Investigate means to share information across data projects, particularly events that may be associated with pertinent events across multiple data projects (e.g., piping ruptures involving flammable fluids)
• Members need to evaluate how sharing of data is done within individual countries to support maximum use of data products by interested parties • Access for contractors who reside outside of member country	• Identify best practices for the roles and responsibilities for national coordinators to encourage information sharing within the member country • Develop a more systematic feedback mechanism with the PSA community (e.g., PSA/Data project forum, cross participation in meetings)
• Several project-specific issues were identified by project participants: - Would be useful if the current database projects would treat specifically the new and evolutionary components and systems (like passive components, computerized systems, advanced human interfaces, dependent failures of highly redundant systems …) - Getting “population” information (i.e., exposure information) to complement the event centred database.	• Provide feedback to project representatives for evaluation.

Issue	Potential Resolution
• Potential new operating experience data collection needs: – Data for new and advanced reactors was desirable, and should be organized as soon as practicable. – Human reliability data (particularly the data from simulator exercises, but also other categories - maintenance failures, for example) collection could be very useful. – External event data, especially the impact on the water intake and/or power supply.	• Periodically evaluate new data needs in light of project success factors described in Section 5.4. Propose new project needs through CSNI as appropriate. • Continue collaborative activities between WGRISK and joint data projects.

7. RECOMMENDATIONS

The following general recommendations were identified as a result of this activity:

- Enhancing participation in data project activities
  - Make clear to potential and current project participants the expected resource commitment associated with data project participation
  - Consider how data can be generally applied to a variety of plant types when collecting operational data
  - Develop limited scope "benchmark" activities that would allow non-participants to share certain data and exercise the application of data to PSA related problems (though it was noted that protecting proprietary data may present challenges to implementation of this recommendation)
  - Promote/advertise information associated with the various data projects, including application examples (for a variety of plant types) and use of different venues to promote data projects (conferences, workshops, etc.)
- Strive for continual improvement in operating experience data collection efforts
  - Emphasize to data project members the importance of periodically verifying data completeness and comprehensiveness
  - Improve knowledge management for new participants in data projects (particularly important as current participants retire or move to new positions)
  - Investigate use of other data sources (such as WGOE, IRS, or INES data) to compare data completeness (e.g., ensure noteworthy events have been recorded)
  - Investigate means to share information across data projects, particularly events that may be associated with pertinent events across multiple data projects (e.g., piping ruptures involving flammable fluids)
  - Identify best practices for the roles and responsibilities for national coordinators to encourage information sharing within the member country
- Increase sharing of data with national organizations including industry and standards organizations (as appropriate)
  - Encourage practical applications of data project data and sharing of experience.
  - Make all publicly available documents, papers, and other references more easily accessible through the data project websites
  - Develop a more systematic feedback mechanism between the data project and the PSA communities (e.g., holding PSA/data project forums, cross participation in meetings)
  - Consider periodically moving the data project meetings out of Paris to build support from a wider range of utilities
- With regard to new data collection needs (e.g., new and advanced reactors, human reliability analysis, external hazards)
  - Data project product users should provide feedback to data project representatives on new data needs for evaluation.

  - The data project and PSA communities should periodically evaluate new data needs in light of project success factors. Propose new project needs through CSNI as appropriate.
- Consider success factors for application of data project products to PSA when developing new activities

Additionally, the following specific recommendations were identified:

- WGRISK members (with assistance from the broader PSA community) should consider performing a detailed critical review of past applications of OECD project data to PSA problems. The results of this critical review to can be used to:
  - Work with data projects to help update best practices and coding guidelines, and
  - Identify potential future activities to improve existing analytical methods, models, tools, and guidance.
- OECD data project members should consider the above general recommendations and the issues and potential resolutions identified in Table 12 when planning future activities.
- CSNI and CNRA decision makers can support these efforts by:
  - Continuing to promote and support interactions between working groups (particularly WGRISK and WGOE) and data projects
  - Recognize the lengthy time scales and sustained commitment needed to ensure a successful data project and provide associated management support
  - Identify areas where stronger data would significantly help current or anticipated risk-informed decision making applications

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APPENDIX A: CSNI ACTIVITY PROPOSAL SHEET WGRISK (2011)-1

<table>
<tr><th>Project/Activity Title</th><th>Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)</th></tr>
<tr><td>Objectives</td><td>Identify and characterize current uses of OECD data project products and data in support of probabilistic safety assessment. In this context, the term ‘products’ refers to data analysis results, technical reports, and other project outputs.
Identify and characterize technical and programmatic characteristics that either support or impede use of data project products in PSA. This includes an assessment of which PSA parameters could be potentially estimated from the various data project products and gaps between available product information and PSA data needs.
Identify recommendations for enhancing the usefulness of data project products and the coordination between WGRISK and the data projects</td></tr>
<tr><td>Scope/Justification/
Deliverables, Expected results and users, Relation to other projects</td><td>Scope

The Nuclear Energy Agency's (NEA) joint database projects and information exchange programmes enable interested countries, on a cost-sharing basis, to pursue research or the sharing of data with respect to particular areas or problems. There are currently four NEA joint database projects being carried out under the auspices of NEA:
International Common Cause Failure Data Exchange (ICDE)
OECD Piping Failure Data Exchange (OPDE)
OECD/NEA Fire Incidents Record Exchange (FIRE) Project
OECD/NEA Computer-based System Important to Safety (COMPSIS) Project
The proposed task will address all four of these projects.

It should be noted that access to project data is generally limited to project participants. To avoid inappropriate release of project data while facilitating task participation by the broader WGRISK community, this activity will focus on the uses of data project products in PSA such as statistics and trending. Therefore, access to</td></tr>
</table>

	restricted individual data will not be required and participation in this activity by organizations not currently participating in the various data projects is encouraged. Acceptance of this task by ICDE, OPDE, FIRE and COMPSIS is confirmed in the minutes of their following meetings: - ICDE meeting of 28-29 September 2010, - OPDE meeting of 13-14 October 2010, - COMPSIS meeting of 30 November – 1st December 2010, - FIRE meeting of 2-3 September 2010. **Justification** Accurate data is needed to ensure that probabilistic safety assessment results realistically represent as-built and as-operated nuclear power plants. The OECD data projects can, in principle, support the collection and analysis of data that is highly relevant to probabilistic safety analysis, particularly in the areas of material degradation and aging, common cause failures, fire risk, and digital instrumentation and control systems. All of the projects collect qualitative information that can be useful in the development and review of PSA models. Moreover, several of these projects include specific objectives to support quantification activities. For example, the objectives of the FIRE project include facilitating fire risk analysis, including the quantification of fire occurrence frequencies for components and compartments. Similarly, an objective of the OPDE project is to facilitate estimation of piping failure frequencies. The Nordic PSA Group (NPSAG) has made use of the OPDE database to establish a handbook of piping reliability parameters for use by PSA engineers. A first edition of this handbook was released to project participants in 2010. The ICDE project also includes project objectives to facilitate the quantification of CCF frequencies in member countries and use of ICDE data to estimate CCF parameters. However, to date, WGRISK members have made little use of the data project products (principally reports). Work is needed to develop a clear, consensus statement regarding the causes of this lack of usage and potential solutions. Such a statement (to be followed by appropriate implementation activities following completion of the proposed task) is needed to ensure a more efficient use of member country resources. **Activities** The following task activities will be performed in coordination with the data projects.

<table>
<tr><td></td><td>

- Questionnaire/Survey
- Workshop
- Final task report

A survey, based on a questionnaire, is justified by the fact that (i) participants to the task are members of all or only a part of the concerned Data Projects, or even are not members at all; (ii) participant experience in using the data project products for PSA purposes is very different from member to another and requires a survey.

Deliverables

Deliverable will be a task report identifying and characterizing current uses of OECD data project products (including a description of data project products relevant to PSA), motivating factors for participation in the various data projects, and recommendations for enhancing the coordination and use of data project outputs.

Expected users

The expected users of the products from this task include the staff supporting the various OECD data projects and WGRISK members who utilize OECD data project products to support probabilistic safety analysis. This activity may also help to increase industry support for the various OECD data projects by highlighting the potential benefits of these activities.

Relation to other projects

This activity will be coordinated with the ongoing NEA joint database projects:

- International Common Cause Failure Data Exchange (ICDE)
- OECD Piping Failure Data Exchange (OPDE)
- OECD/NEA Fire Incidents Record Exchange (FIRE) Project
- OECD/NEA Computer-based System Important to Safety (COMPSIS) Project
-

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<tr><td>

Safety significance/ priority (see priority criteria in Section IV)

</td><td>

Regarding the priority criteria set in Section IV of the CSNI Operating Plan:

- Criterion 1: Relevance to CSNI challenges and technical goals.
- Criterion 2: Better accomplished by international group.
- Criterion 3: Likely to bring conclusive results in reasonable time frame.

</td></tr>
</table>

Technical Goal(s) covered	The following CSNI Main Challenge (and associated Safety Issue and Topic) are addressed by the proposed project: • 1b – Develop and maintain databases in key areas • 3c – Identify and assess the impact of new technologies • 3g - Further review and assess the development of PSA methods; promote further PSA applications • 3i – Contribute to the enhancement of safety performance
Knowledge Management and Transfer covered	Results of this activity will be documented in a CSNI report to facilitate knowledge transfer.
Milestones **(deliverables vs. time)**	Months after CSNI approval: • Set up of a project core task group: 3 months • Core group review and summarize publicly available data project information to facilitate later tasks: 6 months • Develop and Distribute Questionnaire: 9 months • Answer Questionnaire: 12 months • Workshop to Discuss Questionnaire Results and Develop Recommendations: 15-16 months • Draft report for WGRISK and data project review: 22 months • Core Task Group meeting to review comments and finalize report: 26 months • Report submitted to PRG: 27 months • Report submitted to CSNI: 30 months Task group meetings may be necessary to finalize the questionnaire and to analyse the responses.
Lead organization(s) **and coordination**	The following organisations will form the task group and are responsible for planning and organisation of the questionnaire, workshop and preparation of the task report: US NRC (leader), GRS (Germany), HSE/ONR (UK), PSI (Switzerland) and data project representatives. This CAPS has been provided to the data projects for review and comment – feedback has been incorporated as appropriate. Each data project has also designated a main point of contact to facilitate coordination with WGRISK. The task group is expected to coordinate mainly through emails and teleconferences. Task group meetings, when necessary, will be coordinated with other meetings when possible.
Participants (individuals and organizations)	Representatives from all the WGRISK and data project member countries are invited to take part in the work. The following

	organizations have expressed a desire to participate in this activity: U.S.NRC, GRS (Germany), HSE/ONR (UK), IRSN (France), EdF (France), CSN (Spain), STUK (Finland), CNSC (Canada), KAERI (Korea), NUBIKI (Hungary), NRI (Czech Republic), and CNSNS (Mexico).
Resources	The overall effort is estimated to amount to approximately 24 staff-months. For core task group organizations the effort will consist of planning and organizing the work, developing a questionnaire, and preparing the task report. For other participants, completing the questionnaire, attending the workshops and commenting on the final report to take approximately 1 staff-month per participant.
Requested action from PRG/CSNI	Endorsement of proposal.
PRG Recommendation	
CSNI Disposition	

APPENDIX B: WGRISK MEMBER SURVEY

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

<u>Respondent Information</u>

Please identify your organization: ______________________

Type of Organization (please check the appropriate box):

- ☐ Regulatory Agency
- ☐ Government Technical Support Organization
- ☐ Commercial Technical Support
- ☐ Utility/Operator
- ☐ Other _________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

____

____

Responder Name:_____________________________

Address: _______________________________

____

Country: _______________________________

Telephone/e-mail: ____________________________

<u>Activity and Questionnaire Background</u>

Accurate data is needed to ensure that probabilistic safety assessment (PSA) results realistically represent as-built and as-operated nuclear power plants. To meet this need, the OECD Nuclear Energy Agency (NEA) supports a number of joint projects and information exchange programmes to enable interested countries, on a cost-sharing basis, to pursue research or the sharing of data with respect to particular areas or problems. Of particular note to PSA are the following NEA event records database projects:

- International Common Cause Failure Data Exchange (ICDE) Project (http://www.oecd-nea.org/jointproj/icde.html)
- OECD Piping Failure Data Exchange (OPDE) Project (http://www.oecd-nea.org/jointproj/opde.html). This project ended in May 2011, but data exchange activities are being continued under the Component Operational Experience, Degradation and Ageing Programme (CODAP) Project (http://www.oecd-nea.org/jointproj/codap.html).
- OECD/NEA Fire Incidents Record Exchange (FIRE) Project (http://www.oecd-nea.org/jointproj/oecd-fire.html)
- OECD/NEA Computer-based System Important to Safety (COMPSIS) Project (http://www.oecd-nea.org/jointproj/compsis.html)

The OECD data projects can, in principle, support the collection and analysis of data that is highly relevant to probabilistic safety analysis, particularly in the areas of material degradation and aging, common cause failures, fire risk, and digital instrumentation and control systems. All of the projects collect qualitative information that can be useful in the development and review of PSA models. Moreover, several of these projects include specific objectives to support quantification activities. Note that even though detailed project data is generally only distributed to data project members, the data projects have published publicly available reports and technical papers that are available to the broad PSA community.

The main objectives of this WGRISK activity are to:

- Identify and characterize current uses of OECD data project products and data in support of probabilistic safety assessment. In this context, the term 'products' refers to data analysis results, technical reports, and other project outputs.
- Identify and characterize technical and programmatic characteristics that either support or impede use of data project products in PSA. This includes an assessment of which PSA parameters could be potentially estimated from the various data project products and gaps between available product information and PSA data needs.
- Identify recommendations for enhancing the usefulness of data project products and the coordination between WGRISK and the data projects

Format of the Questionnaire and Instructions

- This survey is intended to solicit information from both data project members and non-members to support the above objectives.
- The survey is broken into five main sections – one section for each of the four data project (ICDE, OPDE/CODAP, COMPSIS, and FIRE) and a general set of questions. Questions cover both data project participants and non-participants.
  - ICDE (Questions 1 - 10)
  - FIRE (Questions 11 - 20)
  - COMPSIS (Questions 21 - 30)
  - OPDE/CODAP (Questions 31 - 40)
  - General (Questions 41 – 43)
- Since the intent of this project is to identify recommendations for enhancing the usefulness of data project products and the coordination between WGRISK and the data projects, complete and detailed responses are very much appreciated.
- Please send your completed questionnaire to the NEA WGRISK Secretary, Abdallah Amri (abdallah.amri@oecd.org) with a copy to Kevin Coyne (Kevin.Coyne@nrc.gov).
- Any questions on the questionnaire should be directed to Kevin Coyne at Kevin.Coyne@nrc.gov or by telephone at 01-301-251-7586.

Questionnaire for the ICDE data project

Project Description:

Common-cause-failure (CCF) events can significantly affect the availability of nuclear power plant safety systems. In recognition of this, CCF data is systematically collected and analysed in several countries. A serious obstacle to the use of national qualitative and quantitative data collections by other countries is that the criteria and interpretations applied in the collection and analysis of events and data differ. A further impediment is that descriptions of reported events and their root causes, which are important to the assessment of the events, are usually written in the native language of the countries where the events were observed.

To overcome these obstacles, the International Common-Cause Data Exchange (ICDE) project was initiated in August 1994. Since April 1998, the NEA has formally operated the project. The objectives of the ICDE project are to:

- collect and analyse CCF events over the long term so as to better understand such events, their causes, and their prevention;
- generate qualitative insights into the root causes of CCF events which can then be used to derive approaches or mechanisms for their prevention or for mitigating their consequences;
- establish a mechanism for the efficient feedback of experience gained in connection with CCF phenomena, including the development of defences against their occurrence, such as indicators for risk based inspections;
- generate quantitative insights and record event attributes to facilitate quantification of CCF frequencies in member countries; and
- use the ICDE data to estimate CCF parameters.

The ICDE project operates with a clear separation between data collection and analysis. The data collection and analysis firstly results in qualitative CCF information that can be used for the assessment of the effectiveness of defences against CCF events and the importance of CCF events in the probabilistic safety assessment framework. The qualitative insights on CCF events generated by the analysis are being made available to CSNI countries through published reports. More information on ICDE activities can be found on the project website located at: http://www.oecd-nea.org/jointproj/icde.html.

Questionnaire

Do you currently participate in the ICDE project?

- ☐ No and never have participated in the project *(please answer questions 1 - 3)*
- ☐ Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ☐ Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ______________________________

2. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the ICDE data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

5. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the FIRE data project

Project Description:

The main purpose of the project is to encourage multilateral co-operation in the collection and analysis of data relating to fire events. The objectives of the OECD/NEA Fire Project are to:

- collect fire event experience (by international exchange) in an appropriate format in a quality-assured and consistent database;
- collect and analyse fire events over the long term so as to better understand such events and their causes, and to encourage their prevention;
- generate qualitative insights into the root causes of fire events in order to derive approaches or mechanisms for their prevention and to mitigate their consequences;
- establish a mechanism for efficient operation feedback on fire event experience including the development of policies of prevention, such as indicators for risk-informed and performance-based inspections; and
- record characteristics of fire events in order to facilitate fire risk analysis, including quantification of fire frequencies.

Coding guidelines and a quality assurance manual have been developed and validated by the project's participants. The project participants have set up structures within their country to collect and validate data for the project, which is now widely seen as the reference international database for fire events.

After having established the project quality guidelines and the quality-assurance procedure, data acquisition has proceeded according to plan. An updated version of the database is provided to all participants every year. Currently the event database contains more than 300 events. One or two meetings of the project steering body are held each year with the NEA's support. More information on FIRE activities can be found on the project website located at: http://www.oecd-nea.org/jointproj/oecd-fire.html.

Questionnaire

Do you participate in the FIRE project?

- ☐ No and never have participated in the project *(please answer questions 11 - 13)*
- ☐ Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*
- ☐ Yes *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - ☐ Resources associated with collecting/coding data are excessive
    - ☐ Benefits of participation do not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ________________________________

12. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the FIRE data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

15. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the COMPSIS data project

Project Description:

Software-based systems are currently being used and retrofitted in operating nuclear power plants worldwide. The failure modes of both hardware and software in these systems are to some extent different from the analogue instrumentation and control (I&C) systems. At present, there is no established international database where the failure modes of computerized systems are collected. The general aim of the Computer-based Systems Important to Safety (COMPSIS) project is to exchange information on computer-based system reliability in a structured way. The high-level objective is to contribute to the improvement of safety management and to the quality of software risk analysis for software-based equipment. Software and hardware faults in safety-critical systems are typically rare events and, consequently, most countries do not experience enough faults to allow meaningful syntheses. Combined information from several countries, however, is expected to yield sufficient data to help draw conclusions. The main objectives of the COMPSIS project are to:

- define a format and collect software and hardware fault experience in computer-based safety critical NPP systems (hereafter called "COMPSIS events") in a structured, quality-assured and consistent database;
- collect and analyse COMPSIS events over a long period so as to better understand such events, their causes and their prevention;
- generate insights into the root causes of and contributors to COMPSIS events, which can then be used to derive approaches or mechanisms for their prevention or for mitigating their consequences;
- establish a mechanism for an efficient feedback of experience gained in connection with COMPSIS events, including the development of defences against their occurrence, such as diagnostics, tests and inspections;
- record event attributes and dominant contributors so that a basis for national risk analysis of computerized systems is established.

Work during the first phase of the project (2005-2007) concentrated on the development of the COMPSIS data collection guidelines, quality assurance and data exchange interface. Data collected during first and second phase is about 80 Licensee Event Report (LER) events covering the period from the early 1990s to 2010.

Although the COMPSIS project was completed in December 2011, survey responses providing experience with this project will help identify lessons learned and best practices that may be applicable to other data project activities. More information on the COMPSIS Project can be found on the project website located at: http://www.oecd-nea.org/jointproj/compsis.html.

Questionnaire

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

- No and never participated in the COMPSIS project *(please answer questions 21 - 23)*
- Did not participate in the final phase of the project, but participated in an earlier project phase (*please answer questions 21 - 23 to describe your reasons for leaving the project, and questions 24 - 30 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 24 - 30)*

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

21. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ________________________________

22. With regard to you reasons for not participating in the project: What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

    a. What could have been done to encourage the participation of your organization in the COMPSIS data project?

    b. What advantages and disadvantages did you see to project participation? Had you joined the data project, what information could you have contributed?

    c. Do you believe that there was sufficient information available to support making an informed decision about your participation in the COMPSIS project? If not, what information would you have liked to know about the project?

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications?

28. Were there any consistency issues between how you data was collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the OPDE/CODAP data project

Project Description:

The goals of the OECD Piping Failure Data Exchange (OPDE) Project (2002-2011) are to:

- collect and analyse piping failure event data to promote a better understanding of underlying causes, impact on operations and safety, and prevention;
- generate qualitative insights into the root causes of piping failure events;
- establish a mechanism for efficient feedback of experience gained in connection with piping failure phenomena, including the development of defence against their occurrence;
- collect information on piping reliability attributes and influence factors to facilitate estimation of piping failure frequencies.

The OPDE Project is envisaged to include all possible events of interest with regard to piping failures. It will cover piping components of the main safety systems (e.g. ASME Code Class 1, 2 and 3). It also covers non-safety piping systems that, if leaking, could lead to common-cause initiating events such as internal flooding of vital plant areas. As an example, raw water systems such as non-essential service water could be a significant flood source given a pipe break. Steam generator tubes are excluded from the OPDE project scope. Specific items may be added or deleted upon decision of the Project Review Group. Two meetings of this body are held in annually with support from the NEA. In addition, the project has sponsored seminars and workshops directed at database applications. For example, workshops have been organized in Republic of Korea (December 2004), Sweden (May 2007), and Switzerland (May 2007). An updated version of the project database is provided to all participants every six months. The last OPDE PRG Meeting was held on May 17, 2011. It was immediately followed by the kick-off meeting for the CODAP data project (2011-2014). CODAP, the "OECD-NEA Component Operational Experience, Degradation and Ageing Program," builds on the insights and results from the OPDE and SCAP-SCC data projects. In addition to metallic piping components, the CODAP data project collects failure event data on passive, non-piping components. Unlike, OPDE, the CODAP data project is entirely Internet-based. More information on CODAP activities can be found on the project website located at: http://www.oecd-nea.org/jointproj/codap.html. Information on the completed OPDE project can be found at: http://www.oecd-nea.org/jointproj/opde.html.

<u>**Questionnaire**</u>

Do you participate in the OPDE and/or CODAP project?

- ☐ No and <u>never</u> have participated in either the OPDE or CODAP projects *(please answer questions 31 - 33)*
- ☐ Do not <u>currently</u> participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ☐ Yes *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

- Resources associated with collecting/coding data are excessive
- Benefits of participation do not justify the cost
- Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
- Proprietary/confidentiality concerns with data
- Not an OECD/NEA member
- Other ______________________________

32. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the CODAP data project?
    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?
    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

35. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

43. Other general comments?

APPENDIX C: OECD DATA PROJECT SURVEY

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for Data Project Representatives

Respondent Information

Please identify your organization: ______________________

Type of Organization (please check appropriate box):

- ☐ Regulatory Agency
- ☐ Government Technical Support Organization
- ☐ Commercial Technical Support
- ☐ Utility/Operator
- ☐ Other _________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

____

____

Responder Name:_____________________________

Address: ________________________________

____

Country: ________________________________

Data Project Affiliation:____________________________

Telephone and e-mail:_________________________

Activity and Questionnaire Background

Accurate data is needed to ensure that probabilistic safety assessment (PSA) results realistically represent as-built and as-operated nuclear power plants. To meet this need, the OECD Nuclear Energy Agency (NEA) supports a number of joint projects and information exchange programmes to enable interested countries, on a cost-sharing basis, to pursue research or the sharing of data with respect to particular areas or problems. Of particular note to PSA are the following NEA event records database projects:

- International Common Cause Failure Data Exchange (ICDE) Project (http://www.oecd-nea.org/jointproj/icde.html)
- OECD Piping Failure Data Exchange (OPDE) Project (http://www.oecd-nea.org/jointproj/opde.html). This project ended in May 2011, but data exchange activities are being continued under the Component Operational Experience, Degradation and Ageing Programme (CODAP) Project (http://www.oecd-nea.org/jointproj/codap.html).
- OECD/NEA Fire Incidents Record Exchange (FIRE) Project (http://www.oecd-nea.org/jointproj/oecd-fire.html)
- OECD/NEA Computer-based System Important to Safety (COMPSIS) Project (http://www.oecd-nea.org/jointproj/compsis.html). Although the COMPSIS project was terminated in December 2011, survey responses from this project will not only be used to

communicate the accomplishments of the project, but also help to identify lessons learned and best practices that may be applicable to other data project activities.

The OECD data projects can, in principle, support the collection and analysis of data that is highly relevant to probabilistic safety analysis, particularly in the areas of material degradation and aging, common cause failures, fire risk, and digital instrumentation and control systems. All of the projects collect qualitative information that can be useful in the development and review of PSA models. Moreover, several of these projects include specific objectives to support quantification activities. Note that even though detailed project data is generally only distributed to data project members, the data projects have published reports and technical papers that are publicly available to the broad PSA community.

The main objectives of this WGRISK activity are to:

- Identify and characterize current uses of OECD data project products and data in support of probabilistic safety assessment. In this context, the term 'products' refers to data analysis results, technical reports, and other project outputs.
- Identify and characterize technical and programmatic characteristics that either support or impede use of data project products in PSA. This includes an assessment of which PSA parameters could be potentially estimated from the various data project products and gaps between available product information and PSA data needs.
- Identify recommendations for enhancing the usefulness of data project products and the coordination between WGRISK and the data projects.

CSNI Working Group on Risk Assessment (WGRISK)

The Working Group on Risk Assessment (WGRISK) supports improved uses of Probabilistic Safety Assessment (PSA) in risk informed regulation and safety management through the analysis of results and the development of perspectives regarding potentially important risk contributors and associated risk-reduction strategies. The Working Group addresses PSA methods, tools, and data needed to provide this information.

The main objective of the Working Group on Risk Assessment (WGRISK) is to advance the PSA understanding and to enhance its utilization for improving the safety of nuclear installations, for improving the operation and the design of nuclear installations and for increasing the regulatory effectiveness through risk-informed approaches. In order to achieve this objective, WGRISK:

1. Reports to the Committee on the Safety of Nuclear Installations (CSNI) and assists that Committee with its work.
2. Constitutes a forum for exchange of information and experience related to risk assessment in Member countries. This exchange is not only limited to technical discussions on questions regarding risk analysis approaches, results, insights, applications and interactions with other disciplines and analysis techniques, but it also includes identifying and prioritizing important issues requiring additional research.
3. Prepares technical reviews (such as state-of-the-art reports, technical opinion papers, compilations of ongoing efforts, comparison studies) of work in all phases of risk assessment to assist further

developments and the application of PSA in risk-informed decision making. This work is generally done in task groups, whose work is organized in a task-like manner with outcomes and milestones.

4. Sponsors specialist meetings and workshops to further its objectives.

WGRISK collaborates with and/or assists other CSNI Working Groups, CNRA and other NEA committees on request. The group also co-operates with other international organizations, aiming among others to avoid duplication of effort. More information on WGRISK can be found at the following website: http://www.oecd-nea.org/nsd/csni/wgrisk.html.

Format of the Questionnaire and Instructions

- Since the intent of this project is to identify recommendations for increasing the use of data project products and the coordination between WGRISK and the data projects, complete and detailed responses are very much appreciated.
- A single response is desired from each data project, but if the project leadership would prefer to distribute the survey to the broader project membership, multiple survey responses from each project are welcome. It is left to the judgment of each data project representative to decide how best to respond to this survey (e.g., with a single consolidated response, individual project representatives responses, or a combination of individual representative responses and a consolidated response).
- Please send your completed questionnaire to the NEA WGRISK Secretary, Abdallah Amri (abdallah.amri@oecd.org) with a copy to Kevin Coyne (Kevin.Coyne@nrc.gov).
- Any questions on the questionnaire should be directed to Kevin Coyne at Kevin.Coyne@nrc.gov or by telephone at 01-301-251-7586.

Questionnaire for Data Project Representatives

1. Is the quality and quantity of data being submitted to the project currently adequate to support project objectives? If not, what could WGRISK do to assist the project in addressing your data needs?

2. How are national differences in (a) component safety classifications, (b) system boundaries, functional requirements, and (c) failure reporting criteria among project participants resolved to ensure consistent data reporting (i.e., how are consistency issues between how data is collected/coded for national programs and the data project resolved)?

3. PSA parameter estimation generally requires knowledge of both observed failure events and exposure (e.g., number of components demands, hours of exposure) in order to calculate a failure probability or failure rate. Does your project collect this type of exposure information?

4. Do you believe that project data (e.g., events, component failure data, and exposure information) is readily accessible and in a format that can be easily used by participants for the purposes of PSA (including availability of user and coding manuals)? Is all accumulated project data available to participants, or is data access restricted in certain cases (if so, please describe the project's data access policy).

5. Has the project attempted to quantify failure rates, failure probabilities, or other PSA parameters? If so, please provide examples and/ or references.

6. What project reports have been made publicly available and are available to both participants and non-project participants? Where can these reports be found (e.g., data project website, NEA publication webpage…)? Note that the attachment includes a draft list of publicly available reports and technical papers associated with the various NEA data projects - Is this list complete? If not, please update the attachment as appropriate.

7. Is any project data available to non-participant PSA developers such that they could still benefit from project activities (e.g., information that could support probabilistic parameter estimation or derivation of quantitative equipment performance insights)?

8. How comprehensive/complete are the data sets that have been provided to the data project? Are there any major data gaps that WGRISK could assist the project in addressing?

9. Have you received feedback on the uses of your data project products for the purposes of supporting PSA? If yes, how was this feedback received? How would you prefer to receive this type of feedback?

10. Are you planning any new initiatives for the future? In what ways can WGRISK provide assistance and/or support?

11. How can WGRISK members and observers who currently do not participant in the project learn more about your activities and the process for becoming a project participant?

12. What could WGRISK do to help address other data project challenges?

APPENDIX D: PUBLICLY AVAILABLE DATA PROJECT REPORTS AND RESOURCES

International Common Cause Data Exchange (ICDE) Data Project - Publicly Available Reports

Project Website: http://www.oecd-nea.org/jointproj/icde.html

Report Number	**Title**	**Abstract**	**Web Address**
ICDEPR00	Summary of the ICDE Project, Sept 2010	Description of ICDE Project and summary of data project activities through September 2010	https://www.eskonsult.se/ICDE/OpenFilePage.aspx?id=76
ICDEPR03	Generic Tasks: Coding Steps for Common-Cause Failure Events with Examples	This report presents examples of coded common-cause failure events and observed population records. They serve as examples for those individuals who are starting to code events for the International Common Cause Failure Data Exchange Project.	https://www.eskonsult.se/ICDE/OpenFilePage.aspx?id=68
NEA/CSNI/R(1999)2	ICDE Project Report on Collection and Analysis of Common-cause Failure of Centrifugal Pumps	Objectives of the centrifugal pump report are: • to describe the data profile in the ICDE database for centrifugal pumps and to develop qualitative insights in the nature of the reported ICDE events, expressed by root causes, coupling factors and corrective actions, • to develop the failure mechanisms and phenomena involved in the events, their relationship to root causes, and possibilities for improvement	http://www.oecd-nea.org/nsd/docs/1999/csni-r99-2.pdf
NEA/CSNI/R(2004)4	ICDE General Coding Guidelines - Technical Note	In this document, the general coding guidelines for the OECD ICDE-Project (International Common Cause Failure Data Exchange) are presented with explanations and appendices for each analysed component. The guide reflects the present experience with the already completed data collection.	http://www.oecd-nea.org/nsd/docs/2004/csni-r2004-4.pdf

Report Number	Title	Abstract	Web Address
NEA/CSNI/ R(2000)20	ICDE Project Report on Collection and Analysis of Emergency Diesel Generators	This report documents a study performed on the set of common cause failures (CCF) of emergency diesel generators (EDG). The data studied here were derived from the International CCF Data Exchange (ICDE) database, to which several countries have submitted CCF event data. The data span a period from 1982 through 1997. This report is the result of an in-depth review of the EDG events and presents several insights about them. The objective of this document is to look beyond the CCF parameter estimates that can be obtained from the CCF data, to gain further understanding of why CCF events occur and what measures may be taken to prevent, or at least mitigate the effect of, EDG CCF events. The report presents details of the ICDE project, a quantitative presentation of the EDG events, and a discussion of some engineering aspects of the events.	http://www.oecd-nea.org/nsd/docs/2000/csni-r2000-20.pdf
NEA/CSNI/ R(2001)10	ICDE Project Report on Collection and Analysis of Common-Cause Failures of Motor Operated Valves	This report documents a study performed on the set of common cause failures (CCF) of motor operated valves (MOV). The data studied here were derived from the International CCF Data Exchange (ICDE) database, to which several countries have submitted CCF event data. This report is the result of an in-depth review of the MOV events and presents several insights about them. The objective of this document is to look beyond the CCF parameter estimates that can be obtained from the CCF data, to gain further understanding of why CCF events occur and what measures may be taken to prevent, or at least mitigate the effect of MOV CCF events. The report presents details of the ICDE project, a quantitative presentation of the MOV events, and a discussion of some engineering aspects of the events.	http://www.oecd-nea.org/nsd/docs/2001/csni-r2001-10.pdf

Report Number	Title	Abstract	Web Address
NEA/CSNI/ R(2002)19	ICDE Project Report on Collection and Analysis on Safety and Relief Valves	This report documents a study performed on the set of common cause failures (CCF) of safety and relief valves (SRV). The data studied here were derived from the International CCF Data Exchange (ICDE) database, to which several countries have submitted CCF event data. This report is the result of an in-depth review of the SRV events and presents several insights about them. The objective of this document is to look beyond the CCF parameter estimates that can be obtained from the CCF data, to gain further understanding of why CCF events occur and what measures may be taken to prevent, or at least mitigate the effect of, SRV CCF events. The report presents details of the ICDE project, a quantitative presentation of the SRV events, and a discussion of some engineering aspects of the events	http://www.oecd-nea.org/nsd/docs/2002/csni-r2002-19.pdf
NEA/CSNI/ R(2003)19	ICDE Project Report on Collection and Analysis of Common-Cause Failures of Batteries	This report documents a study performed on the set of Common Cause Failure (CCF) events of batteries (BT). This study examines 50 events in the International CCF Data Exchange (ICDE) database by tabulating the data and observing trends. The data span a period from 1980 through 2000. The data is not necessarily complete for each country through this period. The database contains general information about even attributes like root cause, coupling factor, common cause component group (CCCG) size, and corrective action. As part of the study documented in this report, the events contained in the ICDE database were reviewed again and additional categorizations of the data. The data tabulation and trend observation of this study cover these additional categorizations alongside the original data from the ICDE database. The additional categories include degree of failure and detection method.	http://www.oecd-nea.org/nsd/docs/2003/csni-r2003-19.pdf

Report Number	Title	Abstract	Web Address
NEA/CSNI/ R(2003)15	ICDE Project Report on Collection and Analysis of Common-Cause Failures of Check Valves	This report documents a study performed on the set of Common Cause Failure (CCF) events of Check Valves (CVs). The events studied here were derived from the International CCF Data Exchange (ICDE) database. Organizations from Canada, Finland, France, Germany, The Netherlands, Sweden, Switzerland and the United States contributed with data to this data exchange. This study examines 94 CCF events of CVs reported in the ICDE database by tabulating the data and observing trends. The database contains general information about event attributes like root cause, coupling factor, detection method and corrective action taken. As part of this study, most of these events were reviewed in more detail and characterized by failure cause and failure symptom categories.	http://www.oecd-nea.org/nsd/docs/2003/csni-r2003-15.pdf
NEA/CSNI/ R(2008)8	ICDE Project Report: Collection and Analysis of Common-Cause Failures of Level Measurement Components	This report documents a study performed on a set of 146 CCF events related to level measurement components spanning a period from 1983 through 2003. The function of the component "Level Measurement" is to monitor the liquid level in safety relevant vessels, tanks and piping. The events studied here were collected in the ICDE database. Organisations from Canada, Finland, France, Germany, Sweden, United Kingdom and United States contributed to the exchange. The events contained in the ICDE database were analysed with respect to failure modes, degree of impairment, failure causes, and engineering aspects like failure symptoms. The limitation is that the data is not necessarily exhaustive for each country throughout the study period.	http://www.oecd-nea.org/nsd/docs/2008/csni-r2008-8.pdf

Report Number	Title	Abstract	Web Address
NEA/CSNI/ R(2008)1	ICDE Project report: Collection and analysis of Common-cause Failures of Switching Devices and Circuit Breakers	This report documents a study performed on a set of ICDE events related to switching devices and circuits breakers (CBs). The events studied here had been collected in the ICDE database. Organizations from Canada, Finland, France, Germany, Spain, Sweden, United Kingdom and United States contributed to the exchange. One-hundred-four (104) ICDE events, exhibiting at least some degree of dependency, and spanning a period from 1983 through 2004, were examined in the study. The data are not necessarily complete for each country through this period. The available information on the events is limited sometimes depending on the detail of description in licensee event reports or plant maintenance sheets. The database contains general statistical information about event attributes like impairment of the components in the observed populations, root cause, coupling factor, detection methods and corrective actions taken. The events contained in the ICDE database were analysed with respect to failure modes, degree of impairment, failure symptoms, failure causes, and technical fault aspects.	http://www.oecd-nea.org/nsd/docs/2008/ csni-r2008-1.pdf
NEA/CSNI/ R(2001)8	Proceedings of the ICDE workshop on qualitative and quantitative use of ICDE data. Held in Stockholm, Sweden on 12-13 June 2001	This workshop was hosted by the Swedish Nuclear Power Inspectorate SKI, and it gathered a large audience of researchers, regulators and industry representatives. The findings of the discussions and the papers of the workshop are presented in these proceedings.	http://www.oecd-nea.org/nsd/docs/2001/ csni-r2001-8.pdf

In addition to those reports on the public part of the ICDE website, the following papers have been produced:

- PSA 2011 General insight from the ICDE project. Albert Kreuser, Gunnar Johanson. ANS PSA 2011 International Topical Meeting on Probabilistic Safety Assessment and Analysis Wilmington, NC, March 13-17, 2011

- ICONE 14-89559 Estimation of the Alpha Factor Parameters for the Emergency Diesel Generators of Ulchin Unit 3. Dae Il Kang, Sang Hoon Han
- PSAM 8 0020 (2006)- Development and Structure of the German Common Cause Failure Data Pool. A. Kreuser, C. Verstegen, B. Schubert, R. Wohlstein
- PSAM 8 0364 (2006)- Training on dependency defense and CCF awareness. Gunnar Johanson/ES konsult AB, Per Hellström/Relcon AB, Michael Knochenhauer/Relcon AB
- Kerntechnik 71 (2006) Paper 100434 - Further development of the coupling model. A. Kreuser, J. Peschke and J. C. Stiller
- Kerntechnik 71 (2006) Paper 100436 - ICDE Project insights and lessons learnt. G. Johanson, A. Kreuser, P. Pyy, D. Rasmuson and W. Werner
- Kerntechnik 71 (2006) Paper 100438 - Protection against dependent failures, analysis of dependencies and derivation of CCF data. M. Knochenhauer, T. Mankamo, P. Hellström and G. Johansson
- Blue Book 2002-2005 NEA No. 6150
- PSAM 7 0400 - General Insights from the International Common Cause Failure Data Exchange (ICDE) Project. Baranowsky P., Rasmuson D., Johanson G., Kreuser A., Pyy P., Werner W.
- PSAM 7 0401 - ICDE Project: Insights and Results from the Analysis of Common- Cause Failures of Batteries. Morales R., Pereira B., Pyy P., Werner W.
- PSAM 7 0572 - Insights and Results from the Analysis of Common-Cause Failure Data Collected in the ICDE Project for Safety and Relief Valves. Johanson G., Jonsson E., Jänkälä K., Pesonen J., Werner W.
- PSAM 7 0490 - Lessons Learnt from Data Collected in the ICDE Project. Tirira J., Werner W.
- PSA 2002. Estimation of Common Cause Failure Parameters for Diesel Generators, J. TIRIRA , J-M. LANORE
- ICONE 8. International Common Cause Failure Data Exchange Project - 1999 Status report. Patrick W. Baranowsky, Dale M. Rasmuson, Lennart Carlsson April 2000.

Fire Incident Records Exchange (FIRE) Data Project – Publicly Available Reports

Project Website: http://www.oecd-nea.org/jointproj/oecd-fire.html

Report Number	Title	Abstract	Web Address
NEA/CNRA /R(2009)3	CNRA Summary Report on Operating Experience Feedback Related to Fire Events and Fire Protection Programmes (Safety Analysis of Fire Operating Events)	In 2006, the CNRA Working Group on Operating Experience (WGOE) began the task of examining national and international operating events databases in order to identify any potential safety issues related to NPP fires and fire protection systems. The purpose of this task was to provide the member countries with practical information that would be helpful in assessing and potentially improving their inspection and OEF programmes. This analysis and trending task was performed in conjunction with the Working Group on Inspection Practices (WGIP) task using inputs from OECD NEA Fire Project with the CNRA approval. This report describes the outcomes from the task, including the background, the main conclusions, survey with analysis of results, and survey responses on the basis of national operating experience databases provided by regulatory organizations in the NEA countries.	http://www.oecd-nea.org/nsd/docs/2009/cnra-r2009-3.pdf
NEA/CSNI/ R(2009)6	FIRE Project Report: “Collection and Analysis of Fire Events (2002-2008) – First Applications and Expected Further Developments” - re-printed	Applicable to commercial nuclear power plants only, the OECD FIRE Project exchanges fire events data covering all plant operational modes including construction and decommissioning phases. Currently, the Database contains 344 fire events, most of them quality assured. The events are from the period from the early 1980ies to 2008, with the bulk of the events in the period of the mid 1990ies to end of 2007. Although the reporting of events is not exhaustive, the Database provides a good platform for starting the analytical phase	http://www.oecd-nea.org/nsd/docs/2009/csni-r2009-6.pdf

The following papers are also available on demand from the NEA Secretariat - contact via www.oecd-nea.org/jointprojects

- Röwekamp, M., S. Katzer, J. Klindt, H.-P. Berg: Insights from Investigations of High Energy Arcing Fault "HEAF" Events in German Nuclear Power Plants, Paper 54158 in: Proceedings of the 20th International Conference on Nuclear Engineering collocated with the ASME 2012 Power Conference ICONE20-POWER2012, July 30 – August 3, 2012, Anaheim, CA, USA, ASME, August 2012
- Türschmann, M., W. Werner, M. Röwekamp (2012) Application of OECD FIRE Data for Plant Specific Fire Event Trees, in: Conference Proceedings of PSAM11 Conference, Helsinki, Finland, 2012.
- Werner, W., R. Bertrand, A. Huerta, J. S. Hyslop, N. Melly, M. Röwekamp (2011) Enhancements in the OECD FIRE Database - Fire Frequencies and Severity of Events, in: Proceedings of SMiRT 21, 12th International Seminar on Fire Safety in Nuclear Power Plants and Installations, September 13-15, 2009, München, Germany, 2011.
- Berg, H.P., N. Fritze: *First experiences from international databases on nuclear power plant fire brigade activities*, in: Proceedings of SMiRT 21, 12th International Seminar on Fire Safety in Nuclear Power Plants and Installations, München, Germany, September 13-15, 2011, Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH, GRS-A-3651, Köln, Germany ,September 2011
- Berg, H. P. and M. Röwekamp (2011) Investigation of High Energy Arcing Fault Events in Nuclear Power Plants, Nuclear Power - Operation, Safety and Environment, P. Tsvetkov (Ed.), ISBN: 978-953-307-507-5, InTech, 2011; available from: http://www.intechopen.com/articles/show/title/investigation-of-high-energy-arcing-fault-events-in-nuclear-power-plants, 2011.
- Röwekamp, M., H. P. Berg (2011) Anwendbarkeit der internationalen Brandereignis-datenbank OECD FIRE bei Brand-PSA, Präsentation (CD) beim "Symposium '11, Probabilistische Sicherheitsanalysen in der Kerntechnik, Heidelberg, Germany, 26. – 27. Mai 2011", Mai 2011.
- Berg, H.P., N. Fritze: *Reliability of main transformers*, Reliability: Theory and Applications, Vol. 2, No. 1, March 2011
- Röwekamp, M., W. Werner, A. Huerta (2010) The OECD FIRE Database and Its Applicability in: Fire PSA, Paper 0114, in: Conference Proceedings of PSAM10 Conference, Seattle, WA, USA, June 2010.
- Berg, H.P., N. Fritze: Power plant transformer explosion and fire, SSARS 2010 – Summer Safety and Reliability Seminars, Journal of Polish Safety and Reliability Association, Volume 1, June 2010
- Berg, H. P., B. Forell, N. Fritze, M. Röwekamp (2010) Exemplary Applications of the OECD FIRE Database, in: Jahrestagung Kerntechnik 2010, Hrsg. Deutsches Atomforum, INFORUM-Verlag, Bonn, Germany, 2010.
- Berg, H. P., B. Forell, N. Fritze, M. Röwekamp (2009) First National Applications of the OECD Fire Database, in: Proceedings of SMiRT 20, 11th International Seminar on Fire Safety in Nuclear Power Plants and Installations, August 17-19, 2009, Helsinki, Finland, 2009.
- Werner, W., A. Angner, M. Röwekamp, J, Gauvain (2009) The OECD FIRE Database – Conclusions from Phase 2 and Outlook, in: Proceedings of SMiRT 20, 11th International Seminar on Fire Safety in Nuclear Power Plants and Installations, August 17-19, 2009, Helsinki, Finland, 2009
- Angner, A., H.P. Berg, M. Röwekamp, W. Werner, J. Gauvain (2007) The OECD FIRE Database, 10th International Seminar on Fire Safety, Oshawa, Canada, 20-21 August 2007.
- Angner, A., H.P. Berg, M. Röwekamp, W. Werner, J. Gauvain (2007) The OECD FIRE Project: Objectives, Status, Applications, 19th International Conference on Structural Mechanics in Reactor Technology (SMIRT-19), Toronto, Canada, 12-17 August 2007.
- Angner, A., H.P. Berg, M. Röwekamp, W. Werner, J. Gauvain (2007) The OECD FIRE Database, S*onderheft KernTechnik*, Volume 72 (2007) pp. 120-126.
- Berg, H.P., A. Angner, E. Mathet, M. Röwekamp, W. Werner (2006) Recent Results from The OECD FIRE Project/Use of the OECD-FIRE Database, ESREL 2006 Safety and Reliability Conference, Esteril, Portugal, 18-22 September 2006.

- Werner, W., A. Angner, E. Mathet, M. Roewekamp (2005) Recent Results from The OECD FIRE Project, 18th International Conference on Structural Mechanics In Reactor Technology (SMIRT 18) Post-Conference Seminar III, Vienna, Austria, 22-24 August 2005.
- Werner, W., A. Angner, E. Mathet, M. Roewekamp (2005) Use of the OECD-FIRE Database, Ninth International Seminar on Fire Safety in Nuclear Power Plants and Installations, Vienna, Austria, 22-24 August 2005.
- Bertrand, R., H. Boll, M. Röwekamp, E. Mathet (2005) Examples of the Use of the OECD Fire Database, OECD/NEA Workshop on Fire PSA, Puerto Vallata, Mexico, 23-25 May 2005.
- Röwekamp, M., E. Mathet, A. Angner (2004) The OECD FIRE Project: A Framework for International Cooperation in Fire Data Collection and Analysis, Fire and Safety Conference, Munich, Germany, 11-12 March 2004, Conference Proceedings, Wilmington Publishing Ltd., Dartford, United Kingdom, 2004.

OECD Piping Failure Data Exchange (OPDE)[20] Data Project – Publicly Available Reports

Project Website: http://www.oecd-nea.org/jointproj/opde.html

Report Number	Title	Abstract	Web Address
NEA/CSNI/ R(2009)2	Risk-informed Piping Integrity Management. Workshop Proceedings, Madrid, Spain, 2-4-June, 2008	The main objectives of the Workshop were to examine and address the results and conclusions of the OECD/NEA and EC-JRC coordinated risk-informed in-service inspection methodologies benchmark (RISMET) and to discuss and present the results and applications of the OECD Piping Failure Data Exchange (OPDE) project along with other related activities found in NEA member countries. The workshop was structured in four technical sessions, each followed by ample time for panel discussions.	http://www.oecd-nea.org/nsd/docs/2009/ csni-r2009-2.pdf
NEA/CSNI/ R(2009)19	OECD/NEA Pipe Failure Data Exchange (OPDE) Project - (2002-2008) Status Report	Several OECD Member countries have agreed to establish the OECD-NEA Piping Failure Data Exchange Project (OECD-NEA OPDE) to encourage multilateral co-operation in the collection and analysis of data relating to degradation and failure of piping in nuclear power plants. The scope of the data collection includes service-induced wall thinning, part through-wall cracks, through-wall cracks with and without active leakage, and instances of significant degradation of piping pressure boundary integrity. This report describes the status of the OECD-NEA OPDE database after 6 years of operation from May 2002 to May 2008, and gives some insights based on ca. 3600 piping failure events in the database.	http://www.oecd-nea.org/nsd/docs/2009/ csni-r2009-19.pdf

[20] The OPDE project has recently been completed and has been replaced by the Component Operational Experience, Degradation and Ageing Programme (CODAP) Project (Project Website: http://www.oecd-nea.org/jointproj/codap.html)

NEA/CSNI (2010)13	EC- JRC/OECD-NEA Benchmark Study on Risk Informed In-Service Inspection Methodologies (RISMET), November 2010.		

The following papers and reports are also available on demand from the NEA Secretariat –contact Alejandro Huerta (alejandro.huerta@oecd.org)

- Enhanced Piping Reliability Models for Use in Internal Flooding PSA, Proc. ANS 2011 Topical Meeting on Probabilistic Safety Analysis and Assessment, March 13-17, 2011, Wilmington, North Carolina, USA.
- Lydell, B.O.Y., Huerta, A. and Gott, K. "Insights from PSA Applications of the OECD Nuclear Energy Agency (OECD/NEA) OPDE Database," Proc. ANS PSA 2011 Int. Topical Meeting on Probabilistic Safety Assessment and Analysis, Wilmington, NC, March 13-17, 2011.
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Computer-based Systems Important to Safety (COMPSIS) Data Project – Publicly Available Reports

Project Website: http://www.oecd-nea.org/jointproj/compsis.html

Report Number	Title	Abstract	Web Address
NEA/CSNI/R (1999)14/REV1	Computer-Based Systems Important to Safety (COMPSIS) Reporting Guidelines	The objective of this procedure is to help the user to prepare a COMPSIS report on an event so that important lessons learned are most efficiently transferred to the database. This procedure focuses on the content of the information to be provided in the report rather than on its format. The established procedure follows to large extend the procedure chosen by the IRS incident reporting system. However this database is built for I&C equipment with the purpose of the event report database to collect and disseminate information on events of significance involving Computer-Based Systems important to safety in nuclear power plants, and feedback conclusions and lessons learnt from such events.	http://www.oecd-nea.org/nsd/docs/1999/csni-r99-14-rev1.pdf
NEA/CSNI/R (2008)13	Computer-Based Systems Important to Safety (COMPSIS) Project: 3 Years of Operation (2005-2007)	The COMPSIS Project is designed to fill the shortage of computer-based system analysis data. This project will enable the identification of the root cause of a computer-based system failure and the effect of the failure and the determination of how the failure could have been prevented. The type of analysis expected from this project is needed to support risk analysis and the regulatory review of computer-based systems. This report describes the current status of the COMPSIS database after three years of operation and gives some insights into the database structure, coding guidelines, collected computer based system failure events and a first qualitative insight from the data.	http://www.oecd-nea.org/nsd/docs/2008/csni-r2008-13.pdf
NEA/CSNI/R (2012)12	Computer-Based Systems Important to Safety (COMPSIS)	The purpose of this report is to determine whether the published events collected during the extended second period provides the opportunity for extracting lessons learned and improve the safety of	http://search.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=NEA/CSNI/R(2012)12&docLanguage=En

	Project: Second Period Operation (2008-2011)	nuclear facilities when modernizing with digital computer based equipment. Since all measurements are in error in some way or another, a method must be employed to determine viable lessons that can be used to develop defences against event occurrences.	

APPENDIX E: SUMMARY OF WGRISK MEMBER RESPONSES

Questionnaire for the ICDE data project

Do you currently participate in the ICDE project?

- No and never have participated in the project *(please answer questions 1 - 3)*
- Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

   - Resources associated with collecting/coding data are excessive
   - Benefits of participation do not justify the cost UJD
   - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - Proprietary/confidentiality concerns with data
   - Not an OECD/NEA member
   - Other ________________________________

   The reasons listed in various responses include that the benefits of participation do not justify the cost, that other organizations in the country are acting as the delegates to the project, new OECD/NEA member, resources associated with collecting and coding data are excessive, as well as proprietary/confidentiality concerns with data.

2. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the ICDE data project?

   The reasons listed in various responses include that the organization is not familiar with the project and would need more detailed information before deciding to participate, new member of OECD/NEA and has not yet decided if their organization is interested in participating in the project, that the organization was unsure whether they could provide valuable information for the other partners in the project (although they are now considering the potential to participate and the possibilities of joining.) One organization stated that they felt that access rights to the data would encourage their participation, and one organization felt that with only one reactor with less than three years remaining life, no insight could be achieved in this period.

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

   The advantages to project participation given by organizations include the transfer of know-how in this area, to be more aware of international practices and sharing of data, getting a lot of information about CCF events (which is difficult to get otherwise,) being one of the partners for forming a consistent, integrated approach to CCF, and providing the necessary data to develop reliability data analysis methods. One organization stated that they could provide useful information about long term treatment of CCF data and methodological developments and problems encountered, along with their events and precursors, but that there might be a problem with proprietary or confidential information. The organization indicated a willingness to work to solve the problem.

The disadvantages to project participation given by organizations include the applicability of the results to WWER type plants.

c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

One organization responding indicated that they felt that sufficient information is not available, and stated that they would value a more detailed description about the methodology used, data collection and analyses, implementation of the results, and what was done in the past as well as plans for future use. Other organizations stated that they had sufficient information to make a decision on participation or that the decision to join the project was not theirs.

One organization asked if the project aimed at proposing data for CCF parameters.

EDF UK stated that they are currently planning to move to the alpha factor CCF approach and as part of this process will be investigating how much use can and/or could be made of ICDE data as part of the quantification process. This will help inform them of the potential benefit of future project participation.

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

   Some responding organizations felt that the information available for non-participants was very limited and that the publicly available reports are not enough to make a decision about participation, or that while the website has some valuable data publicly available, it is not fully sufficient. One organization stated that the information available is suitable for understanding mechanisms connected with the occurrence of common cause failures and the distribution of various CCF coupling factors that influence the strength of the CCF potential, but felt that the information was mostly qualitative and does not help with any quantification of parameters. They suggested that generic data for Bayesian updating would be useful, as well as concrete information about CCF events for use in their own plant at specific conditions.

   Some responding organizations felt that the information was sufficient.

   The only report listed as being used by was "NEA/CSNI/R(2003)15, Collection and analysis of common-cause failure of check-valves".

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

Reasons given for participating include the following:

- Gain access to a comprehensive international database of CCF events
- Stay informed about current CCF analysis approaches, tools and best practices in terms of management, engineering, and modelling across a variety of components.
- Obtain information regarding different methods in collecting, evaluating and modelling CCF events in different countries.

- Obtain information on the root cause of events, experience feedback of events, preventive countermeasures, and reliability attributes in other countries.
- Provides raw CCF data to obtain specific CCF parameters
- Improving risk-based inspections
- To have a basis for comparison with the existing data
- The gained knowledge was implicitly used for the identification of CCF groups.
- Data gathered has supported the safety case and continued operation

The ability to use the ICDE database to derive CCF parameters for comparison to the parameters derived from a domestic database. This comparison is particularly useful for components where there is a limited amount of CCF data available and high uncertainty associated with the CCF parameter estimates.

Enlarge the information base for early identification of non or little known CCF phenomena, as well as identification of CCF phenomena not yet observed in national operating experience, including their causes and effects to support the comprehensive assessment of potential CCF phenomena which may occur at safety important components

Improvement of methods for qualitative assessment of CCF and potential CCF events observed in national operating experience (e.g. impairment vector method, assessment of simultaneity of failures)

Improvement of methods for quantitative assessment of CCF probabilities (e.g. quantification of impairments) and application of improved methods for generation of quantitative generic CCF data sets published in the technical documents on PSA methods /FAK 05/ and data /FAK 05a/ accomplishing the national PSA Guideline;

The main initial reason for participation related to a specific regulatory issue on PSA. The regulator had some concern over the methodology for common cause failure (CCF) analysis in UK gas reactor PSAs, namely use of the Unified Partial beta-factor Method and required a way of potentially calibrating the UPM. ICDE was seen as a potential source of data to aid calibration. Further information on this can be found within ONR's Nuclear Research Index for 2011 (www.hse.gov.uk/nuclear/nri-topics/section-k.pdf)\

It provided the impetus for licensees to look into CCFs in more detail, for example to pull together operational experience specifically relating to CCFs and look for trends. It is noted that although this activity was not organized by the ICDE project, the licensees would probably not have done this if they had not been involved in the ICDE project

Provides a forum for discussing new and different CCF analysis approaches. This allows countries to share knowledge with international experts, as well as gives access to other experts in the field.

Gives access to relevant papers prepared by international experts, and some of the benefits of their research

Allows for the forming of relationships with other organizations within the nuclear industry in other countries, including the regulatory bodies, who are involved in CCF analysis.

Aids in the development of our own familiarity and expertise in the area

Sources listed above:

/FAK 05/ Facharbeitskreis (FAK) Probabilistische Sicherheitsanalyse für Kernkraftwerke, Methoden zur Quantifizierung von Ereignisablaufdiagrammen und Fehlerbäumen, Stand: August 2005, BfS-SCHR-37/05, Salzgitter; Oktober 2005

/FAK 05a/ Facharbeitskreis (FAK) Probabilistische Sicherheitsanalyse für Kernkraftwerke, Daten zur Quantifizierung von Ereignisablaufdiagrammen und Fehlerbäumen, Stand: August 2005, BfS-SCHR-38/05, Salzgitter; Oktober 2005

5. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?

      NRC: The NRC has provided CCF data cover 10 different component types. The components and the years that the data has been evaluated are shown in the table below.

Component	**Evaluated time period**
Batteries	1/1/1990 to 12/31/2010
Breakers	1/1/1990 to 12/31/2010
Centrifugal Pumps	1/1/1990 to 12/31/2010
Check valves	1/1/1990 to 12/31/2010
Diesel Generators	1/1/1990 to 12/31/2010
Heat Exchangers	1/1/1990 to 12/31/2010
Motor Operated Valves	1/1/1990 to 12/31/2010
Safety and Relief Valves	1/1/1990 to 12/31/2010
Control Rod Drive Assembly	1/1/1990 to 12/31/2001
Level measurement	1/1/1990 to 12/31/2001

The NRC provides CCF event records and observed population records for each component. Each CCF event record includes an event description, failure mode, and other coded fields that support CCF parameter quantification. Each observed population record includes the observed time period and the number of independent failures during that period.

KAERI: We provided the data for MOV, EDG, MDP (Centrifugal), CV, and breakers

CSN: It depends on the NPP. In general it covers 10 years operational experience for: Centrifugal pumps, check valves, breakers, batteries and motor operates valves.

GRS: Complete set of CCF events on all component types collected in the ICDE database for the time period 1990 to 2002 and partly up to 2005.

JNES: So far, we have provided Japanese event data to the ICDE database. The data include administrative documents issued by the nuclear regulatory authority and related reports submitted by utilities.

ONR: CCF events and observed populations have been provided for the following components across all UK operational power stations (AGRs, Magnox and PWR):

- Batteries (1990-1998)
- Breakers (1995-2002)
- Centrifugal pumps (1990-2001)
- Control rod drive assemblies (1995-2003)
- Diesel generators (1990-2001)
- Level measurement (PWR only) (1995-2003)
- Safety and relief valves (1990-2002)

SSM: - SE has participated in all component data collections

Magnox: various systems for all operating sites

CNSC: CCF events for the following components: Batteries, Heat exchangers, Diesel Generators, Level Measurement, Check valves, Safety Relief Valves, Motor operated valves. The observation period as well as the utilities participating in each data collection campaign is different

ENSI: Switzerland has collected CCF data for the following components: diesel generators, centrifugal pumps, batteries, motor-operated valves, safety and relief valves and check valves.

b. What is the source of the data that you have submitted?

NRC: The NRC maintains its own CCF database, which is used for quantifying CCF parameters for use in NRC's PSA models. The data shared with the ICDE project come from the NRC CCF database. The Idaho National Laboratory (INL) serves as a technical support organization to the NRC and maintains the NRC's CCF database. The source of raw data for the NRC CCF database is the Equipment Performance and Information Exchange (EPIX) System Database, which is maintained by the Institute of Nuclear Power Operations (INPO). The INL reviews the information in the EPIX database, identifies CCF events, and provides the necessary analysis and coding for inclusion in the NRC's CCF database. Because EPIX is used as the original source of the data, the NRC has agreed to allow INPO to review all U.S. data that NRC intends to share with the ICDE project.

KAERI: The data extracted from operating experiences.

CSN: Spanish NPP provided all the data. The CCF data analysis is made by the PSA data group in the PSA team in each NPP. As a part of the PSA data analysis, Spanish NPP make a qualitative and quantitative CCF data analysis. The qualitative analysis is sent to ICDE project.

GRS: The source of data submitted to ICDE is the German national database on reportable events including the underlying information on these events by the German licensees.

JNES: The sources of the provided data are as follows;

- Nuclear power plant event reports submitted to the regulatory agency by the utilities pursuant to the related laws.
- Data from NUClear Information Archives "NUCIA" operated by the Japan Nuclear Technology Institute" JANTI".

ONR: This data has been provided by the licensees of the operating UK reactors. The data was collected specifically for ICDE.

SSM: - SE Licensee Event Reports

IRSN: The provided data source is the EDF nuclear power plants operating experience.

Magnox: Operating experience

CNSC: CCF events from licensees maintenance records for the specific campaign of data collection

ENSI: The source of the data submitted to ICDE is mainly the licensees' PSA studies and event reports.

c. Have you used this data to support PSAs in your country?

There was a mixed response to this question, with some respondents using the data, and other not using it. Additional information is given below.

The data has been used for comparison to the NRC's CCF database.

One respondent performed a case study in using the data.

In the quantitative analysis in the PSA, NPP use their own data, they do not use ICDE database. However the general coding guidelines are used as a guide for NPP.

This data has been used for the technical documents supporting the national German PSA Guideline as well as for most of the PSA having been performed for NPP in Germany in the frame of Periodic Safety Reviews and other PSA studies by the utilities.

Various studies have been carried out to compare the CCF probabilities from the UPM (as used by the licensees in their PSAs) with those from parametric approaches based on ICDE data. Furthermore, there is currently ongoing work moving the AGR PSAs from using the UPM approach to the alpha-factors approach. ICDE and other data sources are being considered although it is noted that ICDE components are either not risk significant for the AGR PSAs or already included in other data source, e.g. US INL data.
In addition, the collected data has been reviewed for qualitative lessons and these have been shared with the licensees.

ONR also use the public reports along with other information (non-ICDE) to support its assessment of licensees' PSAs and safety cases.

ICDE experience has proved very useful in enhancing the modeling of CCFs in Swiss PSAs and was taken into account when developing the Swiss regulatory guidelines on the use of PSA. In particular, the regulatory guideline ENSI-A05 prescribes the development of plant specific CCF parameters and defines the minimum scope of components, for which modeling of CCFs is expected. The definition of the minimum of the minimum scope of CCFs to be considered is also based on the components, which are considered in the ICDE project.

d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

Most respondents stated that there was no national data that was not submitted due to proprietary/confidentiality concerns. Additional responses are below.

The limitations are that suitable data is not routinely collected by the licensees, and specific work and significant effort would be required to collect this data.

We submitted only the data for 5 components, so we have additional data that could be used. Additional data will be collected and analyzed from this year. Also, we need some data for the low power shutdown PSA

Not all licensees have participated to each of the data collection campaigns and the observation period is not up to date.

SSM stated that in the ICDE project the component boundaries do follow the boundaries established in the T-Book (Reliability data on safety related components in Nordic NPPs)

-SE has very good data on single critical failures on safety related components – presented in the so called T-Book

-SE has been quite active in interpretation and testing the collected ICDE data in Nordic projects, with Germany etc to develop CCF parameters to be used in the PSAs.

EDF France stated that the exact number of demands and time exposure are not submitted due to proprietary concerns.

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

NRC: To support the ICDE project, one NRC staff member attends the ICDE Steering Group meetings twice per year. In addition, the NRC also contributes approximately 200 staff-hours per year for supporting ICDE tasks (e.g., developing component reports, reviewing work notes, responding to quality assurance comments on submitted data). The NRC also has contractual support from INL to provide a data update to the ICDE project once per year.

KAERI: Data for 5 components are collected, coded according to the guideline and submitted.

GRS: Specialists and experts on operating experience, technological components and PSA from GRS and the German utilities have been involved in event selection, assessment and coding, and for collection, description and coding of the observed sets of components (exposure data). Finally, the data have been checked and quality assured by the national coordinator, the utilities and the operating agent.

ONR: A significant amount of effort has been applied for each data collection exercise, as suitable data is not already collected by the licensee. This includes resource in the licensees, the regulator and technical support contractors. It is difficult to estimate the level of resource due to fluctuations, although it is likely to have been of the order of 6 person months effort per year, particularly during the periods of active data collection and analysis.

SSM: -In SE the licensees have established a working group with responsibility to collect relevant CCF event records from the past, to do the expected data work according to the ICDE component specific coding guidelines. Data is collected from licensees and SSM

IRSN: IRSN was more involved before 2005 (Phase 1), the ICDE input data being derived by IRSN based on EDF raw data. Beginning with 2005 (Phase 2), the data is derived by EDF, IRSN having mostly a coordination role. The resources allocated by IRSN to the project were:

- Phase 1: 1 specialist full time + 1 specialist part time
- Phase 2: 1 specialist part time

Magnox: Estimated resource to value at approximately 7100k p.a or more shared with other utilities.

CNSC: Data collection (including coding and submission to clearing house) is performed by an external contractor to the CNSC

ENSI: Substantial resources have been applied to collect and analyse data for the ICDE project. Resources are currently scarce for taking part in data collection for new components. The main resources are devoted to keep up-to-date the data of the components, for which we are collecting CCF information.

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

The data are transparent and available in a format that can be used to support a PSA, although two respondents stated that the database has a lack of detailed data for analysis, specifically the statistical data such as single failures or exposure time are not available for all defined component collectives.

The database is able to support different quantification methods. This is seen as a good thing by some respondents, as participating countries may have different approaches for performing CCF quantification; and a negative one by others, as there is not a single internationally used program for quantification.

It would be difficult for us to use the ICDE data as a source of quantification for PSA, as far as the description, scope of components; groups of analysis and etc. are not the same as in the national PSA. However we think that they are very useful in order to identify and to analyze the failure information from the NPP.

All supporting information, e.g. generic component coding guidelines, specific component coding guidelines and database tools user manual are fully available, as well as advice available from the Operating Agent.

The data is stored in a database that can be interrogated by a specific tool. This is available to all licensees, regulator and technical support organizations supporting the licensees or regulator. The database tool has evolved significantly over recent years making analysis reasonably straight forward and flexible.

For the quantification of CCF parameters, the database provides the impairment vectors and some processing is also required to quantify these parameters.

All old CCF data that is provided to the ICDE project is also quality assured in separate reports, published by the Nordic PSA Group (NPSAG).

Most respondents had no proposals for changes or improvements at present, although some respondents stated that the data generally requires further analysis to be of use.

8. Are there any consistency issues between how your data is collected/coded for national programs vs. the ICDE data project? Do these issues represent a significant obstacle to the use of the data, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?

NRC: There have been consistency issues between the national data program and the ICDE project. These consistency issues have generally been addressed on a case-by-case basis as they arise. Because the participating countries have different approaches to data collection and coding, the ICDE database cannot be made to be consistent with all the different national data programs. To address consistency issues, the ICDE database has established a general coding guidelines document. The coding guidelines are regularly updated based on input from the ICDE Steering Group, which includes representatives from each participating country. The latest revision was completed in October 2011 and is publicly available in the report, "NEA/CSNI/R(2011)12 ICDE General Coding Guidelines – Updated version." There are also component-specific coding guidelines for each of the components where data are exchanged. The countries are able to comment on the component coding guidelines before the data exchange takes place. The use of coding guidelines establishes a standard to which all participating countries are expected to adhere.

KAERI: Since we didn't have our own data collection or coding guide, there are no consistency issues. However, some countries' data are not recorded according to the collection and coding requirements.

GRS: The most important issue is the different language. All event and component descriptions have to be translated in English. Furthermore, the qualitative codes used in ICDE are similar but not identical to the codes used in the German CCF database. But, as the ICDE codes are clearly defined in the ICDE coding guidelines, the submitted data can be coded manually according to the ICDE definitions. Parts of the German CCF database have been adjusted according to the ICDE codes (see question 4).

JNES: There is no consistency issue.

ONR: As the data collected in the UK was carried out explicitly for ICDE, there are no consistency issues. This is not a factor in our participation. Furthermore, the ICDE coding guides and operating procedures try to minimize the consistency issues.

SSM: -Yes. There is difference in the SE LER form and in the ICDE database structure. ICDE format is more complex regarding search for dependent failures of course. ICDE data have to be prepared by specialist prior to the use of the data.

Magnox: yes, there are difficulties in matching our data to ICDE requirements.

CNSC: No. Canada follows the coding guidelines provided by the lead country.

ENSI: There is no national program for collecting/coding CCF events in order to have a quantification database.

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

Data from the ICDE project has not been directly used to support CCF parameter estimates in PSA models, but it has been used to develop general CCF insights. The ICDE data were used to compare CCF parameters for certain components where the amount of national data available is limited. The three components that have been compared are: batteries, heat exchangers, and component cooling water motor-driven pumps. CCF parameters were estimated using ICDE data (excluding national data) and with national data. The parameters agreed well for all three components, and the comparison helped to reduce uncertainty associated with the limited data available for these components. The ICDE data has also been used to review CCF phenomena that have occurred in other countries and for general insights on CCF analysis, as well as contribute to a better understanding and awareness of the CCFs among non-PSA specialists. These activities are not a formal part of any data analysis program, but they are performed on an as-needed basis.

Uses given include improvements in German CCF quantification methods. The GRS coupling model has been developed with insights from the ICDE project. Other respondents stated that the CCF Database was used in regulatory matters (e.g., the existancy of dependent and CCF's failures in own as well as other countries.) Additionally, a comparison of licensee PSA CCF probabilities with those derived using ICDE data to gain confidence in the licensee's claims, and insights from the national data for each component where data was collected and insights from the wider data, not seen in the national data.

One respondent stated that only a case study was performed so far, and one stated that they are in the process of initiating a contract with a university or the CCF parameters quantification.

Most countries stated that there were no publicly available reports; however, the references below are public.

/KRE 10/ Kreuser, A., C. Verstegen: Common-Cause Failure Analysis – Recent Developments in Germany, in: Conference Proceedings of PSAM10 Conference, Seattle, 7-10 June

/KRE 08/ Kreuser, A., C. Verstegen: Auswertung von Ereignissen mit gemeinsam verursachten Ausfällen (GVA) aus dem internationalen GVA Datenaustauschprojekt ICDE (in German), GRS FACHFORUM, Köln, 07./08. April 2008

Further development of the coupling model, Kerntechnik 71 (2006)

/KRE 06/ Kreuser, A., J. Peschke, J.,-C. Stiller: Coupling Model: A Common-Cause-Failure-Model with Consideration of Interpretation Uncertainties, Nuclear Technology 136, 2001

SSM report 2009:07

SKI report 2007:41

SKI report 2004:04

Several Nordic PSA Group (NPSGA) reports are now under finalization

Guideline ENSI-A05

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    Many respondents stated that there have not been significant challenges to using the ICDE data, and/or that they had no suggestions for improvement. Other comments are stated below.

    Challenges:

    - The most significant challenge to using the project data for quantification is the availability of detailed technical description of the exposed components. Such information is necessary to assess the applicability of data for quantification. For some of the collected sets of components this information is available in verbal descriptions. However, providing such information would need huge resources and is therefore limited by the available resources in the participating organizations. Furthermore, as it is not possible to provide such technical detail in coded form, using such information from many 1000 sets of components would also need huge resources for evaluation.
    - Most significant challenges to use of the data have been resolved; for example: completeness of data, consistency, quality, accessibility have been focus of much attention in recent years with notable improvements. Notwithstanding this, the data for a given component remains fairly heterogeneous, which is expected for a data collection over many countries and licensees. This potentially limits the usefulness of the data for supporting CCF quantification. Key improvements would be gained from a wider range of components and greater number of participants in the project.
    - One problem is to incorporate the ICDE results (new CCF parameters) fully in the domestic PSA's. One cause is that it takes so long time to reach final results from the OECD ICDE component studies and after that on national level create new/updated CCF parameters. The challenge is to communicate the interesting findings within a reasonable timeframe to the licensees.
    - One challenge is to find other countries to participate with in benchmarks of the ICDE data and to interpret other countries CCF data to their own conditions. The fact is that small countries have to develop larger population groups to be able to find data to count on and to decrease the uncertainties.
    - Applicability of data to gas cooled reactors
    - In the present status, the ICDE public reports are not really useful for PSA and an improved content and presentation could be helpful. For example, a summary report giving an overview (in a condensed format) of the ICDE database may be useful.
    - Moreover, a general problem with the CCF quantification is related to CCF model parameters estimation. The estimation of several CCF model parameters used in PSA (α or β factors) needs not only CCF events information but also independent failures and observed population information. In fact, the ICDE database is a complex structure which contains several types of information: CCF events, independent failure events and observed populations. The collection of this information is a difficult problem, both for providing data and for interpreting foreign data. Some more detailed guidance may be helpful.

    Improvements:

    - An area where the project could improve is to increase the qualitative analysis and insights that can be gathered from the data. The ICDE project has had some recent activities that may help meet those objectives. Examples of recent activities include initiating a task to identify interesting events in the database, and holding a workshop to discuss events related to external environmental impacts.
    - We would like to recommend that ICDE project estimate ICDE generic CCF parameters such as NUREG CCF data. The generic CCF parameters could be used as a reference to most countries

which don’t have database, and the countries which are not participated in the project will be interested in ICDE database.

- In recent years, major efforts were made to improve the quality of the data in the databank (e.g., function in the “ICDE tool” to verify that all data fields have been filled in.) In order to be ready for PSA quantification, the quality of the data in the databank should be further improved.
- Based on the quantification of the available data, the ICDE project could develop its own CCF parameters that could be compared to other generic data.
- The possibility of inter-system CCFs could be investigated.

Questionnaire for the FIRE data project

Do you participate in the FIRE project?

- No and never have participated in the project *(please answer questions 11 - 13)*
- Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ________________________________

    Reasons listed include that the benefits of participation do not justify the cost, proprietary/confidentiality concerns with data, a new OECD/NEA member, and the following other reason.

    ONR understand that the information gathered as part of the OECD FIRE data project is based upon larger fire events which does not necessarily provide UK licensees with sufficiently detailed information with regard to fires including smaller fires and precursors to fire. In addition, the level of reporting of incidents by some UK licensees considers events such as smoke generation, consequences of fire, fire services intervention, fire near miss events, outage related fires, etc which ONR do not believe are captured within the data. ONR would not wish the level of licensee reporting to reduce based upon the designation of reportable fires to be increased.

    In addition, ONR are hesitant to join the OECD FIRE data project as there are limited numbers of fires in nuclear plant worldwide to base nuclear safety related claims upon especially when it comes to larger fires that could threaten more than one train of protection.

    Finally, there is the need to consider the level of reporting to ensure that they are applied consistently and given that fire event reporting within some of the UK licensees involves the reporting of precursors and near misses, the results from the UK could appear skewed and misrepresent the very low instances of “real” fire events as reported within the OECD FIRE data project.

    EDF UK does not currently supply information to this database as figures collected across Europe are not consistent. EDF Energy does compare and share data with peers in EDF France, but EDF Energy has taken the current decision that if our data was fed into the OECD project there is a strong chance that it will be misread as we report to a lower level than a lot of our European peers. Currently very few Europeans are inputting to this database and there is little useful information to be gained.

12. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the FIRE data project?

       UJD/RELKO: We are not familiar with the project, more detailed information is needed about the project.

       CEA: I have to see if my organization is interested in participating of the FIRE data project

       ONR: ONR would need to be able to have further resource available to be able to contribute to the further development of the classification of both fire events and precursors. However, given the limited resource available within ONR this is unlikely. Numerous discussions have taken place with the OECD FIRE data project. However, there are a number of aspects of the data gathering that ONR would seek to change in order for the information to be applicable to the reporting criteria in place for existing UK licensees.

       EDF UK: Ensure level of reporting that is of use to EDF Energy and usefulness of information contained.

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

       UJD/RELKO: The advantages are in transfer of know how in this area. The disadvantages are regarding the applicability of the results for the WWER plants. Slovak data can be provided for the project.

       CEA: My organization, not involved in nuclear power plant exploitation but in nuclear installations, may share information in this area but I don't know if that would be of interest for you. I am running a PSA on a Sodium Cooled Fast Reactor and fire is of particular interest for the reasons you know but I don't think that this type of reactor is considered in your data bank.

       ONR: Advantages:

       - greater sharing of knowledge relating to fire events worldwide; and
       - greater international co-operation between member countries.

       Disadvantages:

       - potential under or over reporting of fire events resulting in results from a particular country being skewed and either showing large numbers of fires or very few;
       - the potential for fire frequency data to be used to support nuclear safety claims in the area of fire which may not be supportable from the data already gathered by existing UK licensees;
       - the lack of resource within ONR to adequately contribute and have oversight of the FIRE data project; and
       - the potential impact on the existing level of reporting should the level of reporting be reduced.

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

UJD/RELKO: Sufficient information is not available, as it was already mentioned in point a., detailed description is needed mainly about the used methodology, data collection and analyses, implementation of the results, what was done in the past and what will be done in the future.

CEA: yes

ONR: Responses are based on discussions that were had some 2-3 years ago and provided feedback similar to the above previously. If the OECD FIRE data project believe that the situation has changed such that UK involvement in this project would offer value to ONR and UK licensees ONR would welcome further discussion. Likewise, the UK would be happy to contribute to such a project providing the approach to reporting levels would not lead to a reduction in the level of reporting already undertaken by UK licensees in general.

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

Some respondents stated that there was sufficient information available, while others stated that there was very limited information available about the project for non-participant PSA developers. The publicly available reports are not enough to make decision about the participation, although they do provide useful qualitative insights. One respondent stated that the work for widely used site data suppressed by generic data from a German study.

EDF UK stated that a pilot “modern standards” fire PSA has been undertaken for one of EDF Energy Gas Cooled Reactors without using FIRE project data. Fire PSA frequency data informed from keyword searches of the INPO Plant Event Database and WANO OE Events Database together with other information such as the NRC Fire Events OPEX reviews e.g.:

• Fire Events – Update of US Operating Experience 1986-1999, Dec 2001, US NRC RES/OERAB/S01-01 Vol 1

• Special Study: Fire Events – Feedback of US Operating Experience, June 1997 by US NRC, AEOD/S97-03

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

Reasons for participating: The project provides a cost effective method for collecting operational experience related to fire events at nuclear power plants, which allows member organizations to share their experiences and apply this experience to develop an approach and mechanisms for their prevention. It also helps to quantify fire occurrence frequencies for a Fire PSA, and aids in the understanding of the phenomena, consequences, preventative measures, and consequence mitigation used.

Benefits Received:

- The project provides an additional source of fire event information for comparison with the national database maintained by the Electric Power Research Institute (EPRI), and aids in the identification of any fire safety issues that may be applicable, as well as insights on event combinations of fires and other hazards as well as insights on approach to fire risk analysis.

- This project also acts as a reference for fire events when the fire protection program licensees develop are reviewed, and aids in creating fire PRAs. One respondent also stated that the fire statistical analysis and fire scenario studies were useful for deterministic safety assessment.
- The project also provides a venue to share unique fire scenarios that have occurred in other member countries and have been documented in the OECD fire events database. Countries present lessons learned at semi-annual meetings. Recent presentation topics include:
  - Swedish Containment Air Test Fire, May 10 2011
  - Onagawa seismically induced high energy arcing fault (HEAF) fire, March 11, 2011
  - Identification of high energy arcing fault (HEAF) research testing need.
- Participation also permits staff to interact with international experts in fire and ensure our continued expertise.

15. In relation to the national data provided to the project:

a. What national data have you already provided to this project?

NRC: The U.S. national coordinator(s) have provided U.S. fire events that are documented in licensee event reports (LERs).

KAERI: Korea has provided six fire event data for operating nuclear power plants.

CSN: Spain has provided data of each NPP. All the fire events that have been informed to CSN since the starting of each NPP

KINS: There is no specific national data but some data of fire events occurred in operating nuclear power plants had been provided already.

GRS: Germany has provided data on all fire events, which obligatory have to be reported from German NPP corresponding to the German reporting criteria valid at the time of the event occurrence and a few non-reportable, but however publicly and/or well-known and sufficiently documented NPP fire events.

UJV Rez: We provided information about some fire events occurred in Czech NPPs.

JNES: The fire events reported to government based on the requirements of the following laws:

- Law for Regulations of Nuclear Source Material, Nuclear Fuel Material and Reactors and its ordinance
- The Electric Utility Law and its ordinance

SSM: -All SE fire data

IRSN: The national data provided to the OECD Fire project concerns more particularly the equipment that have been to the origin of fires, the number of equipment and the number of rooms of the French NPPs as well as the main information related to the fire scenarios development (detection and suppression of the fire, equipment damaged by the fire…).

CNSC: CNSC staff have contributed to the database by providing information on reported fires at CANDU plants dating back to the 1990's.

ENSI: Data regarding fire events at Swiss NPPs were provided to the database.

b. What is the source of the data that you have submitted?

NRC: U.S. LERs submitted to the NRC per U.S Code of Federal Regulations 10 CFR 50.73(x) are the source of the information provided to the OECD fire events database project. This regulation requires licensees to report any event that posed an actual threat to the safety of the nuclear power plant or significantly hampered site personnel in the performance of duties necessary for the safe operation of the nuclear power plant including fires, toxic gas release, or radioactive releases.

KAERI: Most data came from the reports of fire event prepared by the regulatory agency (KINS) and the utility (KHNP).

CSN: The source of data is the events which had been informed to the CSN

KINS: 4 fire events had been submitted.

GRS: The source of the German fire events is mainly the German national database on reportable events including the underlying information on these events by the German licensees, information notices written by GRS and, to some extent (see a.) event reports on the non-.reportable events.

UJV Rez: The source of the data is plant specific database of information about plant specific safety related events (not only fires) and additional discussions with utility experts oriented to fire safety.

JNES: The event reports provided to government by licensees based on laws and their ordinances (see the above item).

SSM: -All known SE LER report, rescue services reports, licensee´s fire report

IRSN: We had submitted information transmitted by the licensee.

CNSC: The data was obtained from CERTS (Central Event Reporting and Tracking System) and S-99 Standard (Reporting Requirements for Operating Nuclear Power Plants) reports.

ENSI: Main source of information are the licensees' reports on fire events.

c. Have you used this data to support PSAs in your country?

Some respondents stated that this data was not used to support PSAs; others stated that it hasn't been used yet, but they were planning on using it, and some stated that they had used it to support PSAs. Some respondents stated that there was an insufficient number of data to use for the PSAs (although the information was sometimes used in deterministic assessments and analysis). Uses stated were: a source of data for initiating frequencies, partly (but not completely) used for more recent Fire PSA in the frame of periodic safety reviews, and as part of a fire PSA methodology enhancement (summarized in NEA/CSNI/R(2009)6 report. It has also been used for verification of the licensees' fire PSAs.

NRC has used it as a comparison to the U.S. fire events database developed and maintained by EPRI. This information is then used to identify trends and any possible changes to the fire ignition frequency.

One respondent stated that their PSA (regarding fire initiating events) is significantly based on generic data. However, they have taken into consideration selected plant specific fire events. In general, they used a Bayesian approach to combine generic and plant specific fire events data (similarly to other categories of plant specific initiating events). Still, such kind of analysis was done in several cases only (for those fire risk scenarios, we were able to get some plant specific information). We do not have sufficiently broad database (number of occurrences) of fire events that we could base our fire risk analysis to plant specific data to a bigger extent.

d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

NRC: Yes. Utilities experience many fire events that do not meet the threshold for being reported as a LER under 10 CFR 50.73(x). As such, the NRC has no process or mechanism for providing those events to the OECD fire events database.

Most respondents stated that they had not withheld data due to proprietary/confidentiality concerns. The NRC and GRS stated that because they have no process or mechanism for providing results that do not meet the threshold for being reported, there may be events that the licensees did not report. One respondent stated that one event is not in the database because the event is in litigation for a death, and will go into the database upon completion of the trial. CNSC stated that there is an AECL (Atomic Energy Canada Ltd.) database, COG (Candu Owners Group) database and EPRI databases which are not accessible to CNSC staff for use in the project.

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

NRC: NRC Office of Nuclear Regulatory Research (NRC/RES) staff resources have been used to collect, code, and submit LER events into the OECD fire events database.

KAERI: Since the fire events are rarely occurred, resources to support the project were not of main concerns.

CSN: I cannot give a clear estimation about resources.

KINS: Fund of long term research project supported by Korean government is used in this project. 4 staff members are involved in this project.

GRS: For support of the project, fire specialists and experts (senior and junior experts) have been involved in data collection and coding, finally the data have been checked and quality assured by the national coordinator (senior expert) together with the operating agent.

UJV Rez: Medium level of resources have been applied.

JNES: The three staffs of JNES have been committing to collecting, coding and submitting of fire events in NPPs of Japan.

SSM: - In SE the licensees have established a working group with responsibility to collect relevant FIRE event records from the past, to do the expected data work according to the FIRE component specific coding guidelines. Data is collected from licensees and SSM. The licensees do nowadays use the FIRE Coding guideline form in reporting of fires to SSM and the OECD FIRE project.

IRSN: Two persons working partial time are involved in the OECD Fire project. Their involvement varies in function of the number of fire events to submit (usually 5 to 8 event per year, the submission of one event needing about half of a day for a person), the participation to the writing of the project report related to the applications of the database and the participation to the meetings.

In addition, a lot of works performed in the frame of the fire PSA are used for the project OECD Fire project like for example the walkdown carried out to localize the equipment inside the NPs, the fire frequency estimation and the fire scenarios studies. Several databases developed for the fire PSA are used to provide information to the OECD Fire project like for example:

- Database called « Equipements 900MWe », gives the rooms and equipment in NPP,
- Database called « DuréeFeu », calculates the « calorific charges »and the duration of fire in a room by state of NPP,
- Database called « FeuxREP », gives all fire events in French NPPs,
- Database called « Câbles_état_puissance », gives the cable tray in a building of NPP and information about cables (functional analysis),
- Database called « Source-cible BR », estimates the malfunction of component if an equipment is in fire in reactor building,
- XCAD permit to localize equipment and cable trays in a room.

CNSC: The workload has been spread across 3 staff members. The total effort per year is estimated at 80 hours.

ENSI: Switzerland is participating actively in the project, providing data and taking part in the discussions and analyses.

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

Data readily accessible:

- Most respondents felt that the data was readily available and complete. Other comments on accessibility are below.
- One respondent stated that the data was not readily accessible, but that it may not be difficult to transform the data format. They stated that they would consider the recommendation after the fire data sufficient to PSA work are collected.
- Member countries of the project have been extensively discussing structures, formats and coding guide of the project database in every steering meeting, so there are no problems about accessibility and availability.
- Some improvements are possible, notably concerning the search by key words (research of fire by kind of reactors PWR, BWR, CANDU…, research of events in a time period…)
- The raw event data is available but it is not in a format that would easily facilitate incorporation into PSA reviews. There are also currently a limited number of events, more time is required to collect data.

Formatting and data collection changes:

- Many respondents stated that they had no changes or suggestions. Other suggestions and changes are below.
- The reporting threshold is the only limitation to the usefulness of the project. This was identified as a project limitation at the project onset and cannot be changed at this time do to country specific challenges.
- Depending on the time of the events, for which data were collected – older data are often of less quality and details than more recent event data – and on the country having provided data – information provided on events from NPP in some countries is relatively poor quality with insufficient level of detail – data can principally be used for Fire PSA purposes. The quality of the data provided to the OECD FIRE Database is continuously increasing with the number of events

provided. For countries providing information/data on all fire events (without any reporting thresholds), data can to some extent be used as generic data for PSA.

- The ideal way of quantitative data to be used in PSA is number of events of the given kind versus of total time of data collection. However, sufficiently detailed information about the fire events has to be present to for the decision making whether the event under concern is relevant for specific operating conditions typical for our plant, since fire risk analysis is highly plant specific.
- The project database includes coding items relevant to all phases and activities of event progress. Furthermore, the database contains narrative explanation on each event. These features are helpful for the understanding each events, which is necessary to quantify fire frequency.

18. Are there any consistency issues between how your data is collected/coded for national programs vs. the FIRE data project? Do these issues represent a significant obstacle to the use of the data, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?

Some respondents stated that there were no issues or obstacles, while a few stated that the results need to be prepared by a specialist prior to the use of the data. Additional comments are below.

The information provided to the OECD fire events database has to be manually extracted from the text of LERs. Although it takes time to code the LERs it is not excessively burdensome to the staff. If the information were made available from the EPRI database to be transferred to the OECD fire events database, then a significant effort (several man years) would be required to transfer the massive amount of data. It was also suggested that it is better to have consistency between the FIRE DB and the EPRI fire DB.

There are consistency issues between how data is collected/coded for national programs versus the OECD FIRE data project, since some countries (e.g. Sweden, Finland and Czech Republic) provide event data for all fire events without any reporting criteria and/or thresholds being applied, while others (e.g. Germany and USA) do collect only data from reportable events according to national reporting criteria, which, in addition, might even vary over time. It was suggested that the project try to gather event data from non-reportable fire events.

Additional collection on fire protection features failures (reliability data) would be highly beneficial.

The obstacles are the quantification of event trees with few events fire.

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

<u>NRC</u>: No. NRC has used it as a comparison to the U.S. fire events database developed and maintained by EPRI. This information is then used to identify trends and any possible changes to the fire ignition frequency. The U.S. also plans to perform a trend analysis when the full EPRI/NRC database and frequency effort is complete, which is projected to be during year 2013. There are no publicly available references on the work at this time.

<u>KAERI</u>: no

<u>CSN</u>: no

<u>KINS</u>: No, we do not use the FIRE DB for PSA activities yet.

<u>GRS</u>: Experience feedback has continuously being used to account for additional issues up to now not being covered in PSA (e.g. HEAF fire events or events combinations of fires and other internal and

external hazards). A first approach on the use of the OECD FIRE Database for event sequence analysis has been recently published at PSAM11. The following references can be mentioned:

- /BER 09/ Berg, H. P., B. Forell, N. Fritze, M. Röwekamp: First National Applications of the OECD Fire Database, in: Proceedings of SMiRT 20, 11th International Seminar on Fire Safety in Nuclear Power Plants and Installations, August 17-19, 2009, Helsinki, Finland, 2009
- /BER 10/ Berg, H. P., B. Forell, N. Fritze, M. Röwekamp: Exemplary Applications of the OECD FIRE Database, in: Jahrestagung Kerntechnik 2010, Hrsg. Deutsches Atomforum, INFORUM-Verlag, Bonn, Germany, 2010
- /BER 10a/ Berg, H.P., N. Fritze: Power plant transformer explosion and fire, SSARS 2010 – Summer Safety and Reliability Seminars, Journal of Polish Safety and Reliability Association, Volume 1, June 2010
- /BER 11/ Berg, H.P., N. Fritze: First experiences from international databases on nuclear power plant fire brigade activities, in: Proceedings of SMiRT 21, 12th International Seminar on Fire Safety in Nuclear Power Plants and Installations, München, Germany, September 13-15, 2011, Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH, GRS-A-3651, Köln, Germany, September 2011
- /ROE 11b/ Röwekamp, M., H. P. Berg: Anwendbarkeit der internationalen Brandereignisdatenbank OECD FIRE bei Brand-PSA, Präsentation (CD) beim "Symposium '11, Probabilistische Sicherheitsanalysen in der Kerntechnik, Heidelberg, Germany, 26. – 27. Mai 2011": Mai 2011 (in German only)
- /ROE 12/ Röwekamp, M., S. Katzer, J. Klindt, H.-P. Berg: Insights from Investigations of High Energy Arcing Fault "HEAF" Events in German Nuclear Power Plants, Paper 54158 in: Proceedings of the 20th International Conference on Nuclear Engineering collocated with the ASME 2012 Power Conference ICONE20-POWER2012, July 30 – August 3, 2012, Anaheim, CA, USA, ASME, August 2012
- /TUE 12/ Türschmann, M., W. Werner, M. Röwekamp: Application of OECD FIRE Data for Plant Specific Fire Event Trees, in: Conference Proceedings of PSAM11 Conference, Helsinki, Finland, 2012
- /WER 11/ Werner, W., R. Bertrand, A. Huerta, J. S. Hyslop, N. Melly, M. Röwekamp: Enhancements in the OECD FIRE Database - Fire Frequencies and Severity of Events, in: Proceedings of SMiRT 21, 12th International Seminar on Fire Safety in Nuclear Power Plants and Installations, München, Germany, September 13-15, 2011, Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH, GRS-A-3651, Köln, Germany, September 2011

UJV Rez: The information in project database was used for better understanding of fire events, in general (and it was quite useful for such purpose). The information was not used for any direct statistical data analysis, because it was not clear, how much relevant are the concrete events in the database for operation of Czech NPPs at the time, fire risk analysis was done for "our" NPP Dukovany several years ago. However, we may be up-dating our fire risk analysis during time horizon of several years and we expect to use the information collected within the project more extensively (because both the extent and the quality of the information has been and will be improved significantly).

JNES: We analyzed ignition mechanisms for a part of fire PSA methodology enhancement. This effort is described in the following publicly available report;

"Development of Fire PSA Methodology," JNES/SAE 06-090, Aug 2006 (in Japanese)

SSM: - Yes. Fire frequencies have been developed and used in SE FIRE PSA

IRSN: OCDE Fire Database was notably consulted and was useful notably to present fire induced by electrical cables and to identify fire scenarios due to human action during maintenance.

CNSC: To date it has not been used for this purpose.

ENSI: No

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Most respondents indicated that there have been no significant challenges to using the data project data, and had no recommendations for improvement, although several stated that this was because the number of fire event data is too small to use in a fire PSA. Other comments are below.

Several OECD FIRE database applications feedback indicated that some coded fields were sometimes incomplete or could be misleading, and that additional codes and/or coded field were needed. As far as practicable and feasible in view of the goals of the project the improvements recognized to be necessary have already been implemented. However, it cannot be excluded that further improvements might become necessary in the future depending on the practical applications of the Database. This inconsistency between various countries' inputs has led some respondents to preferentially use national databases, and only use the FIRE project data when the national databases are not sufficient (e.g. for fire detection and suppression quantification).

One further recommendation is to apply this database not only to commercially operated nuclear power plants but also to research reactors. The data could be useful for application in the frame of periodic safety reviews being performed for these reactors.

One potential issue is that the organization of the database (improved during recent years) is still strongly connected with the character of fire events, with the points we can get and we can miss to describe the event the best, from point of view of safety, in general. Maybe we should start more discussions that will be devoted, from the very beginning and exclusively, to the determined use of the information we are collecting, i.e., modeling, quantification and integration of fire risk in PSA.

The benchmark of interpretation of specified events in the database may be useful for harmonization of fire PSA in member countries. Such a benchmark may help the improvement of coding for the project database.

It takes a long time get results from certain FIRE analysis or topics on the agenda.

One challenge is to communicate interesting findings in a reasonable timeframe to the licensees.

It would be interesting to have information about the sort of detection system and about the organization of the firefighting team in each country or NPP.

Questionnaire for the COMPSIS data project

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

- No and never participated in the COMPSIS project *(please answer questions 21 - 23)*
- Did not participate in the final phase of the project, but participated in an earlier project phase (*please answer questions 21 - 23 to describe your reasons for leaving the project, and questions 24 - 30 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 24 - 30)*

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

21. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other

    Reasons stated include the following:
    - No computer based systems important to safety are installed in NPP in the country.
    - New OECD/NEA member
    - Proprietary/confidentiality concerns with data
    - The way the project is oriented is not consistent with needs
    - Benefits of participation do not justify the cost
    - Awareness of project was limited amongst computer system specialists. It is uncertain that the data would be sufficiently extensive, generic and applicable to provide meaningful input to regulatory decisions.
    - Data is unlikely to be already collected by licensees making it resource intensive to collect information to feed into the project.
    - Unlikely that the output from the data project would be able to support PSA
    - Lack of awareness of this project.

    IRSN participated during the preliminary phases, in order to assess the feasibility of a possible active further participation to the COMPSIS project. As EDF (data owner) interest in the project was very limited, the IRSN participation was also canceled.

22. With regard to you reasons for not participating in the project: What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

CEA: Same answers as for ICDE database

a. What could have been done to encourage the participation of your organization in the COMPSIS data project?

UJD/RELKO: We are not familiar with the project; more detailed information is needed about the project.

UJV Rez: The project should be oriented more to collecting such information, we need for PSA, or, at least, we can derive the information for PSA from. Instead of just detailed description about failure events, the information should be well structured (failure modes taxonomy necessary) and all PSA related items should be collected (numbers of demands, for example). Also, the current trends orienting the effort in I&C area to digital components should be followed in the project.

ONR: Specific communication about the background to the project, the benefits of membership and data available would be required as well as a clear case that the benefits of membership outweighed the disadvantages. ONR would need to have sufficient resource and also be able to convince licensees of the benefit to them.

b. What advantages and disadvantages did you see to project participation? Had you joined the data project, what information could you have contributed?

UJD/RELKO: The advantages are in transfer of know how in this area. The disadvantages are regarding the applicability of the results for the WWER plants. Slovak data can be provided for the project

UJV Rez: We could contribute with pretty detailed information about NPP I&C components failures, but the issue of proprietary/confidentiality of relevant information would have to be solved.

ONR: Due to lack of detailed knowledge of the project it is difficult to provide a list of advantages and disadvantages. However, the key disadvantage relates to the perceived resource requirements to be actively involved.

c. Do you believe that there was sufficient information available to support making an informed decision about your participation in the COMPSIS project? If not, what information would you have liked to know about the project?

UJD/RELKO: Sufficient information is not available, as it was already mentioned in point a., detailed description is needed mainly about the used methodology, data collection and analyses, implementation of the results, what was done in the past and what will be done in the future.

UJV Rez: We think that the current information, we have about the project, is sufficient (we also have additional information taken from the discussions within CSNI NEA DIGREL working group).

ONR: Insufficient information is available about making an informed decision. ONR would need to understand the resource implications of participation (particularly those related to collecting the required data in the UK) and the key benefits to both the licensee and ONR. Furthermore, such a project would need promoting more widely within the licensees and the regulator.

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

Respondents stated that they felt there was very limited information is available about the project for non-participant PSA developers, especially in comparison with the other projects considered in this questionnaire. The publicly available reports are not enough to make decision about the participation.

Respondents also stated that they are not aware of any publicly available information of sufficient quantity and quality to affect PSA judgments on appropriate failure values to assign computer-based systems. Given the variety and number of variables in these systems (e.g. differences in development methods), it is unclear as to whether this is possible.

EDF UK stated that they have used reliability studies undertaken by the OEM for SZB systems supplemented by other techniques as described in the Station Safety Report.

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

Reasons for participating:

- The COMPSIS project was intended to improve the safety of nuclear facilities by utilizing operating experience and providing common resources for the analytical framework of qualitative and quantitative assessments. This will help to reduce the uncertainties involved in determining the reliability of digital safety I&C and therefore the uncertainties in the licensing process.
- To share the experiences of different equipment families and applications
- It is difficult to analyze or find the failure mechanisms and root causes because of the complexity of those systems. We have experienced several events caused by digital systems. So we have joined the COMPSIS project to share our experiences and get the information from other countries. We think we could have made better regulatory decision with the information of COMPSIS project data during the evaluation process regarding the computer based systems.
- Systematic feedback from operating experience with failure events of software based digital instrumentation and control equipment in nuclear power plants; enlarge the information base for early identification of non or little known failure phenomena including their causes and effects to support own comprehensive assessment of phenomena which may occur at safety important digital I&C equipment.
- It was a forum for exchange of information. Mostly it gave qualitative information rather than quantitative.

Benefits received:

- Getting familiar with different classification systems, better understanding of fault classification and root cause analysis.
- Some feedback and some lessons learned from international operating experience with events related to digital I&C at NPP.

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

NRC: No information was available on the national data provided to the project.

STUK: See the Finnish contribution of COMPSIS, about 4 events
ISTec: Data have been provided by GRS.
KINS: We have provided the data of 4 events
GRS: Complete set of events for the time period 1990 to 2010.
SSM: An event in Ringhals
INER: Taiwan has provided 8 digital I&C system failure event data.
ENSI: The corresponding description of one event was provided.

b. What is the source of the data that you have submitted?

STUK: Fault reports and reparation plans drawn up by the licensees

ISTec: National system to collect data about events in German NPPs.

KAERI: Digital-induced trip occurrence data for commercial operating NPP were submitted.

KINS: The data are based on the event reports prepared by KINS

GRS: The source of data submitted to COMPSIS was the German national database on reportable events including the underlying information on these events by the German licensees.

SSM: National LER

INER: Atomic Energy Council (AEC) takes lead to run COMPSIS project in Taiwan. Taiwan Power Company (TPC) provides failure data. Institute of Nuclear Energy Research (INER) uploads the failure data and also analyzed the failure data of COMPSIS project.

ENSI: Licensee event reports and specifiable discussions with the originator of the report.

c. Have you used this data to support PSAs in your country?

Most respondents stated that the data have not been used, or not been used yet. There was one effort to quantify failure rates; however, this only included a limited number of data points (22 events).

d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

Some participating countries had restrictions limiting the data that was shared with the project (although most did not). These issues were not identified or addressed in the early stages of developing the project.

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

The COMPSIS webpage and data processing system took the project Operating Agent a significant amount of time to set up, verify and finalize. The quality of the data processing and validating of event information was very high, and the requirements for having data accepted were very stringent. The effort to complete the entry of one event was a minimum of 4 to 5 hours. This caused limitations for several countries.

The principal resource has been one senior I&C expert at STUK. Utility representatives have been consulted to correct possible errors in data.

Manager of I&C department and one staff were involved to collect, code and submit data.

Specialists and experts on operating experience and I&C have been involved in event selection, assessment and coding. Finally, the data have been checked and quality assured by the national coordinator, the utilities and the operating agent.

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications?

The COMPSIS data project did not develop to the point where it could be easily used for the purposes of supporting a PSA. There was never a way to collect the final number of exposed systems. This was information that participating countries were not willing to release.

The database is readily available including documentation such as the Coding Guideline. However, it can only be used for qualitative assessments. It is unsuitable for quantification purposes, as information on the observed equipment populations has not been part of the data collection. Failure modes have also not been coded in COMPSIS.

28. Were there any consistency issues between how your data was collected/coded for national programs vs. the COMPSIS data project? Do these issues represent a significant obstacle to the use of the data, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?

The COMPSIS project database process provided a very well defined method to mix different events reported from different standards and then segment them accordingly. However, due to other limitations of the project the implementation of this feature was never fully tested and verified.

Only minor problems with consistency were found. At this phase it is suggested that when developing reporting requirements in any member country the COMPSIS Guidelines should be observed to reduce the inconsistencies and to improve the national reporting.

COMPSIS data has been collected in the limited scope of high-level events, e.g., digital-failure-induced trip events, In other words, there are no low-level events such as safety-related digital I&C component failure data. It is the significant limitation to the use of the data for digital I&C PSA.

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

Most respondents stated that they had not used the project database to support PSA activities. Additional comments are below.

The COMPSIS data has not been used to support PSA activities by the NRC, and the COMPSIS project has been discontinued. The NRC is performing its own database collection and review of operational experience. This will provide a way to include outside sources of event types and relate lessons learned at nuclear power plant environments.

COMPSIS data is helpful for understanding failure mechanism of digital I&C component and system.

Data in the project database has been used to support general digital I&C equipment performance insights activities.

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    Recommendations:

    - In order to succeed a project must have a reasonable concept and expectations for its members' conduct and resources. If the events do not exist for a research safety grade type collection for use in a PSA calculation, then the project course should be corrected to find useful objectives within the limitations and available experience.
    - If the collected data is to be used in PSA, it would be useful to require some more statistical information along with the data, such as operation times of similar equipment and demand frequencies for them. This would make possible to perform more statistical analyses of the data.
    - Continue collecting of data.
    - We'd like to recommend that the scope of COMPSIS data include low-level operational failure data, e.g., safety-related DI&C component failure data.
    - The event coding scheme in our view became overly complex. For future digital I&C event collection efforts a significantly simpler coding should be utilized.
    - To develop a technique to obtain digital I&C system failure rate with limited data may be a way to support PSA activities

Questionnaire for the OPDE/CODAP data project

Do you participate in the OPDE and/or CODAP project?

- ☐ No and never have participated in either the OPDE or CODAP projects *(please answer questions 31 - 33)*
- ☐ Do not currently participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ☐ Yes *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - ☐ Resources associated with collecting/coding data are excessive
    - ☐ Benefits of participation do not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ______________________________

    Reasons given include:

    - Benefits of participation do not justify the cost.
    - CEA: Same answers as for ICDE database
    - Need convincing that data would be sufficiently extensive, generic and applicable to provide meaningful input to regulatory decisions.
    - Data is unlikely to be already collected by licensees in the form required making it resource intensive to collect information to feed into the project.
    - Lack of awareness of this project.

32. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the CODAP data project?

       Provide more detailed information about the project

       Need to have sufficient resources and also be able to convince licensees of the benefit to them.

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

       The advantages are in transfer of know how in this area. The disadvantages are regarding the applicability of the results for the WWER plants. Slovak data can be provided for the project

ONR can see potential advantage in joining the OPDE project, but does not retain sufficient data of statistical quality to be able to contribute in its own right.

c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

   One respondent stated that sufficient information is not available, a detailed description is needed mainly about the used methodology, data collection and analyses, implementation of the results, what was done in the past and what will be done in the future.

   ONR: Yes there is sufficient information available.

   Magnox: Please provide further details of the range of projects covered as Magnox main form for the future will move towards decommissioning.

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

    Respondents stated that they felt there was very limited information is available about the project for non-participant PSA developers. The publicly available reports are not enough to make decision about the participation. This publicly available information provides some information that may be able to support PSA activities, although this appears to be at a relatively high level. It would be helpful if failure rates were also published. ONR has not used this information to support PSA activities to date.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

    <u>NRC</u>: Operational experience related to degradation and ageing issues is reported to NRC through the Licensee Event Report (LER) system. Prior to participating in this project, the NRC did not have a systematic process for categorizing and organizing this operating experience. Participation in this project provides access to a centralized operational experience database with standardized coding guidelines. The database structure allows the user to easily search for specific degradation and ageing events. The OPDE/SCAP/CODAP databases have been used to inform NRC regulatory decision making. The NRC licensing offices will occasionally ask for information of a certain type of event (e.g., bolting failures). One example involved the possibility of stress corrosion cracking in stainless steel fuel canisters used for dry storage of spent fuel. Operating experience from the SCAP database was used to demonstrate that stainless steel tanks and pipes exposed to a marine environment have exhibited stress corrosion cracking at domestic nuclear power plants.

    <u>KAERI</u>: We wanted to obtain more piping failure data, since piping failure in safety significant area of NPP is a rare event. With the data, we were to calculate piping failure frequency for RCS piping rupture frequency and flooding frequency. By participating in the OPDE data project, we obtained

enough data to calculate piping failure frequency, and as a result KAERI and KINS developed a Korean specific piping failure database and developed an ISI method with the piping failure frequency.

CSN: The reasons are those specified in the goals of the project. The benefits of the participation : having a database of piping failure at international level with a quite large number of events; getting reports prepared by the participants or by the clearinghouse, on issues related to piping failure; exchange operating experience with the other participants in the project, knowing applications of the database performed by other participants,

KINS: KINS participates in OPDE/CODAP data project in order to gain feedback from failure events and the related corrective actions, to understand aging mechanisms and determine effective aging management program, and to utilize failure data as a validation source for a probabilistic safety assessment code.

GRS: Reasons for participating and associated benefits have included:
- Sharing German operating experience with passive mechanical components,
- Structured access to corresponding foreign operating experience,
- Platform for discussion on relevant issues with experts from other countries,
- Extending knowledge base.

UJV Rez: The methodology and process of derivation of PSA initiating events frequencies connected with loss of piping integrity, including ruptures, is mostly based on rare data. Thus we hope, we will get extensive generic information, which we will be able to transfer into the inputs for the process of frequencies derivation. In addition we expect, we would be able, with the CODAP information, to address not only the "traditional" regions of PSA model (frequencies of primary circuit LOCAs), but also most of other initiating events related to loss of integrity (secondary circuit breaks, loss of support systems due to piping failure - event for the piping delivering low pressure medium).By using of CODAP information, we also hope to address the specifics of low power and shutdown operation in estimation of frequencies of initiating events connected with loss of piping integrity.

JNES: Participates in this database project with aiming at the following objectives and application:
- To obtain a wide variety of data on events of pipe items and static components in nuclear power plants from international society.
- To obtain information on root cause of events, experience feedback of events, preventive countermeasures, reliability attributes, structural integrity evaluation, and regulation of maintenance/ aging management.
- To utilize such information obtained to prevent the occurrence of events, to study of improving safety of nuclear power plants, and to develop technical information bases aiming at sharing the information.

IRSN: Our main interest is to be granted an access to a large international database concerning the operating experience of pipeline failures in order to analyse it with our probabilistic tools.

CNSC: The OPDE, SCAP-SCC and CODAP event and knowledge management databases contain significant subset of the technical information necessary to technical specialists of regulatory agencies to develop and defend the regulatory position and perform technical assessment up to the professional standards. Active participation in the OPDE/SCAP-SCC/CODAP projects and a proper use of information available to the user is of great help to the CNSC technical specialists as a means of maintaining professional integrity and independence. Accordingly, the same will reflect on the agency as a whole. In addition, having an access to an independent source of technical information put us on a par, if not giving some an advantage, with our counterparts in industry. Basically we do not have to depend on the same source of information, typically controlled by industry.

ENSI: The reason for participating in the CODAP data project is to gain a better understanding of the underlying causes of the piping failure mechanism and to support a databank which could be used to derive piping failure frequencies.

35. In relation to the national data provided to the project:

a. What national data have you already provided to this project?

NRC: The NRC has reviewed data submitted through the LER system. The LERs that are deemed applicable to the database project are documented in spreadsheet format and submitted to the project. The submitted data includes historical LERs from year 1970 to the present.

KAERI: We have provided data about 50 piping failures occurred in Korean NPPs.

CSN: Spain has provided the data related to 20 piping failure events. Some other events were already in the original database.

KINS: KINS has provided information on pipe failure data in domestic nuclear power plants.

GRS: Data on events affecting safety related piping in German NPPs and data on events affecting other safety related mechanical components in German NPPs

UJV Rez: A set of events with loss of piping integrity potential was provided in the format agreed for CODAP database development.

JNES: So far, we have provided event data to the OPDE database and SCAP-SCC database. Regarding SCAP project, the data included administrative documents issued by the nuclear regulatory authority and reports and technical documents summarized by the authority based on the reviewing the related reports submitted by utilities.

IRSN: None, since the French utility EDF who owns the information has not yet provided us with any data. Without this delivery, IRSN does not have access to the updated database.

CNSC: Data on piping degradation and failure events

ENSI: Data from the Swiss NPPs have been delivered.

b. What is the source of the data that you have submitted?

NRC: The NRC reviews LERs to identify operational experience that is applicable to the database project.

STUK: Data is received from the licensees.

KAERI: Replacement program report, corrective action report, root cause report, LER etc.
CSN: The data were taken from the records of those events provided by the NPPs.
KINS: The source of the data includes regulatory periodic inspection report, utility's inspection and maintenance report and repair/replacement program.
GRS: Reportable events, supplemented by information from root cause analyses and additional information from German operators in individual cases
UJV Rez: Plant specific records including information from additional consultations with plant experts.
JNES: The sources of the provided data are as follows:

- Nuclear power plant event reports submitted to the regulatory agency by the utilities pursuant to the related laws.

- Regarding SCAP project, the meeting materials at advisory and/or consultant meeting organized by the Nuclear and Industrial Safety Agency.

CNSC: Reportable events, periodic operational performance reports, open access information, conference proceedings, journal publications, technical support organization's analyses and reports, and other relevant technical documentation.

ENSI: Licensees deliver the input data for the databank.

c. Have you used this data to support PSAs in your country?

Some respondents stated that they used this data, while others did not. Additional comments are below:

- No, but there have been studies that have explored the use of this data to develop failure probabilities and initiating event frequencies. NRC is currently developing a method to use data from the OPDE and CODAP databases to estimate conditional failure probabilities for observed pipe degradations. Although not directly related to the OECD/NEA data projects, several past NRC projects have used operational data to estimate failure rates for benchmarking fracture mechanics calculations. For example, operational data was used to estimate LOCA frequencies that were compared to frequencies using other estimation approaches in NUREG-1829, "Estimating Loss-of-Coolant Accident (LOCA) Frequencies Through the Elicitation Process."
- No. The data was used for a flooding PSA with flooding frequency and Level 1 PSA with LOCA frequency, but we did not apply the data in practice.
- Not for PSA per se, however number of studies by CNSC staff and industry were performed using the data from OPDE (fatigue studies, inspection strategies and frequency, Risk Informed In-Service Inspections). We shared information with Canadian industry by providing an access to database.
- Yes, analyzed pipe failure data in domestic nuclear power plants and evaluated pipe rupture frequencies of the very small LOCA, feedwater line break events, and flood events. The resulting pipe rupture frequencies were used as initiating event frequencies for the PSA.
- Yes, all the data were specifically (for the given purpose of PSA IEs frequency derivation) analyzed by the PSA specialists and the relevant events (mostly precursors) were included (as plant specific data) into application of Bayesian approach for frequency estimation.

d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

Most respondents stated that there was no additional national data that could be used, although a few stated that it is possible that licensees could provide additional information on replacement and repair activities. Access to this additional information would require agreement and approval from the nuclear industry. One respondent stated that there is additional data on piping failure events that could be provided to the project, but that the cost to collect data from past events was prohibitive.

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

The resources required to participate in the project are minimal compared to the benefits. Once per year the LERs are reviewed to identify those applicable to the database. The national coordinator must perform some minimal processing of the data by summarizing the LERs in a spreadsheet table. Most of the data coding is performed by the project contractor.

One senior expert has used part of his time as the project coordinator. The level of resources used by the licensees is not known.

12 man months for collecting and submitting data to the project. The national coordinator participated in almost all project meetings (2 days every six months); review of the Coding Guidelines, QA program, User's Manual. Organization of one project meeting, preparation of presentations with events occurred in Spain to be presented at the project meetings, preparation of presentations with the potential applications of the database. Additionally, a three days course on how to use the database was held.

National long term research project fund is used and 1 manager / 1 staff are involved in this project.

Medium level of resources has been applied.

Very few, since the French participation to the project is in a stand-by state;

One person with cooperation of the National Operators (representatives of utilities), albeit with very limited time since the participation has not been seen as regulatory or licensing requirement/obligation on part of the licensees/operators

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

The project data is accessible and is in a useable format. Although it has not been extensively used in PSA applications, the format does not prevent it from being used. The tool has searchable fields that make identifying and categorizing events easy. OPDE project published 'OPDE Database Applications Handbook' to provide descriptions of the data processing steps and examples of application.

In the CSN the database and all documents related to this project are in a network space accessible to the people potentially interested in these data and reports (about 40 people from different technical areas including, Mechanical Engineering, ISI, PSA Nuclear Systems, Operating Experience, Safety Analysis, …). So far, the database was not used for PSA purposes. Only few queries were done for other purposes.

One aspect to be considered in what concerns the use of the database for PSA purposes, is database completeness. It is not guaranteed that all piping failure events in all participating countries are included in the database. There are different approaches in the participating countries in what concerns data submission, because of the different reporting criteria in each country. There is a need to establish the same reporting criteria for all participating countries (for the purposes of data submission) and a strong commitment of all participating countries with the project in the sense that all events be included in the database. So far, this is not the case.

Another aspect related to the use of the database for PSA purposes is that the database does not include the number of areas, piping length, component populations, etc., so probabilities cannot be determined.

In comparison with other sources of information about loss of piping integrity events, there are some very useful information points in this database (parameters of transported medium in time of the event etc.). Some other items could be added to further improve the potential to use the information as most directly as possible in PSA effort (well-structured source of information about the total observation time, some additional information about the operation of the frontline and support systems, the data have been taken from etc.)

38. Are there any consistency issues between how your data is collected/coded for national programs vs. the OPDE/CODAP data project? Do these issues represent a significant obstacle to the use of the data, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?

    Most respondents stated that there were few issues and that national databases are structured similarly. One respondent said that they modelled their own database after the CODAP project requirement, so they were similar, while others stated that the CODAP database was much higher detail than other national databases. The OPDE project developed a cross-reference table based on input of all national coordinators. Despite differences the OPDE data can be used across the industry, countries and reactor technologies.

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

    NRC: The data is not directly used to support PSA models, but NRC has a project to explore the use of data to develop conditional failure probabilities for observed pipe degradations. The initial work on this project was presented at the PSAM 11 and ESREL 2012 Conference.

    STUK: For example, the Loviisa NPP which participated in OPDE has successfully applied the database to PSA and RI-ISI applications. STUK reviews PSAs submitted by the licensees but does not, in general, perform PSA modeling and has not been using the OPDE data for PSA applications.

    KAERI: We have researched to calculate flooding frequency and RCS piping rupture frequency for PSA activities.

    KINS: KINS analyzed pipe failure data in domestic nuclear power plants and evaluate pipe rupture frequencies of the very small LOCA, feedwater line break events, and flood events. The resulting pipe rupture frequencies were used as initiating event frequencies for the PSA of Korean PWR plants.

    GRS: Recently, GRS has investigated the influence of learning effects, i.e. of measures taken after understanding of the root causes of events, on the leak and break frequencies of safety related piping on behalf of the Federal Ministry of Economics and Technology (BMWi). In the frame of these activities data from OPDE were used among others. The work performed is documented in a GRS report /GRE 10a/.

    UJV Rez: Some information from the database was discussed during the process of searching for the best and most complete data sources about loss of piping integrity. There are no publicly available reports about PSA studies of Czech NPPs with a level of detail, where the information taken from CODAP is discussed.

    CNSC: CNSC does not have this information. However the industry used the OPDE database information to prepare at least two state of the art reports on fatigue management. In addition the CNSC staff developed an original methodology to infer the data among power plant population of different aging. CANDU industry is keen on using the CODAP database to validate the newly developed fracture mechanics code Praise-CANDU, if feasible. The OECD NEA websites for

OPDE, SCAP-SCC and CODAP projects contain number of documents in public domain reporting on results achieved across those projects.

ENSI: The data has not been used so far for the PSA. A pilot study demonstrating a procedure how this data can be used to estimate parameters for the PSA would be very useful.

Reports Listed:

/GRE 10/ Grebner, H., et al., Weiterentwicklung von Methoden zur Ermittlung von Leck- und Bruchhäufigkeiten druckführender Komponenten, Technischer Fachbericht, GRS-A-3555, Gesellschaft für Anlagen und Reaktorsicherheit (GRS) mbH, Köln, Juli 2010 (in German only)

Sun Yeong Choi, Young Hwan Choi, and Jae Joo Ha, Evaluation of RCS Piping Rupture Frequency by Using OPDE Database, Transactions of KPVP, Vol 1. No.1, September 2005.

Sun Yeong Choi and Joon-Eon Yang, Flooding PSA by Considering the Operating Experience Data of Korean PWRs, Nuclear Engineering and Technology, Vol.39 No.3 June 2007

J. Wood, *et al*, "Estimating Conditional Failure Probabilities of Observed Piping Degradations," PSAM 11 and ESREL 2012 Conference on Probabilistic Safety Assessment June 25-29, 2012, Helsinki, Finland.

International Journal of Pressure Vessels and Piping, Vol. 90, pp. 56-60, "Application of piping failure database to nuclear safety issues in Korea"

Koriyama, T., Li, Y., Hamaguchi, Y., Yamashita, M., and Hirano, M., "Study on Risk-Informed In-Service Inspection for BWR Piping," Journal of Nuclear Science and Technology, Vol. 46, No. 8, p. 1–28 (2009).

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Challenges:

- The format of the database, ACCESS, is not necessarily well known by the technicians that could be interested in the use of this database. A deep knowledge of the database is needed to get something out of it, and the people interested to not necessarily have this knowledge.
- Completeness of database is a generic issue with any database. Even the well-known INPO OPEX database had the very same issues, even though not to the same extent as those projects which are run more or less on voluntary contribution by participants.

Recommendations:

- The project could benefit from improving awareness of methods and approaches for using the data to estimate failure probabilities and frequencies. Providing references to established methods would be helpful.
- The secondary effects of pipe breaks and leaks could be a possible application. Assessment of the alleviated Code rules and need of supplementary rules (better protection, supporting, routing etc.) for small bore components might be also possible.
- The project, through the Clearinghouse (who really knows the database), should prepare reports on topics suggested or required by National Coordinators.
- Pipe population data (i.e. total number of welds with similar condition etc.) is needed to evaluate a pipe failure frequency. However, this information is difficult to obtain from the utility. It would

be helpful if there are some reference values of pipe population data to some representative plant types and system.

- Data from OPDE / CODAP are mainly used at GRS for generic evaluation of operating experience, in particular for:
  - Identification of weak points (susceptible materials / component areas),
  - Enhancement of knowledge on relevant degradation mechanisms,
  - Enhancement of knowledge on appropriate measure to be taken.
- For this reason, the implementation of an additional knowledge base (as already scheduled in CODAP) will be helpful.
- A general discussion (two day meeting?) should be organized with participation of PSA experts and database/project developers with the subject "how to make the database/project the most useful for PSA".

The key element at this moment is to develop application and calculation tools and applications for use by both regulators and industry for their respective needs. CNSC staff is working with universities to develop research projects to develop such applications for inspection strategies, scope and frequency among others.

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?

    The comment most often stated was that there are no data activities are ongoing for new and advanced reactors, and stated that it still needs to be organized. They felt that a project to address the limited operational experience with new and advanced reactors was desirable, and should be organized as soon as practicable. Other comments are below.

    The data projects are generally directed at supporting the needs of operating reactors. The COMPSIS project was potentially useful for new and advanced reactors because the new and advanced designs will involve computer-based I&C systems, but this project is no longer in operation. It may be useful to see how the current data projects are, or are not, applicable to new and advanced reactors.

    All these data projects are focused on western designed PWR and BWR. The WWER data are not implemented. Better support is possible after implementation of data from all type of reactors in operation and to discuss the issue of applicability of data from one type of reactors to other types.

    The fire event data in FIRE project do not depend on the reactor type so we don't think there is a need to change the FIRE DB to allow for new and advanced reactors.

    One respondent is working on a prototype of Sodium-Cooled Fast Reactors, and no data projects are being used to support these efforts. In order to use these products, they would need specific data about this type of nuclear reactors: failure rate data, sodium fire, ect.

    The UK are currently only involved in ICDE, which will be used as a source of information, along with other sources, to support licensing and permissioning of new nuclear reactors, particularly in the review of the licensees' PSAs. Similarly the publicly available information for the other data products will be utilised where possible and necessary to inform ONR's regulatory decision making.

    At IRSN the new reactors data related activities are limited to the verification of the licensee data and approaches to establish data in the frame of new reactors PSA (EPR and ATMEA).

    It will be useful if the current database projects would treat specifically the new and evolutionary components and systems (like passive components, computerized systems, advanced human interfaces, high redundancies CCFs…)

    Knowledge Management base of the CODAP could be a good start for information useful for regulatory assessments of new build and advance reactors (Gen III+, and to certain level for Gen IV). CODAP is focused on collecting reliability centered data of passive components, which make it relevant to assessment of passive safety systems used in new builds.

    KINS launched the project on data collection of repair welding of piping and components for advanced reactors this year.

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

    If a new data need is identified, then the NRC would be interested in supporting the project.

    If new data needs are identified within OECD/NEA, STUK is interested in supporting them according to the resources available at the time.

    KINS is interested in supporting a new project if a new data is valuable.

Extending the existing projects, e.g. the FIRE Data Project, might be necessary to some extent.

Human reliability data (particularly the data from simulator exercises, but also other categories - maintenance failures, for example) collection could be very useful. UJV would support such project and would have plenty of data to be provided.

In general, VTT is interested in any data collection activities. Recent activities are related to HRA and I&C, but also other areas are of interest. VTT is not a provider of data, but we can support as, e.g., as a developer of a taxonomy, data analysis, reliability parameter estimation method developer, etc.

IRSN is interested in participating in new data projects. Particularly, information on operating experience related to external events is a subject of highest interest for IRSN, especially the impact on the water intake and/or power supply.

CNSC: Question of getting "population" information to complement the event centered database. Development of applications and analytic tools to process data from databases

EDF UK: Consider whether it is worth collecting "time to repair" data for components given different types of observed failures – this is in the context of potentially modeling longer mission times for certain scenarios where repair may want to be considered in the PSA. However, the data collected may not be that valid for use in such scenarios.

43. Other general comments?

The data projects are an important part of OECD/NEA work. They are especially important to member states with a small number of nuclear installations and limited national databases.

In the long term data collection should be developed so that the data can be more easily used in PSA applications.

The possibilities for future co-operation between OECD/NEA and, e.g., the EU Clearinghouse and IAEA should be examined.

It is necessary for the countries have plenty of data to open their data fully to other countries for PSA.

Human factors is generally incriminated in the accidents but human actions are not always negative for nuclear safety. Indeed, humans can analyze the situation and act to prevent an accident or permit a better availability of the installation (in situations of control-command inopportune signals, for example).

How to document all work and applications as well as benefits for the regulator stemming from our participation in this project? Simply we are dealing with few resources, time and support.

CODAP project is well suited and aligned with the CNSC Regulatory Document (RD) 334 on Aging Management for Nuclear Power Plants.

A number of data projects have collected a substantial amount of data. It should be demonstrated within these projects (or by a separate group) how this data can be used in order to estimate parameters for the PSA. This demonstration should outline the calculation procedure (and – if possible – derive generic data.)

EDF UK felt that there was a lack of visibility for most of these projects.

APPENDIX F: OECD DATA PROJECT SURVEY RESPONSES

ICDE

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for Data Project Representatives

Respondent Information

Please identify your organization: Office for Nuclear Regulation (ONR)________

Type of Organization (please check appropriate box):

X Regulatory Agency
☐ Government Technical Support Organization
☐ Commercial Technical Support
☐ Utility/Operator
☐ Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

Assessment, inspection and licensing__________________________

____

Responder Name: Shane Turner (on behalf of the ICDE Steering Group)___

Address: ___ONR, Redgrave Court. Merton Road, Bootle, Merseyside, L20 7HS

____

Country: ________________________________

Data Project Affiliation:__ICDE________________________

Telephone and e-mail: 0151 951 3995, shane.turner@hse.gsi.gov.uk__________

Questionnaire for Data Project Representatives

1. Is the quality and quantity of data being submitted to the project currently adequate to support project objectives? If not, what could WGRISK do to assist the project in addressing your data needs?

   The objectives of ICDE are as follows:

   a) collect and analyse Common-Cause Failure (CCF) events over the long term so as to better understand such events, their causes, and their prevention;

   b) generate qualitative insights into the root causes of CCF events which can then be used to derive approaches or mechanisms for their prevention or for mitigating their consequences;

   c) establish a mechanism for the efficient feedback of experience gained in connection with CCF phenomena, including the development of defences against their occurrence, such as indicators for risk based inspections;

   d) generate quantitative insights and record event attributes to facilitate quantification of CCF frequencies in member countries; and

   e) use the ICDE data to estimate CCF parameters.

   It is considered the data that is submitted into ICDE is of both sufficient quality and quantity to enable each of the project objectives to be addressed.

   In terms of data quantity, ICDE has currently collected a significant amount of data as summarised in the following table (source: OA report Jan-March 2012):

Component	**Number of observed populations**	**Number of CCF events**
Battery	375	75
Breakers	1016	103
Centrifugal pumps	1201	362
Check valves	1222	112
Control rod drive assemblies	416	171
Diesels	302	207
Main steam isolation valves	Collection just started	Collection just started
Fans	Collection just started	Collection just started
Heat exchanger	567	52
Level measurement	578	153
Motor operated valves	1259	155
Safety and relief valves	718	243
TOTAL	***7654***	***1633***

   This data has been collected from 11 member countries over various time periods. It is noted that the CCF events include partial CCFs, including those involving degraded components and incipient failures and not just total CCFs.

In terms of data quality, a significant amount of effort is carried out by members when collecting the data, the Operating Agent, who manages the database and the ICDE steering group. The Operating Agent verifies whether the information provided by the national coordinators complies with the ICDE Coding Guidelines, verifies the correctness of the data jointly with the national coordinator who has provided such data, and operates the databank.

Data quality is considered at the outset for each data collection exercise. Coding guidelines have been developed during the project and are continually revised. They describe the methods and documentation requirements necessary for the development of the ICDE databases and reports. The format for data collection is described in the general coding guidelines and in the specific component coding guidelines including the information that has to be collected (mandatory information).

Specific component coding guidelines are developed for all analysed component types as the ICDE plans evolve including the failure modes, the component boundary and the systems included in the collection.

Further project documentation consists of descriptions, report format, agreements, definitions, reporting criteria, quality assurance program, directory, guides, coding, procedures, etc.

A thorough quality assurance process is followed for data collection that includes various quality assurance stages. This is detailed in the following public report: “ICDEPR-03 International Common-Cause Failure Event Data Collection Project ICDE Generic Tasks: Coding Steps for Common-Cause Failure Events with Examples”.

Key steps that ensure quality include:

- General component guidelines are developed;
- Specific component guidelines are developed;
- Trial data collection is carried out that is reviewed by the Operating Agent – this may influence the coding guidelines and the data collection requirements;
- Events are coded and collected consistent with the component coding guidelines;
- Operating Agent reviews all events entered into the database by member countries;
- Countries iterate with the Operating Agent to resolve comments;
- Workshops carried out with the steering group that also adds an additional chance for quality assurance;
- Report about generic insights is developed; and
- Completeness statements are provided by member countries.

To enable this to occur in a consistent way, ICDE have developed various operating procedures: ICDEPR02 – Operating procedures, ICDEPR03 – generic tasks, ICDEPR04 – Project report outline, and ICDEPR05 – Quality assurance program.

No WGRISK assistance was identified to improve the quality of the data. However, it was noted by the ICDE steering group that WGRISK could assist in promoting ICDE, and also encouraging further members to join that would increase the amount of data collected. Furthermore, WGRISK could have a role in recommending interested areas of focus for ICDE. ICDE could also make much clearer the process to join, which could be shared with WGRISK to assist in the publicity for ICDE.

2. How are national differences in (a) component safety classifications, (b) system boundaries, functional requirements, and (c) failure reporting criteria among project participants resolved to ensure consistent data reporting (i.e., how are consistency issues between how data is collected/coded for national programs and the data project resolved)?

National differences are resolved by having clear and strict coding guidelines (including relevant systems, component boundaries and functional failure modes), numerous operating procedures and a thorough quality assurance process as was outlined in the response to question 1. These are aimed at trying to get data that is as homogeneous as possible. A compilation of national reporting criteria is part of the ICDE documentation: ICDEPR08 – reporting criteria.

In addition, each member country is required to provide a completeness statement for each of the components they have collected data. This ensures that members have a clear understanding of the quality of data from any country. Where countries' data is not complete they may only be given partial access to the data from other countries, thus providing an incentive for more complete data collection.

3. PSA parameter estimation generally requires knowledge of both observed failure events and exposure (e.g., number of components demands, hours of exposure) in order to calculate a failure probability or failure rate. Does your project collect this type of exposure information?

   ICDE does collect exposure information. The ICDE project was designed such that information would be collected to enable all commonly used CCF quantification approaches to be supported. The completeness statements also provide visibility of the individual country information collected on exposure. It is an expectation that information is recorded on all observed populations of components with ICDE data collected on for a given plant in a country no matter whether a CCF event has occurred or not.

4. Do you believe that project data (e.g., events, component failure data, and exposure information) is readily accessible and in a format that can be easily used by participants for the purposes of PSA (including availability of user and coding manuals)? Is all accumulated project data available to participants, or is data access restricted in certain cases (if so, please describe the project's data access policy).

   For those members of the project that have contributed to a given component data collection exercise over a similar time period they have full access to all information collected in all countries for that component. The data is stored within a database that the member countries have access to and a tool has been developed by the Operating Agent to allow detailed analysis of this data. For these members the data is readily available and in a format that can be easily used by participants for the purpose of PSA. In addition, all supporting information, e.g. generic component coding guidelines, specific component coding guidelines are fully available to all members, and also publicly available.

   However, there are strict rules within ICDE relating to access to the proprietary data as summarised below. The ICDE terms and conditions state:

   "The database or those parts of it containing collected data in ICDE format will be accessible to those Signatories, Associated Members or other organisations that have actually contributed data with a comparable coverage (as described in ICDE Operating Procedures) to the data bank through their country's national coordinators."

   Not all accumulated data is therefore available to all members if they have not collected data on a specific component or for a similar time period.

   Notwithstanding this, for each component where data is collected a public report is produced that contains both qualitative and quantitative insights from across all events. Whereas this will not allow CCF parameters to be estimated it is still of value to PSA. For example it highlights specific failure modes, defences and contributory factors that may need to be considered within the PSA.

5. Has the project attempted to quantify failure rates, failure probabilities, or other PSA parameters? If so, please provide examples and/ or references.

   As a group the project has not attempted to produce PSA parameters, e.g. CCF probabilities or CCF parameters for various models. However, the data is collected and recorded in a way to enable such quantification to be carried out by members if they wished. There are a number of problems with producing a set of parameters for them to be used 'blindly' e.g. the heterogeneous nature of some of the data, the different approaches to CCF quantification used internationally, which require individual countries to understand the applicability of individual events before they are used as part of quantification. These are some of the reasons that this has not been pursued by the group as a whole. It is noted that this has been of much discussion within the ICDE meetings.

However, the fifth object of ICDE states "use the ICDE data to estimate CCF parameters". This is achieved through the data being collected in a way that allows quantification and through individual member countries using the data in this way if they wish.

Whereas the project has not produced CCF parameters or direct estimates, individual countries have used the data in this way and have shared their analysis regularly during the ICDE steering group meetings. Quantification has also been the subject of a number of workshops during ICDE meetings.

An example of such work is included in:

- SSM Rapport 2009-07 Guide for CCF analysis

6. What project reports have been made publicly available and are available to both participants and non-project participants? Where can these reports be found (e.g., data project website, NEA publication webpage…)? Note that the attachment includes a draft list of publicly available reports and technical papers associated with the various NEA data projects - Is this list complete? If not, please update the attachment as appropriate.

In addition to those reports on the public part of the ICDE website, the following papers have been produced:

1. PSA 2011 General insight from the ICDE project. Albert Kreuser, Gunnar Johanson. ANS PSA 2011 International Topical Meeting on Probabilistic Safety Assessment and Analysis Wilmington, NC, March 13-17, 2011
2. ICONE 14-89559 Estimation of the Alpha Factor Parameters for the Emergency Diesel Generators of Ulchin Unit 3. Dae Il Kang, Sang Hoon Han
3. PSAM 8 0020 (2006)- Development and Structure of the German Common Cause Failure Data Pool. A. Kreuser, C. Verstegen, B. Schubert, R. Wohlstein
4. PSAM 8 0364 (2006)- Training on dependency defense and CCF awareness. Gunnar Johanson/ES konsult AB, Per Hellström/Relcon AB, Michael Knochenhauer/Relcon AB
5. Kerntechnik 71 (2006) Paper 100434 - Further development of the coupling model. A. Kreuser, J. Peschke and J. C. Stiller
6. Kerntechnik 71 (2006) Paper 100436 - ICDE Project insights and lessons learnt. G. Johanson, A. Kreuser, P. Pyy, D. Rasmuson and W. Werner
7. Kerntechnik 71 (2006) Paper 100438 - Protection against dependent failures, analysis of dependencies and derivation of CCF data. M. Knochenhauer, T. Mankamo, P. Hellström and G. Johansson
8. Blue Book 2002-2005 NEA No. 6150
9. PSAM 7 0400 - General Insights from the International Common Cause Failure Data Exchange (ICDE) Project. Baranowsky P., Rasmuson D., Johanson G., Kreuser A., Pyy P., Werner W.
10. PSAM 7 0401 - ICDE Project: Insights and Results from the Analysis of Common- Cause Failures of Batteries. Morales R., Pereira B., Pyy P., Werner W.
11. PSAM 7 0572 - Insights and Results from the Analysis of Common-Cause Failure Data Collected in the ICDE Project for Safety and Relief Valves. Johanson G., Jonsson E., Jänkälä K., Pesonen J., Werner W.
12. PSAM 7 0490 - Lessons Learnt from Data Collected in the ICDE Project. Tirira J., Werner W.

13. PSA 2002. Estimation of Common Cause Failure Parameters for Diesel Generators, J. TIRIRA , J-M. LANORE
14. ICONE 8. International Common Cause Failure Data Exchange Project - 1999 Status report. Patrick W. Baranowsky, Dale M. Rasmuson, Lennart Carlsson April 2000.

7. Is any project data available to non-participant PSA developers such that they could still benefit from project activities (e.g., information that could support probabilistic parameter estimation or derivation of quantitative equipment performance insights)?

   A significant amount of information is available to non-participants. Whereas the raw data (individual events and observed populations) are not available due to the project data proprietary rules, information is provided in public summary component reports that are produced following the completion of data collection exercises for each component. The component reports do provide some useful information for PSA practitioners, which includes qualitative information about the observed events that is useful for defining the CCF groups in the PSA, failure mechanisms, coupling factors, relevant defences etc. Furthermore, some high level quantitative information is also provided for example, distribution of failure modes, root causes, coupling factors, detection method, corrective actions, timing factor, shared cause factor, observed population, the type of CCF (e.g. complete, partial etc).

8. How comprehensive/complete are the data sets that have been provided to the data project? Are there any major data gaps that WGRISK could assist the project in addressing?

   As described in the responses to questions 1 and 2 it is considered that a significant amount of effort is expended by the Operating Agent, ICDE steering group and members to ensure that the data is as comprehensive and complete as possible. This is through the ICDE operating procedures, the component coding guidelines and general quality assurance procedures. Therefore, in general it is considered that there is a high level of completeness to the datasets within ICDE.

   In addition, all members have to produce a completeness statement for each of their data collections on each component. This gives all members visibility of the completeness of data for an individual component from a specific country. In the small number of areas where there are issues with completeness, these data can be easily excluded from any specific application.

   The ICDE project has spent a significant amount of effort in improving the quality and completeness of data within the database. Specific functionality has also been developed within the database tool to identify potential issues within the database.

9. Have you received feedback on the uses of your data project products for the purposes of supporting PSA? If yes, how was this feedback received? How would you prefer to receive this type of feedback?

   Feedback on the use of ICDE data to support PSA is regularly discussed at the 6 monthly ICDE steering group meetings. Each country representative provides an update on the use of ICDE data within their country at ICDE meetings – this is a standing agenda item. Other groups in other countries also discuss use of ICDE data, for example the Nordic PSA group. Any feedback is predominantly brought back to and discussed at the ICDE steering group meetings.

   Specific workshops on use of ICDE data have also been arranged in connection with ICDE meetings where this issue has been discussed in depth.

It is also considered that feedback from WGRISK on use of ICDE data would be useful, for example by having a specific agenda item at both WGRISK and data project meetings where this could be discussed and key messages shared.

Feedback can also be provided via the ICDE chair, vice chair, NEA secretariat or other ICDE members. Contact details are provided on the public parts of the ICDE websites.

10. Are you planning any new initiatives for the future? In what ways can WGRISK provide assistance and/or support?

New initiatives are discussed regularly during ICDE Steering Group meetings. The following new initiatives have recently started or are being explored:

- Data collection for new components, e.g. fans, main steam isolation valves, computerised systems;
- Update of previous component reports as more data is collected, including examination of any trends since the last report;
- Cross component CCFs;
- Subtle dependencies; and
- Highlighting important events based on criteria that are being developed.

Such initiatives are identified through ICDE members and often explored via workshops during the ICDE meetings.

WGRISK can always provide assistance/support by feedback of areas of particular interest or issues from within the wider PSA community. Any new dependency related issues could then be considered and explored by ICDE.

11. How can WGRISK members and observers who currently do not participant in the project learn more about your activities and the process for becoming a project participant?

Non members with interest in joining ICDE are welcome to attend ICDE meetings as observers. There is also a significant amount of information available on the ICDE websites and in the public reports:

www.eskonsult.se/ICDE/

www.oecd-nea.org/jointproj/icde.html

In terms of learning more, these websites also provide contact information for the ICDE chair, vice chair, Secretariat, members and operating agent. Any of these people are able to provide more information on the activities and process for becoming a project participant.

12. What could WGRISK do to help address other data project challenges?

The main assistance from WGRISK could be on promoting the ICDE project, the publicly available reports, and providing input on dependency issues from the wider PSA community. With more members, the quantity and quality of data will improve such that it is able to be used for more applications.

A more formal link between WGRISK and the database projects may be beneficial for example by starting with standing agenda items at both WGRISK and data project meetings on the WGRISK/database project link. This WGRISK activity is considered a good step towards this.

FIRE

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for Data Project Representatives

Respondent Information

Please identify your organization**: Chair of OECD FIRE Database Project responding for the Project**

Type of Organization (please check appropriate box):

- ☐ Regulatory Agency
- X Government Technical Support Organization
- ☐ Commercial Technical Support
- ☐ Utility/Operator
- ☐ Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

Safety assessment (for licensing and supervision of nuclear installations), R&D

____

Responder Name: Dr. Marina Röwekamp (OECD FIRE Chair)

Address: Schwertnergasse 1

50667 Köln

Country: Germany

Data Project Affiliation: OECD FIRE (National Coordinator of Germany and Chair

Telephone and e-mail: +49-(0)221-2068-898 / marina.roewekamp@grs.de

Questionnaire for Data Project Representatives

1. Is the quality and quantity of data being submitted to the project currently adequate to support project objectives? If not, what could WGRISK do to assist the project in addressing your data needs?

   The objectives of the OECD FIRE project are:

   - To collect fire event experience by international exchange in an appropriate format in a quality assured and consistent database (the "OECD FIRE Database");
   - To collect and analyze fire events over the long-term so as to better understand such events and their causes, and to encourage their prevention;
   - To generate qualitative insights into the root causes of fire events in order to examine:
     - approaches or mechanisms for their prevention and mitigation of their consequences,
     - fire causes,
     - new correlations as a result of fires having occurred,
   - To establish statistics based on the Database contents for e.g. identifying repeating causes, fire mechanisms, etc.;
   - To support member countries to establish more effective national fire event reporting practices;
   - To establish a mechanism for the efficient operational feedback on fire event experience including the development of policies of prevention, such as indicators for risk informed and performance based inspections; and
   - To record characteristics of fire events in order to facilitate fire risk analysis, including quantification of fire frequencies.

   The majority of event data collected within the OECD FIRE Project allow for qualitative insights into the fire events characteristics and the event sequences, their consequences, causes and the fire occurrence mechanisms. The Project clearly supports deterministic analysis of fires.

   The Database is envisioned to be used to

   - Support model development, validation, etc.;
   - Identify all types of events and scenarios for inclusion in PSA models ensure that all mechanisms are accounted for;
   - Support fire PSAs by real data;
   - Compare fire event data from member states with the accumulated international data collected within the OECD FIRE Database.

   The Project is in principle able to support Fire PSA providing quantitative insights to be used for fire risk analysis in general. The OECD FIRE data can meanwhile be principally applied for plant specific fire event trees. Fire occurrence frequencies (compartment specific as well as component specific ones) can be principally estimated for all plant operational states (full power as well as low power and shutdown states) from fire event data at NPP in those countries providing all fire events from NPP to the Database without specific reporting criteria and/or thresholds). Information on numbers of different types of components and/or compartments to be considered for PSA use has to be completed by different member countries.

2. How are national differences in (a) component safety classifications, (b) system boundaries, functional requirements, and (c) failure reporting criteria among project participants resolved to ensure consistent data reporting (i.e., how are consistency issues between how data is collected/coded for national programs and the data project resolved)?

   There are differences between the reporting criteria for providing fire event data in the different member countries. Some countries do report all fire events having occurred in NPP (e.g. Czech Republic, Finland, Sweden). Other countries are only able to provide those events to the Database which have to be obligatory reported to the national authorities according to the national reporting criteria in place (e.g. Germany, Japan, USA). And these criteria and/or reporting thresholds may even vary over time. The users of the OECD FIRE Database are made aware of these differences by an Appendix to the Coding Guideline, where for each country the reporting criteria are provided in detail. There would be no benefit in WGRISK getting involved as this issue is predicated on individual member countries relationships with licensees and country reporting practices.

3. PSA parameter estimation generally requires knowledge of both observed failure events and exposure (e.g., number of components demands, hours of exposure) in order to calculate a failure probability or failure rate. Does your project collect this type of exposure information?

   For PSA parameter estimation based on the OECD FIRE Database in principle event occurrence numbers (number of fires at a specific component or in a specific compartment related to rector type and/or plant operational state and reactor operational duration for each plant state) are required. In principle, this information is available in the Database, information collection on type specific numbers of components and compartments as well as plant operational years for the different plant operational states is ongoing at the time being, and the information is being included as generic information in the Database. In addition, the total number of components per fire ignition source per plant is intended to be collected (with the exception of cables, for which this is difficult). Hours of exposure are not recorded.

4. Do you believe that project data (e.g., events, component failure data, and exposure information) is readily accessible and in a format that can be easily used by participants for the purposes of PSA (including availability of user and coding manuals)? Is all accumulated project data available to participants, or is data access restricted in certain cases (if so, please describe the project's data access policy).

   The information on fire events in the OECD FIRE Database is principally available in a format allowing for quantifying fire specific PSA parameters, such as component and/or compartment specific fire frequencies for different reactor types and/or plant operational states, failures of fire detection and/or extinguishing means. At the time being, the collection of accumulated generic information (e.g. number of components/compartments per reactor type and/or plant operational state, number of plant operating years, etc.) is still ongoing. As soon as all this information is available it will be available to all participants in anonymous generic form.

5. Has the project attempted to quantify failure rates, failure probabilities, or other PSA parameters? If so, please provide examples and/ or references.

   The OECD FIRE Database Project has already started to quantify compartment and component specific fire occurrence frequencies for different reactor types and for full power as well as low power and shutdown states /WER 11/. However, the information of plant specific numbers of compartments and/or components is not yet complete from all member countries´ NPP at the time being.

Completion is foreseen up to the end of the third Project phase (December 2013). Due to the data inconsistencies mentioned in the answer to question 1 such PSA parameters are up to now only meaningful for data from those countries reporting all fire events. In addition, the Database can meanwhile principally be applied for establishing plant specific fire event trees /TUE 12/.

/TUE 12/ Türschmann, M., W. Werner, M. Röwekamp:
Application of OECD FIRE Data for Plant Specific Fire Event Trees, in: Conference Proceedings of PSAM11 Conference, Helsinki, Finland, 2012

/WER 11/ Werner, W., R. Bertrand, A. Huerta, J. S. Hyslop, N. Melly, M. Röwekamp:
Enhancements in the OECD FIRE Database - Fire Frequencies and Severity of Events, in: Proceedings of SMiRT 21, 12th International Seminar on Fire Safety in Nuclear Power Plants and Installations, München, Germany, September 13-15, 2011, Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH, GRS-A-3651, Köln, Germany, September 2011

6. What project reports have been made publicly available and are available to both participants and non-project participants? Where can these reports be found (e.g., data project website, NEA publication webpage…)? Note that the attachment includes a draft list of publicly available reports and technical papers associated with the various NEA data projects - Is this list complete? If not, please update the attachment as appropriate.

In addition to the attachment, the following publications have to be mentioned:

/BER 10/ Berg, H.P., N. Fritze: Power plant transformer explosion and fire, SSARS 2010 – Summer Safety and Reliability Seminars, Journal of Polish Safety and Reliability Association, Volume 1, June 2010

/BER 10a/ Berg, H.P., N. Fritze: Reliability of main transformers, Reliability: Theory and Applications, Vol. 2, No. 1, March 2011

/BER 11/ Berg, H.P., N. Fritze: First experiences from international databases on nuclear power plant fire brigade activities, in: Proceedings of SMiRT 21, 12th International Seminar on Fire Safety in Nuclear Power Plants and Installations, München, Germany, September 13-15, 2011, Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH, GRS-A-3651, Köln, Germany ,September 2011

/ROE 11/ Röwekamp, M., S. Katzer, J. Klindt, H.-P. Berg: Insights from Investigations of High Energy Arcing Fault "HEAF" Events in German Nuclear Power Plants, Paper 54158 in: Proceedings of the 20th International Conference on Nuclear Engineering collocated with the ASME 2012 Power Conference ICONE20-POWER2012, July 30 – August 3, 2012, Anaheim, CA, USA, ASME, August 2012

7. Is any project data available to non-participant PSA developers such that they could still benefit from project activities (e.g., information that could support probabilistic parameter estimation or derivation of quantitative equipment performance insights)?

The Database is accessible only by OECD FIRE Project members. However, some events have also been publicly reported on an international basis. Information on these events is also available by non-participants to the Project. In addition, all information published (see reports/publications not limited to OECD/NEA members) is available also to non-participant PSA developers such that they may benefit from project activities.

8. How comprehensive/complete are the data sets that have been provided to the data project? Are there any major data gaps that WGRISK could assist the project in addressing?

   The datasets are essentially complete. The only issue to be mentioned is that, unfortunately, not all member countries do report all fire events to the OECD FIRE Database. For PSA use this represents a limitation. For a reliable probabilistic assessment of the fire risk with an as far as possible high level of confidence a meaningful statistical database with as much as possible data, in particular starting with incipient fires, is required. This gap can only be closed if the database can be further extended and the inconsistencies stepwise excluded. In addition, the level of detail and quality of project data from events farer in the past is sometimes insufficient for use within Fire PSA. However, the quality of data provided to the OECD FIRE Database is continuously increasing with the number of events provided.
9. Have you received feedback on the uses of your data project products for the purposes of supporting PSA? If yes, how was this feedback received? How would you prefer to receive this type of feedback?

   At present, the OECD FIRE Project products are used for resolving more generic questions by the regulatory body and partially as additional information and/or data source for Fire PSA in the frame of periodic safety reviews.

10. Are you planning any new initiatives for the future? In what ways can WGRISK provide assistance and/or support?

    In the short-term, no new initiatives are planned. In the long-term, the data needed on fire detection and fire fighting systems could be collected as well as data on those events inducing a leak of explosive gas (notably hydrogen).

11. How can WGRISK members and observers who currently do not participant in the project learn more about your activities and the process for becoming a project participant?

    A CSNI report on the project is available as well as several publications which can be provided to WGRISK members and observers not participating in the project via OECD NEA secretariat (Alejandro.Huerta@oecd.org). Moreover, so-called Topical Reports on specific issues such as HEAF fire events, comparison of fire protection standards in member countries or combinations of fires with other hazards, are being or will be prepared and provided to CSNI.

12. What could WGRISK do to help address other data project challenges?

    At the time being, no specific action by WGRISK is needed.

CODAP

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for Data Project Representatives

Respondent Information

Please identify your organization: SIGMA-PHASE, INC.

Type of Organization (please check appropriate box):

- Regulatory Agency
- Government Technical Support Organization
- Commercial Technical Support
- Utility/Operator
- Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

R&D, PSA Applications incl. Risk-Informed ISI, Training

Responder Name: Bengt Lydell

Address: 16917 S. Orchid Flower Trail

Vail, AZ 85641-2701

Country: USA

Data Project Affiliation: OPDE & CODAP

Telephone and e-mail: +1-832-287-4068 bly@scandpower.com

Questionnaire for Data Project Representatives

1. Is the quality and quantity of data being submitted to the project currently adequate to support project objectives? If not, what could WGRISK do to assist the project in addressing your data needs?

   Yes! Early in the project, a detailed coding guideline (CG) was developed and subsequently approved by the project review group (PRG). In addition, a quality assurance program (QAP) has been established for the project (OPDE & CODAP). The QAP defines the roles and responsibilities of the project members. In the opinion of the respondent, the CG and QAP have been key to addressing data quality. However, it is important to recognize that the PRG consists primarily of non-PSA experts/ practitioners, and, therefore, it has been challenging to instill in the PRG body the importance of data completeness and coverage combined with a sustained data collection effort. The 'PRG body' is mainly made up of material scientists, structural engineers, and NDE experts whose primary motivation for participation has been to exchange operating experience data and information about the different national practices with respect to degradation mitigation, operability (fitness-for-service) determination, NDE effectiveness/reliability, and so on. By no means should this observation be viewed as a "detrimental indicator" on the success of the project. Rather the opposite. Passive component reliability is a complex technical issue. A deep understanding of the conjoint requirements for material degradation is of necessity to correctly interpret, process, and analyze the operating experience (OE) data. Clearly, this has been fully recognized by everybody involved. The whole process of data collection, classification, processing and analysis has been strengthened by this multi-disciplinary group of experts. Furthermore, and with minor exception, the PRG body has remained intact ever since the May 2002 kick-off meeting. This continuity has been instrumental in overcoming any project related obstacle. Again, in the opinion of this respondent, it would be highly beneficial if WGRISK were to consider organizing a joint 2-part OECD/NEA data project workshop. **Part 1** should be a closed session for PRGS & operating agents to share and discuss insights and experiences associated with respective project. **Part 2** should be open to invited PSA experts from industry and technical support organizations. From a U.S. perspective, invitees should come from the national laboratories, EPRI (R&R users group), INPO (EPIX), and selected utilities ("PSA pro-active" utilities). A 'part 2' objective should be two-directional; i.e., strengthen communications (projects → the 'outside,' and solicit feedback from data users.

2. How are national differences in (a) component safety classifications, (b) system boundaries, functional requirements, and (c) failure reporting criteria among project participants resolved to ensure consistent data reporting (i.e., how are consistency issues between how data is collected/coded for national programs and the data project resolved)?

   This is handled via the coding guideline. The (a) through (c) considerations were the subject of significant work by the PRG membership throughout the first and second terms of the OPDE project. It was essential to the development of the coding guideline, which includes a number of appendices defining national differences in classifications, material designations/specifications, and so on. An ongoing and quite challenging issue concerns failure reporting criteria. For passive components, the reporting criteria are undergoing periodic changes. It is an evolving process making the "data mining" increasingly cumbersome since multiple source of information must be screened for applicable event data. The vast majority of records on degraded material conditions remain the property of the plant owners/operators. It is of utmost importance to put in place a sustained and focused data collection effort. This requires additional resources outside the 'jurisdiction' of OECD/NEA.

3. PSA parameter estimation generally requires knowledge of both observed failure events and exposure (e.g., number of components demands, hours of exposure) in order to calculate a failure probability or failure rate. Does your project collect this type of exposure information?

No, it does not and for the reasons noted in the response to survey item #1. However, this topic was discussed from the outset and it has been revisited during each national coordinator's meeting. Some countries have developed their own "exposure term" databases; e.g., the Republic of Korea (KINS & KAERI).

4. Do you believe that project data (e.g., events, component failure data, and exposure information) is readily accessible and in a format that can be easily used by participants for the purposes of PSA (including availability of user and coding manuals)? Is all accumulated project data available to participants, or is data access restricted in certain cases (if so, please describe the project's data access policy).

   No! The event data is readily available, but exposure term data is not. Seminars & workshops on database applications have been organized in conjunction with the OPDE national coordinator meetings. Additionally, noteworthy contributions in terms of sponsoring applications workshops have been made by CSN (Spain, May 2008), the Nordic PSA group (NPSAG, Sweden, June 2008), and CNSC (Canada, February 2011). The data access policy is very clearly specified in the operating procedure (OP), which elaborates on the "confidentiality commitment." starting in the fall of 2005, a transition is underway to a fully internet-based database. This means, that effective April of 2012 the entire OPDE/CODAP database will reside on a secure server at NEA headquarters. Data access is very carefully managed by NEA-IT and the operating agent. A shared understanding of access rules exists among the full PRG membership. In short, NEA secretariat, NEA-IT and operating agent have full access to all data at all time. The national coordinators have full access to all data that has undergone the full QA process. The national coordinators have access to all country-specific data at all time, whether in "draft status" or "approved status." plant operators submitting data directly to database have access to the plant-specific data. A confidentiality agreement must be in place between an organization seeking full data access and a national coordinator.

5. Has the project attempted to quantify failure rates, failure probabilities, or other PSA parameters? If so, please provide examples and/ or references.

   No! However, some countries have established/supported national efforts to quantify passive component reliability parameters; e.g., Canada, Japan, Republic of Korea, Sweden, and Switzerland. In the case of the Republic of Korea and Sweden, public domain technical reports are available that document these attempts; see the attached bibliography for details.

6. What project reports have been made publicly available and are available to both participants and non-project participants? Where can these reports be found (e.g., data project website, NEA publication webpage…)? Note that the attachment includes a draft list of publicly available reports and technical papers associated with the various NEA data projects - Is this list complete? If not, please update the attachment as appropriate.

   On NEA website and project website. See the attached bibliography for details. The list has been updated.

7. Is any project data available to non-participant PSA developers such that they could still benefit from project activities (e.g., information that could support probabilistic parameter estimation or derivation of quantitative equipment performance insights)?

Yes! The process for accessing data is specified in the operating procedures and the quality assurance program.

8. How comprehensive/complete are the data sets that have been provided to the data project? Are there any major data gaps that WGRISK could assist the project in addressing?

   In general, the comprehensiveness of submitted data is quite high. The internet-based database includes provisions for uploading supporting information (e.g., photographs, P&IDS, isometric drawings). The completeness of the data varies significantly, on a country-by-country basis as well as on a system-by-system basis. Major structural failures are covered quite well. For other types of failures and degraded/rejectable conditions the database coverage is "spotty." a new data collection philosophy is being tried in CODAP. During the first year of its operation a focused effort is directed at event information specific to flow-accelerated corrosion (FAC). There are many gaps in the database. Filling in these gaps would require quite diligent efforts at the respective national level.
9. Have you received feedback on the uses of your data project products for the purposes of supporting PSA? If yes, how was this feedback received? How would you prefer to receive this type of feedback?

   Yes! Regular communications with actual and prospective data users provide good feedback. The operating agent is using his contact network to promote the OPDE/CODAP projects. Respective national coordinator is the conduit for feedback from users and interested parties at large. This topic is closely tied to comments provided under survey item #1 ("Data Project Workshop").
10. Are you planning any new initiatives for the future? In what ways can WGRISK provide assistance and/or support?

    The operating agent for OPDE/CODAP has ongoing discussions with EPRI to encourage active project participation (last discussion was on March 5, 2012). In the U.S., few organizations & individuals outside the NRC know much about the OECD/NEA database projects. True, OPDE/CODAP have been presented at international conferences (ASME PVP, PSAM, ANS PSA Topical Mtg., etc.), but at the plant-level there is still little-to-no awareness of the projects. It is an ongoing communications issue. In Germany, good progress has been made to actively engage the VGB in the project work. It is essential to engage EPRI. Preserving knowledge about passive component integrity and reliability remains extremely important and ought to be a strong motivation for expanding project participation. The OPDE operating agent has volunteered time to support the work of the European 'APSA network,' and participated in the November 2010 network meeting at kernkraftwerk gősgen-däniken. A unique feature of CODAP is the establishment of a knowledge base (KB) to ensure access to relevant reference material on codes and standards, mitigation practices, research. This particular initiative builds on insights gained from the SCAP-SCC project (2006-2010).
11. How can WGRISK members and observers who currently do not participant in the project learn more about your activities and the process for becoming a project participant?

    Starting with the December 2004 OPDE national coordinators meeting, the PRG has invited WGRISK members and observers from academia and industry to participate in ½-day to 1-day workshops. This has been very successful in terms of communicating our results to the outside world.
12. What could WGRISK do to help address other data project challenges?

    From a U.S. perspective, initiate contact with the ASME/ANS JCNRM (PSA Standard) and EPRI R&R users group and inform respective group/organization about the OECD/NEA database projects. A critical issue is to address how to best organize and support a sustained data collection effort. It is important to ensure that the full knowledge base for passive component reliability is maintained and continuously updated as the existing plant fleet enters into long-term operation. It is equally important to ensure a sustained data collection effort as new plants are being constructed and commissioned.

COMPSIS

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for Data Project Representatives

Respondent Information

Please identify your organization: Nuclear Regulatory Commission (NRC)

Type of Organization

- Regulatory Agency
- Government Technical Support Organization
- Commercial Technical Support
- Utility/Operator
- Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

The NRC Office of Nuclear Regulatory Research (NRC/RES) performs research related to the development and improvement of PSA methods. NRC/RES) also develops the technical bases and PSA tools needed to support regulatory decisions and inspection activities.

Responder Name: Karl Sturzebecher

Address: U.S. NRC Mailstop: C2 A7M

Washington, DC 20555

Country: United States

Data Project Affiliation: COMPSIS

Telephone and e-mail: 301-251-7494 Karl.Sturzebecher@nrc.gov

Questionnaire for Data Project Representatives

1. Is the quality and quantity of data being submitted to the project currently adequate to support project objectives? If not, what could WGRISK do to address your data needs?

   In COMPSIS there were two levels of data entry designed for the collection process. The main level process contained 5 required fields. These fields were very similar in flow to a NRC Licensee Event Report format with the added benefits of requiring the type of severity and the associated IEEE or IEC standard categorization. The second level of data entry was considered for lower level type events and didn't require completing all 5 fields. The entry of events for this lower level was never completed during the COMPSIS project.

   The quality of this main level entry was very high and the requirements were very stringent in passing the COMPSIS process and the final verification by the Operating Agent (OA). The actual COMPSIS webpage and process system took the OA significant amount of time to set up, verify and finalize. The quality of the data process would prove as a lead method for collecting and validating the event information; however the effort to complete the entry of one event was minimum of 4 to 5 hours. This caused limitation issues for several countries when entering their events, and although the design of the COMPSIS website provided high quality event collection, the flexibility of sorting the events was limited. The proofing process for the project never had enough events to test the sorting of data for lessons learned. The report development was still an open unproven task for COMPSIS. For example: the events for the final analysis report were sorted manually by the responsible national coordinator.

2. How are national differences in (a) component safety classifications, (b) system boundaries, functional requirements, and (c) failure reporting criteria among project participants resolved to ensure consistent data reporting (i.e., how are consistency issues between how data is collected/coded for national programs and the data project resolved)?

   The COMPSIS project database process provided a very well-defined method to inter-mix different events from one standard or another and then segment them accordingly. However, this feature was never proofed for the COMPSIS group.

3. PSA parameter estimation generally requires knowledge of both observed failure events and exposure (e.g., number of components demands, hours of exposure) in order to calculate a failure probability or failure rate. Does your project collect this type of exposure information?

   No. There was never a way to collect the final number of exposed systems. This was information that participating countries were not willing to release.

4. Do you believe that project data (e.g., events, component failure data, and exposure information) is readily accessible and in a format that can be easily used by participants for the purposes of PSA (including availability of user and coding manuals)? Is all accumulated project data available to participants, or is data access restricted in certain cases (if so, please describe the project's data access policy).

   No. The data collected was not always specific to safety systems. Part of the data basis process problem in relationship to the framing concept was the lack of understanding of the nuclear power plant (NPP) environment. In the US, most NPPs are in transition from analog to digital and have a limited set of safety systems that are considered digital, while other participants in COMPSIS have restrictions involving the public's perception. For example one country provided only the events that occurred in operating plants, but did not include any events from closed plants. The COMPSIS data process did not consider the working environment and restrictions involved before building the functionality of a high quality database process.

5. Has the project attempted to quantify failure rates, failure probabilities, or other PSA parameters? If so, please provide examples and/ or references.

   Yes, for quantifying failure rates only. However this was on a minimum of 22 data points.

6. What project reports have been made publicly available and are available to both participants and non-project participants? Where can these reports be found (e.g., data project website, NEA publication webpage…)? Note that the attachment includes a draft list of publicly available reports and technical papers associated with the various NEA data projects - Is this list complete? If not, please update the attachment as appropriate.

   Yes, the final report in 2011. See http://search.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=NEA/CSNI/R(2012)12&docLanguage=En

7. Is any project data available to non-participant PSA developers such that they could still benefit from project activities (e.g., information that could support probabilistic parameter estimation or derivation of quantitative equipment performance insights)?

   No. This data is proprietary to the owners of the COMPSIS working group based on what the charter states.

8. How comprehensive/complete are the data sets that have been provided to the data project?

   The data events are within a 70 to 90 percent of quality completion.

9. Have you received feedback on the uses of your data project products for the purposes of supporting PSA? If yes, how was this feedback received? How would you prefer to receive this type of feedback?

   No. The events are not completely about safety systems. There were only a couple safety types out of 90 some events. The final report does not recommend a PSA approach.

10. Are you planning any new initiatives for the future? In what ways can WGRISK provide assistance and/or support?

    No. The NRC is performing its own database to collect and review the operational experience events. This provides a way to include outside sources of event types and will help relate on a much broader scale of understanding for lessons learned at a NPP environment.

11. How can WGRISK members and observers who currently do not participant in the project learn more about your activities and the process for becoming a project participant?

    Not possible as the project has been closed out. During the COMPSIS project there was a lack of support from some member countries due to other work obligations.

12. What could WGRISK do to help address other data project challenges?

    The lessons from COMPSIS can help identify the interesting challenges of a digital safety system database project. In order to succeed, a project must have a reasonable concept expectation and a better understanding of the resources that will be required to participate. If sufficient safety grade events do not exist for a PSA calculation, then project course should be corrected to find the next best situation within the limitations and the experiences.

APPENDIX G: COMPLETE WGRISK MEMBER SURVEY RESULTS

Respondent	OECD Joint Data Project			
	ICDE	FIRE	COMPSIS	OPDE
Canada (CNSC)	P	P	-	P
Chinese Taipei (INER)	NP	NP	P	NP[21]
Czech Republic (UJV Res, a.s.)	NP	P	NP	P
Finland (STUK)	P	P	P	P
Finland (VTT)	NP	NP	NP	NP
France (CEA)	NP	NP	NP	NP
France (EDF)	P	-	-	-
France (IRSN)	P	P	NP	P
Germany (GRS)	P	P	P	P
Germany (ISTec)	NP	NP	P	NP
Japan (JNES)	P	P	NP	P
Korea (KAERI)	P	P	P	P
Korea (KINS)	NP	P	P	P
Slovakia (UJD SR and RELKO Ltd.)	NP	NP	NP	NP
Spain (CSN)	P	P	NP	P
Sweden (SSM)	P	P	P	P
Switzerland (ENSI)	P	P	P	P
UK (EDF)	NP	NP	NP	NP
UK (Magnox Ltd)	NP	NP	NP	NP
UK (ONR)	P	NP	NP	NP
USA (NRC)	P	P	P	P

P – Project Participant

NP – Non Project Participant

[21] Chinese Taipei is currently participating in the CODAP joint data project

Canada

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: **CANADIAN NUCLEAR SAFETY COMMISSION (CNSC)**

Type of Organization (please check the appropriate box):

- √ **Regulatory Agency**
- □ Government Technical Support Organization
- □ Commercial Technical Support
- □ Utility/Operator
- □ Other _________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

The Canadian Nuclear Safety Commission (CNSC) regulates the use of nuclear energy and materials to protect health, safety, security and the environment and to respect Canada's international commitments on the peaceful use of nuclear energy. CNSC fulfills its mandate through licensing, and compliance activities (including inspections) with the support of research activities.

Responder Name: **RADUCU GHEORGHE** (coordinator and CNSC representative at WGRISK), on behalf of CNSC staff: **S YALAOUI (ICDE), G. CHERKAS (FIRE), J. RIZNIC (CODAP)**

Address: **280 Slater, P.O.Box1046, Station B**

Ottawa, Ontario K1P 5S9

Country: **CANADA**

Telephone/e-mail: **+ 1 613 947** 0517/ raducu.gheorghe@cnsc-ccsn.gc.ca

Questionnaire for the ICDE data project

Questionnaire

Do you currently participate in the ICDE project?

- ☐ No and never have participated in the project *(please answer questions 1 - 3)*
- ☐ Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- √ Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

   - ☐ Resources associated with collecting/coding data are excessive
   - ☐ Benefits of participation do not justify the cost
   - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - ☐ Proprietary/confidentiality concerns with data
   - ☐ Not an OECD/NEA member
   - ☐ Other ________________________________

2. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the ICDE data project?

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

   c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

Because of the low probability of CCF events, an international campaign is necessary to have a representative statistic sample. Canada is participating to this project in order to generate qualitative insights into the root causes of CCF events which can then be used to derive approaches or mechanisms for their prevention or for mitigating their consequences. The objective is also to generate quantitative insights and record event attributes to facilitate quantification of CCF parameters.

5. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?
      CCF events for the following components: Batteries, Heat exchangers, Diesel Generators, Level Measurement, Check valves, Safety Relief Valves, Motor operated valves. The observation period as well as the utilities participating in each data collection campaign is different

   b. What is the source of the data that you have submitted?
      CCF events from licensees maintenance records for the specific campaign of data collection

   c. Have you used this data to support PSAs in your country?
      Not yet

   d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
      As mentioned in (a) above, not all licensees have participated to each of the data collection campaigns and the observation period is not up to date.

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
   Data collection (including coding and submission to clearing house) is performed by an external contractor to the CNSC

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?
   The database contains all the necessary information and features and can generate reports on CCF events. However, the data from the database need to be processed in order to gain the qualitative insights. For the quantification of CCF parameters, the database provides the impairment vectors and some processing is also required to quantify these parameters.

8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?
   No. Canada follows the coding guidelines provided by the lead country.

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).
   Not yet. CNSC is in the process of initiating a contract with a Canadian university for the CCF parameters quantification

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

No

Questionnaire for the FIRE data project

Questionnaire

Do you participate in the FIRE project?

- No and never have participated in the project *(please answer questions 11 - 13)*
- Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*
- √ Yes *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ________________________________

12. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the FIRE data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.
    CNSC staff requires information on fire events at NPPs and the conditions which contribute to fires to ensure we understand the phenomena, consequences and preventive measures to effectively regulate nuclear facilities from the risk of fire. Participation also permits CNSC staff to interact with international experts in fire and ensure our continued expertise.

15. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?
    CNSC staff have contributed to the database by providing information on reported fires at CANDU plants dating back to the 1990's.

    b. What is the source of the data that you have submitted?
    The data was obtained from CERTS (Central Event Reporting and Tracking System) and S-99 Standard (Reporting Requirements for Operating Nuclear Power Plants) reports.

    c. Have you used this data to support PSAs in your country?
    Currently there is an insufficient amount of data points for direct use in PSAs in Canada, however, the information is used in deterministic assessments and analysis.

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
    Yes, there is an AECL (Atomic Energy Canada Ltd.) database, COG (Candu Owners Group) database and EPRI databases which are not accessible to CNSC staff for use in the project.

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
    The workload has been spread across 3 staff members. The total effort per year is estimated at 80 hours.

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?
    The raw event data is available but it is not in a format that would easily facilitate incorporation into PSA reviews. There are also currently a limited number of events, more time is required to collect data.

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?
    The information collected by Canada is consistent with national reporting requirements under the S-99 standard. It is noted that each member country reports based upon their own set of criteria, normally based upon reporting thresholds. These thresholds vary greatly from one country to another which is a challenge when interpreting the results from the database.

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).
    To date it has not been used for this purpose.

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    Additional time is required to gather data from events, as a result Canada should continue to participate in the project.

Questionnaire for the OPDE/CODAP data project

<u>Questionnaire</u>

Do you participate in the OPDE and/or CODAP project?

- No and <u>never</u> have participated in either the OPDE or CODAP projects *(please answer questions 31 - 33)*
- Do not <u>currently</u> participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- √ **Yes *(please answer questions 34 - 40)***

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ________________________________

32. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the CODAP data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

    The OPDE, SCAP-SCC and CODAP event and knowledge management databases contain significant subset of the technical information necessary to technical specialists of regulatory

agencies to develop and defend the regulatory position and perform technical assessment up to the professional standards. Active participation in the OPDE/SCAP-SCC/CODAP projects and a proper use of information available to the user is of great help to the CNSC technical specialists as a means of maintaining professional integrity and independence. Accordingly, the same will reflect on the agency as a whole. In addition, having an access to an independent source of technical information put us on a par, if not giving some an advantage, with our counterparts in industry. Basically we do not have to depend on the same source of information, typically controlled by industry.

35. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?
    Data on piping degradation and failure events,

    b. What is the source of the data that you have submitted?
    Reportable events, periodic operational performance reports, open access information, conference proceedings, journal publications, technical support organization's analyses and reports, and other relevant technical documentation.

    c. Have you used this data to support PSAs in your country?
    Not for PSA per se, however number of studies by CNSC staff and industry were performed using the data from OPDE (fatigue studies, inspection strategies and frequency, Risk Informed In-Service Inspections). We shared information with Canadian industry by providing an access to database.

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
    CNSC does not have this information. The data reporting, collection and processing system is not a part of regulatory /licensing requirements, so it is reasonable to conclude that number of events have not been captured by these projects. The industry maintain its own databases (Ontario Power Generation Company's Passport database, COG OPEX database, INPO's APEX). However, the regulatory agency staff do not have access to those databases.

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
One person at the CNSC with cooperation of the National Operators (representatives of utilities), albeit with very limited time since the participation has not been seen as regulatory or licensing requirement/obligation on part of the licensees/operators.

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?
ODE database is developed under the MS ACCESS environment. Data are easily accessible to authorized national operators, however it is up to the user to develop particular applications and tools to process and interpret the information.

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your

participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?

The reality is that there are differences in national reporting levels and requirements. However the OPDE project developed a cross-reference table based on input of all national coordinators. Despite differences the OPDE data can be used across the industry, countries and reactor technologies.

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

    CNSC does not have this information. However the industry used the OPDE database information to prepare at least two state of the art reports on fatigue management. In addition the CNSC staff developed an original methodology to infer the data among power plant population of different aging. CANDU industry is keen on using the CODAP database to validate the newly developed fracture mechanics code Praise-CANDU, if feasible. The OECD NEA websites for OPDE, SCAP-SCC and CODAP projects contain number of documents in public domain reporting on results achieved across those projects.

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    Completeness of database is a generic issue with any database. Even the well known INPO OPEX database had the very same issues, even though not to the same extent as those projects which are run more or less on voluntary contribution by participants. The key element at this moment is to develop application and calculation tools and applications for use by both, regulators and industry for their respective needs. CNSC staff is working with universities to develop research projects to develop such applications for inspection strategies, scope and frequency among others.

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?

    Knowledge Management base of the CODAP could be a good start for information useful for regulatory assessments of new build and advance reactors (Gen III+, and to certain level for Gen IV). CODAP is focused on collecting reliability centered data of passive components, which make it relevant to assessment of passive safety systems used in new builds.

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

    Question of getting "population" information to complement the event centered database. Development of applications and analytic tools to process data from databases.

43. Other general comments?

How to document all work and applications as well as benefits for the regulator stemming from our participation in this project? Simply we are dealing with no much resources, time and support.

CODAP project is well suited and aligned with the CNSC Regulatory Document (RD) 334 on Aging Management for Nuclear Power Plants.

Czech Republic

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: **UJV Rez, a.s.**

Type of Organization (please check the appropriate box):

- ☐ Regulatory Agency
- ☐ Government Technical Support Organization
- ☐ Commercial Technical Support
- ☐ Utility/Operator
- ☐ Other_________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

engineering support of utilities in various areas of operation and design (licencing, inspection, operation, design, research)

Responder Name: **Jaroslav Holy**

Address: **Department of Risk and Reliability Analysis, UJV Rez a.s., 250 68, Rez, Czech Republic**

Country: **Czech Republic**

Telephone/e-mail: **+420 266 172 167 / hoj@ujv.cz**________________________

Questionnaire for the ICDE data project

Questionnaire

Do you currently participate in the ICDE project?

- No and never have participated in the project *(please answer questions 1 - 3)*

- Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*

- Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

   - **Resources associated with collecting/coding data are excessive**
   - Benefits of participation do not justify the cost
   - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - **Proprietary/confidentiality concerns with data**
   - Not an OECD/NEA member
   - Other ______________________________

2. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the ICDEdata project? **We do think that the idea of the project is quite useful and the results are valuable. We have not been participating in the project mostly due to internal reasons, because we were not sure whether we can provide valuable information for the other partners in the project. Currently, we are considering our potential to participate in the project and the possibilities of joining it.**

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute? **We do not see any significant disadvantages regarding participation in the project. The main advantages are twofold: 1)getting a lot of information about CCF events, which is, as plant specific, quite rare, in general 2)being one of the partners forming consistent, integrated approach to this very important area of PSA. We could be able to provide definitely information about our long treatment of CCF data in Czech PSA studies and about methodological development made and problems encountered during last two decades. We would like also to provide detailed information about the CCF events and precursors, we have been collecting during last 25 years, but there may be problem with proprietary /confidential data, as we indicated above (however, we can try to solve it).**

   c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project? **In our opinion, there is sufficient information about the project in all the references given on project web pages. We analyzed that information and it provides enough facts for evaluation of usefulness of the project and for the decision whether to participate or not.**

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects. **The information presented in the reports, we analyzed, is very suitable for understanding of the mechanisms connected with occurrence of common cause failures and distribution of various CCF coupling factors influencing the strength of CCF potential. However, this information is mostly qualitative and does not help very much in quantification of CCF parameters (we use alpha factor method) - neither by providing some kind of generic data, not by providing some input for Bayesian update (the numbers of events are present in the database, but the number of "opportunities" cannot be derived on the base of information presented). There is also little detailed information about concrete CCF events, what does not make possible to analyze the transferability of events occurred at various plants into specific conditions of Czech NPPs operation.**

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

5. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the FIRE data project

Questionnaire

Do you participate in the FIRE project?

- No and never have participated in the project *(please answer questions 11 - 13)*

- Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*

- **Yes** *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ________________________________

12. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the FIRE data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation. **In general, the reasons of our participation are connected with the aim to improve the quality of our fire risk analysis within PSA projects. The benefit, we can see, is in delivering the structured information about fire events. During the discussions of the fire events and the framework for treating them, we are getting valuable inputs regarding the approach, we use for**

fire risk analysis. Since there is no standardized fire risk analysis methodology, it helps us to decide about concrete steps of the approach to integrating fire risk in PSA.

15. In relation to the national data provided to the project:

    a. What national data have you already provided to this project? **We provided information about some fire events occurred in Czech NPPs.**

    b. What is the source of the data that you have submitted? **The source of the data is plant specific database of information about plant specific safety related events (not only fires) and additional discussions with utility experts oriented to fire safety.**

    c. Have you used this data to support PSAs in your country? **Yes. Our PSA (regarding fire initiating events) is significantly based on generic data. However, we have to taken into consideration selected plant specific fire events. In general, we have used Bayesian approach to combine generic and plant specific fire events data (similarly to other categories of plant specific initiating events). Still, such kind of analysis was done in several cases only (for those fire risk scenarios, we were able to get some plant specific information). We do not have sufficiently broad database (number of occurrences) of fire events that we could base our fire risk analysis to plant specific data to a bigger extent.**

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)? **The proprietary/confidentiality concerns are important and we have to take them into consideration anytime, we provide concrete information about fire events to the project. However, there is no set or database of additional data, we have excluded from information exchange due to such concerns in recent course of the project.**

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)? **Medium level of resources have been applied.**

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications**? The ideal way of quantitative data to be used in PSA is number of events of the given kind versus of total time of data collection. However, sufficiently detailed information about the fire events has to be present to for the decision making whether the event under concern is relevant for specific operating conditions typical for our plant, since fire risk analysis is highly plant specific.**

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project? **We do not see any principal obstacles from the side of the project.**

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available). **The information in project database was used for better understanding of fire events, in general (and it was quite useful for such purpose). The information was not used for any direct statistical data analysis, because it was not clear, how much relevant are the concrete events in the database for operation of Czech NPPs at the time, fire risk analysis was done for "our" NPP Dukovany several years ago. However, we may be up-dating our fire risk analysis during time horizon of several years and we expect to use the information collected within the project more extensively (because both the extent and the quality of the information has been and will be improved significantly).**

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement? **One potential issue is that the organization of the database (improved pretty much during last years) is still strongly connected with the character of fire events, with the points we can get and we can miss to describe the event the best, from point of view of safety, in general. May be, we should start more discussions that will be devoted, from the very beginning and exclusively, to the determined use of the information, we are collecting, i.e. modeling, quantification and integration of fire risk in PSA.**

Questionnaire for the COMPSIS data project

__Questionnaire__

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

- **No and never participated in the COMPSIS project** *(please answer questions 21 - 23)*

- Did not participate in the final phase of the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*

- Yes *(please answer questions 24 -30)*

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

22. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - **Proprietary/confidentiality concerns with data**
    - Not an OECD/NEA member
    - Other **The project, the way it is oriented, is not very consistent without needs.**

23. With regard to you reasons for not participating in the project:What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

    a. What could have been done to encourage the participation of your organization in the COMPSIS data project? **The project should be oriented more to collecting such information, we need for PSA, or, at least, we can derive the information for PSA from. Instead of just detailed description about failure events, the information should be well structured (failure modes taxonomy necessary) and all PSA related items should be collected (numbers of demands, for example). Also, the current trends orienting the effort in I&C area to digital components should be followed in the project.**

    b. What advantages and disadvantages did you see to project participation? Had you joined the data project, what information could you have contributed? **We could contribute with pretty detailed information about NPP I&C components failures, but the issue of proprietary/confidentiality of relevant information would have to be solved.**

    c. Do you believe that there was sufficient information available to support making an informed decision about your participation in the COMPSIS project? If not, what information would you have liked to know about the project? **We think that the current information, we have about**

the project, is sufficient (we also have additional information taken from the discussions within CSNI NEA DIGREL working group).

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects. **The information is relatively limited in comparison with the other projects considered in this questionnaire.**

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications?

28. Were there any consistency issues between how you data was collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the OPDE/CODAP data project

Questionnaire

Do you participate in the OPDE and/or CODAP project?

- ☐ No and never have participated in either the OPDE or CODAP projects *(please answer questions 31 - 33)*

- ☐ Do not currently participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*

- ☐ **Yes** *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - ☐ Resources associated with collecting/coding data are excessive
    - ☐ Benefits of participation do not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ________________________________

32. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the CODAP data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation. **The methodology and process of derivation of PSA initiating events frequencies**

connected with loss of piping integrity, including ruptures, is mostly based on rare data. Thus we hope, we will get extensive generic information, which we will be able to transfer into the inputs for the process of frequencies derivation. In addition we expect, we would be able, with the CODAP information, to address not only the "traditional" regions of PSA model (frequencies of primary circuit LOCAs), but also most of other initiating events related to loss of integrity (secondary circuit breaks, loss of support systems due to piping failure - event for the piping delivering low pressure medium).By using of CODAP information, we also hope to address the specifics of low power and shutdown operation in estimation of frequencies of initiating events connected with loss of piping integrity.

35. In relation to the national data provided to the project:

    a. What national data have you already provided to this project? **A set of events with loss of piping integrity potential was provided in the format agreed for CODAP database development.**

    b. What is the source of the data that you have submitted**? Plant specific records including information from additional consultations with plant experts.**

    c. Have you used this data to support PSAs in your country? **Yes, all the data were specifically (for the given purpose of PSA IEs frequency derivation) analyzed by the PSA specialists and the relevant events (mostly precursors) were included (as plant specific data) into application of Bayesian approach for frequency estimation.**

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)? **There are no additional data available.**

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)? **Medium level of resources has been applied.**

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications? **In comparison with other sources of information about loss of piping integrity events, there are some very useful information points in this database (parameters of transported medium in time of the event etc.). Some other items could be added to further improve the potential to use the information as most directly as possible in PSA effort (well structured source of information about the total observation time, some additional information about the operation of the frontline and support systems, the data have been taken from etc.)**

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project? **There are no basic issues (related to PSA) connected with consistency between national and project data.**

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available**). Some information from the database was discussed during the process of searching for the best and most complete data sources about loss of piping integrity. There are no publicly available reports about PSA studies of Czech NPPs with a level of detail, where the information taken from CODAP is discussed.**

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement**? Although this project has not been developed to serve to PSA originally, there are many useful attributes and items, which can be used in the process of derivation of frequencies and conditional probabilities of the loss of integrity events in PSAs. Still, general discussion (two days meeting?) should be organized with participation of PSA experts and database/project developers with the subject "how to make the database/project the most useful for PSA".**

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors? **We are not conducting the data activities to address the limited operational experience with new and advanced reactors. However, we feel that such projects may be very desirable and should be organized as soon as possible and reasonable.**

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project? **Human reliability data (particularly the data from simulator exercises, but also other categories - maintenance failures, for example) collection could be very useful. UJV would support such project and would have plenty of data to be provided.**

43. Other general comments? **No other comments.**

Finland

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: Radiation and Nuclear Safety Authority- STUK________________________

Type of Organization (please check the appropriate box):

- ✓ Regulatory Agency
- ☐ Government Technical Support Organization
- ☐ Commercial Technical Support
- ☐ Utility/Operator
- ☐ Other _________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

regulatory control, technical inspections__________________

Responder Name: Mr. Jorma Sandberg______________________

Address: PO Box 14, FIN-00881 Helsinki, Finland_____________

Country: Finland__________________________

Telephone/e-mail: +358 40 1520178_____________________

Note: The questionnaires on ICDE and FIRE have not been completed in this version (July 10, 2012). We try to send additional information after the holiday period.

Questionnaire for the ICDE data project

Questionnaire

Do you currently participate in the ICDE project?

- ☐ No and never have participated in the project *(please answer questions 1 - 3)*
- ☐ Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ✓ Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - ☐ Resources associated with collecting/coding data are excessive
    - ☐ Benefits of participation do not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ________________________________

2. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the ICDE data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

5. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

   d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the FIRE data project

Questionnaire

Do you participate in the FIRE project?

- ☐ No and never have participated in the project *(please answer questions 11 - 13)*
- ☐ Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*
- ✓ Yes *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - ☐ Resources associated with collecting/coding data are excessive
    - ☐ Benefits of participation do not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ________________________________

12. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the FIRE data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

15. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

   d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the COMPSIS data project

Questionnaire

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

- ☐ No and never participated in the COMPSIS project *(please answer questions 21 - 23)*
- ☐ Did not participate in the final phase of the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ✓ Yes *(please answer questions 24 - 30)*

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

21. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

    - ☐ Resources associated with collecting/coding data are excessive
    - ☐ Benefits of participation do not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ________________________________

22. With regard to you reasons for not participating in the project: What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

    a. What could have been done to encourage the participation of your organization in the COMPSIS data project?

    b. What advantages and disadvantages did you see to project participation? Had you joined the data project, what information could you have contributed?

    c. Do you believe that there was sufficient information available to support making an informed decision about your participation in the COMPSIS project? If not, what information would you have liked to know about the project?

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

    Reason: to share the experiences of different equipment families and applications. Other benefits were e.g. getting familiar with different classification systems, better understanding of fault classification and root cause analysis.

25. In relation to the national data provided to the project:
    a. What national data have you already provided to this project?
       See the Finnish contribution of COMPSIS, about 4 events
    b. What is the source of the data that you have submitted?
       Fault reports and reparation plans drawn up by the licensees
    c. Have you used this data to support PSAs in your country?
       No
    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
       Yes, but COMPSIS has been terminated

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
    The principal resource has been one senior I&C expert at STUK. Utility representatives have been consulted to correct possible errors in data.

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications?
    Data is available for COMPSIS members.

28. Were there any consistency issues between how you data was collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?
    Only minor problems with consistency. At this phase it is suggested that when developing reporting requirements in any member country the COMPSIS Guidelines should be observed to reduce the inconsistencies and to improve the national reporting.

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).
    No, (so far not).
30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?
    If the collected data is to be used in PSA, it would be useful to require some more statistical information along with the data, such as operation times of similar equipment and demand frequencies for them. This would make possible to perform more statistical analyses of the data.

Questionnaire for the OPDE/CODAP data project

Questionnaire

Do you participate in the OPDE and/or CODAP project?

- ☐ No and never have participated in either the OPDE or CODAP projects *(please answer questions 31 - 33)*
- ☐ Do not currently participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ✓ Yes *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

- ☐ Resources associated with collecting/coding data are excessive
- ☐ Benefits of participation do not justify the cost
- ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
- ☐ Proprietary/confidentiality concerns with data
- ☐ Not an OECD/NEA member
- ☐ Other ______________________________

32. With regard to the potential for future project participation:

a. What can be done to encourage the participation of your organization in the CODAP data project?

b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

Information was not available at the moment, to be added later.

35. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?
    Information was not available at the moment, to be added later.

    b. What is the source of the data that you have submitted?
    Data is received from the licensees.

    c. Have you used this data to support PSAs in your country?
    Yes, see point 39.

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
    -

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
    At STUK, one senior expert has used part of his time as the project coordinator. The level of resources used by the licensees is not known.

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?
    Information on component populations has not been collected although it would be essential for PSA applications. (In some cases the populations can be estimated based on data from other sources.)

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?

    -

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).
    For example, the Loviisa NPP which participated in OPDE has successfully applied the database to PSA and RI-ISI applications. STUK reviews PSAs submitted by the licensees but does not, in general, perform PSA modeling and has not been using the OPDE data for PSA applications.

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?
    The secondary effects of pipe breaks and leaks could be a possible application. Assessment of the alleviated Code rules and need of supplementary rules (better protection, supporting, routing etc.) for small bore components might be also possible.

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?

    Currently no. In the future, data collection on the EPR reactor has to be organized.
42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

    At the moment we do not have new specific data needs. If new data needs are identified within OECD/NEA, STUK is interested in supporting them according to the resources available at the time.
43. Other general comments?

    The data projects are an important part of OECD/NEA work. They are especially important to member states with a small number of nuclear installations and limited national databases.

    In the long term data collection should be developed so that the data can be more easily used in PSA applications.

    The possibilities for future co-operation between OECD/NEA and, e.g., the EU Clearinghouse and IAEA should be examined.

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: VTT (Technical Research Centre of Finland)

Type of Organization (please check the appropriate box):

- Regulatory Agency

X Government Technical Support Organization

- Commercial Technical Support
- Utility/Operator
- Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

research & development

Responder Name: Jan-Erik Holmberg

Address: VTT, P.O.Box 1000, FI-02044 VTT

Country: Finland

Telephone/e-mail: +358 20 722 6450, jan-erik.holmberg@vtt.fi

Questionnaire for the ICDE data project

Do you currently participate in the ICDE project?

The answers are applicable to all the data projects (ICDE, FIRE, COMPSIS, OPDE)

X No and never have participated in the project *(please answer questions 1 - 3)*

- Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

- Resources associated with collecting/coding data are excessive
- Benefits of participation do not justify the cost
- Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)

X Proprietary/confidentiality concerns with data

- Not an OECD/NEA member

X Other Not our choice

2. With regard to the potential for future project participation:

a. What can be done to encourage the participation of your organization in the ICDE data project?

To get access rights to the data

b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

Perform data analyses for various purposes, develop reliability data analysis methods

c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

Decision making is not up to us.

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

Summary reports cannot be used in PRA projects.

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

5. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the FIRE data project

Do you participate in the FIRE project?

X No and <u>never</u> have participated in the project *(please answer questions 11 - 13)*
- ☐ Do not <u>currently</u> participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*
- ☐ Yes *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - ☐ Resources associated with collecting/coding data are excessive
    - ☐ Benefits of participation do not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ________________________________

12. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the FIRE data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

15. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

c. Have you used this data to support PSAs in your country?

d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the COMPSIS data project

Questionnaire

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

- X No and never participated in the COMPSIS project *(please answer questions 21 - 23)*
- □ Did not participate in the final phase of the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- □ Yes *(please answer questions 24 - 30)*

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

21. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

    - □ Resources associated with collecting/coding data are excessive
    - □ Benefits of participation do not justify the cost
    - □ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - □ Proprietary/confidentiality concerns with data
    - □ Not an OECD/NEA member
    - □ Other

22. With regard to you reasons for not participating in the project: What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

    a. What could have been done to encourage the participation of your organization in the COMPSIS data project?

    b. What advantages and disadvantages did you see to project participation? Had you joined the data project, what information could you have contributed?

    c. Do you believe that there was sufficient information available to support making an informed decision about your participation in the COMPSIS project? If not, what information would you have liked to know about the project?

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications?

28. Were there any consistency issues between how you data was collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the OPDE/CODAP data project

Questionnaire

Do you participate in the OPDE and/or CODAP project?

X No and never have participated in either the OPDE or CODAP projects *(please answer questions 31 - 33)*

 Do not currently participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*

 Yes *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

 Resources associated with collecting/coding data are excessive
 Benefits of participation do not justify the cost
 Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
 Proprietary/confidentiality concerns with data
 Not an OECD/NEA member
 Other ________________________________

32. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the CODAP data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

35. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?
    No

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

    In general, VTT is interested in any data collection activities. Recent activities are related to HRA and I&C, but also other areas are of interest. VTT is not a provider of data, but we can support as, e.g., as a developer of a taxonomy, data analysis, reliability parameter estimation method developer, etc.

43. Other general comments?

France

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: CEA

Type of Organization (please check the appropriate box):

- ☐ Regulatory Agency
- ☑ Government Technical Support Organization
- ☐ Commercial Technical Support
- ☐ Utility/Operator
- ☐ Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

Research and development

Responder Name: Florence CURNIER

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Country: FRANCE

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Questionnaire for the ICDE data project

Questionnaire

Do you currently participate in the ICDE project?

- ☑ No and <u>never</u> have participated in the project *(please answer questions 1 - 3)*
- ☐ Do not <u>currently</u> participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ☐ Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

   - ☐ Resources associated with collecting/coding data are excessive
   - ☐ Benefits of participation do not justify the cost
   - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - ☐ Proprietary/confidentiality concerns with data
   - ☐ Not an OECD/NEA member
   - ☑ Other I am a new OECD/NEA member____________________

2. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the ICDE data project? I have to see if my organization is interested in participating in the ICDE data project, even though we are not involved in reactors exploitation.

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

      I think that it is always interesting to be aware of international practices and to share the data. I must see with my organization if we can collect data to be shared.

   c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

   Do you aim at proposing data for CCF parameters?

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project?
   Yes
   If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

5. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?

   b. What is the source of the data that you have submitted?

   c. Have you used this data to support PSAs in your country?

   d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the FIRE data project

Questionnaire

Do you participate in the FIRE project?

- ☑ No and never have participated in the project *(please answer questions 11 - 13)*
- ☐ Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*
- ☐ Yes *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

   - ☐ Resources associated with collecting/coding data are excessive
   - ☐ Benefits of participation do not justify the cost
   - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - ☐ Proprietary/confidentiality concerns with data
   - ☐ Not an OECD/NEA member
   - ☑ Other I am a new OECD/NEA member____________________

12. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the FIRE data project?

   I have to see if my organization is interested in participating of the FIRE data project

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

   My organization, not involved in nuclear power plant exploitation but in nuclear installations, may share information in this area but I don't know if that would be of interest for you.

   I am running a PSA on a Sodium Cooled Fast Reactor and fire is of particular interest for the reasons you know but I don't think that this type of reactor is considered in your data bank.

   c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

   Yes, I think so.

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project?
   Yes

If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

15. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the COMPSIS data project

Questionnaire

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

- ☑ No and never participated in the COMPSIS project *(please answer questions 21 - 23)*
- ☐ Did not participate in the final phase of the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ☐ Yes *(please answer questions 24 - 30)*

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

21. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

    - ☐ Resources associated with collecting/coding data are excessive
    - ☐ Benefits of participation do not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☑ Other I am a new OECD/NEA member_________________

22. With regard to you reasons for not participating in the project: What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

Same answers as for ICDE database

   a. What could have been done to encourage the participation of your organization in the COMPSIS data project?

   b. What advantages and disadvantages did you see to project participation? Had you joined the data project, what information could you have contributed?

   c. Do you believe that there was sufficient information available to support making an informed decision about your participation in the COMPSIS project? If not, what information would you have liked to know about the project?

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project?

    Yes

If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications?

28. Were there any consistency issues between how you data was collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the OPDE/CODAP data project

Questionnaire

(same answers as for ICDE project)

Do you participate in the OPDE and/or CODAP project?

- ☐ No and never have participated in either the OPDE or CODAP projects *(please answer questions 31 - 33)*
- ☐ Do not currently participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ☐ Yes *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - ☐ Resources associated with collecting/coding data are excessive
    - ☐ Benefits of participation do not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ________________________________

32. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the CODAP data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

35. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors?
    Yes. I'm working on a prototype of Sodium-Cooled Fast Reactors.
    Are data project products being used to support these efforts?
    No.
    If not, how could data projects products better support your programmes for new and advanced reactors?
    I would need specific data about this type of nuclear reactors : failure rate data, sodium fire, …
42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? Cf. 41.

    If a new data need is identified, would your organization be interested in supporting a new project? I have to ask.
43. Other general comments?

    Human factor is generally incriminated in the accidents but human actions are not always negative for nuclear safety. Indeed, human can analyze the situation and act to prevent an accident or permit a better availability of the installation (in situations of control-command inopportune signals for example).

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: Electricité de France (EDF)____________________

Type of Organization (please check the appropriate box):

- ☐ Regulatory Agency
- ☐ Government Technical Support Organization
- ☐ Commercial Technical Support
- ☒ Utility/Operator EDF utility
- ☐ Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

________________generation of electricity,

________________research & development__

Responder Name: ICDE : Michel Balmain, Anne-Marie Bonnevialle

The scope of this answer is only ICDE project.____________

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Country: France______________________________

Telephone/e-mail: +33 1 4765 4356 michel.balmain@edf.fr

_________+33 1 4765 5304 anne-marie.bonnevialle@edf.fr______

Questionnaire for the ICDE data project

Questionnaire

Do you currently participate in the ICDE project?

- ☐ No and never have participated in the project *(please answer questions 1 - 3)*
- ☐ Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*

☒Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

   - ☐ Resources associated with collecting/coding data are excessive
   - ☐ Benefits of participation do not justify the cost
   - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - ☐ Proprietary/confidentiality concerns with data
   - ☐ Not an OECD/NEA member
   - ☐ Other ________________________________

2. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the ICDE data project?

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

   c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.
   Similar answer as IRSN:

The EDF main reason for participation in ICDE project is to benefit from the world wide experience in terms of CCF occurred in the nuclear industry, for the in-house PSA development:

- To have a basis for comparison with the existing data,
- To anticipate/consider the occurrence of new failure mechanisms.

Even no quantitative data was derived for the ICDE database, the gained knowledge was implicitly employed in the frame of EDF PSA related activities. In particular, the methodology of impairment vector has been adopted by EDF.
The participation in the ICDE project raised also timely and comprehensive discussion between the IRSN and EDF related to the operating experience CCF treatment, in terms of methodologies, approaches and results.

5. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?
      See 5b
   b. What is the source of the data that you have submitted?

      The provided data results from the EDF operating experience.
   c. Have you used this data to support PSAs in your country?

      The data is employed by EDF to quantify the CCF parameters for the EDF NPP components. IRSN and EDF use similar data in the frame of the PSA development.
   d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

      Exact number of demands and time exposure are not submitted due to proprietary concerns.
6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
   IRSN was more involved before 2005 (Phase 1), the ICDE input data being derived by IRSN based on EDF raw data. Beginning with 2005 (Phase 2), the data is supplied and analysed by EDF, IRSN having mostly a coordination role. The resources allocated by IRSN to the project were:
   - Phase 1: 2 specialists part time.
   - Phase 2: 2 specialists part time.
7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

   Common EDF and IRSN answer:

   For quantification EDF uses its own methodology and the relatively large operating feedback coming from the French NPP fleet (58 reactors). This current methodology does not allow using non-French operating feedback. ICDE data are therefore only used in a qualitative way.To get these qualitative insights, it’s necessary to be able to extract from the database the relevant information. Due to particular ergonomics in ICDE tool navigation, this task has to be done by skilled people. That is the reason why the representative of EDF in ICDE project does extract information for other PSA involved people at EDF.
8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in

the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?

Common EDF and IRSN answer:

There is a strong difficulty related to component boundaries. According to ICDE guideline, a centrifugal pump includes motor, pump, dedicated breakers whereas EDF, since data collection in the 80's, is separating pump, motor, equivalent breakers (for pumps or busbars) that may be identical crosswise inside its different standardized series (900, 1300, 1450 MW series). It has not yet been solved how to easily present the data re-arranged. A work is on progress for centrifugal pumps. There is no evident way of finding a consistency between ICDE and EDF programs.

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

   No quantified data form ICDE database was used in the EDF PSA projects, since EDF has a large amount of operating data.

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    No, main problems are exposed in Answers 7 and 8.

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

43. Other general comments?

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: Institute for Radiological Protection and Nuclear Safety (IRSN)

Type of Organization (please check the appropriate box):

- ☐ Regulatory Agency
- ☒ Government Technical Support Organization
- ☐ Commercial Technical Support
- ☐ Utility/Operator
- ☐ Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

French Safety Authority (ASN) Technical Support Organization

Respondents Name: ICDE – Gabriel Georgescu (gabriel.georgescu@irsn.fr)

FIRE – Fabienne Nicoleau, Pauline Basillais et Remy Bertrand (fabienne.nicoleau@irsn.fr / pauline.basillais@irsn.fr / remy.bertrand@irsn.fr)

OPDE/CODAP - Christophe Blain (christophe.blain@irsn.fr)

COMPSIS – Pascal Regnier (pascal.regnier@irsn.fr)

General questions - Gabriel Georgescu

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Country: France

Telephone/e-mail: +33 1 58358108

Questionnaire for the ICDE data project

Questionnaire

Do you currently participate in the ICDE project?

- ☐ No and <u>never</u> have participated in the project *(please answer questions 1 - 3)*
- ☐ Do not <u>currently</u> participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*

☒Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

   - ☐ Resources associated with collecting/coding data are excessive
   - ☐ Benefits of participation do not justify the cost
   - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - ☐ Proprietary/confidentiality concerns with data
   - ☐ Not an OECD/NEA member
   - ☐ Other ______________________________

2. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the ICDE data project?

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

   c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

   .

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

The IRSN main reason for participation in ICDE project is to benefit from the world wide experience in terms of CCF occurred in the nuclear industry, both for the in-house PSA development as well as in the frame of licensee (EDF) PSA verification:

- To have a basis for comparison with the existing data,
- To anticipate/consider the occurrence of new failure mechanisms.

Even no quantitative data was derived for the ICDE database, the gained knowledge was implicitly use in the frame of IRSN related activities, for example for the identification of CCF groups.
The participation in the ICDE project raised also timely and comprehensive discussion between the IRSN and EDF related to the operating experience CCF treatment, in terms of methodologies, approaches and results.

5. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?

      See 5b

   b. What is the source of the data that you have submitted?

      The provided data source is the EDF nuclear power plants operating experience.

   c. Have you used this data to support PSAs in your country?

      The data is used by EDF to quantify the CCF parameters for the EDF PSA. IRSN and EDF use similar data in the frame of the PSA development.

   d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

      Not applicable

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

   IRSN was more involved before 2005 (Phase 1), the ICDE input data being derived by IRSN based on EDF raw data. Beginning with 2005 (Phase 2), the data is derived by EDF, IRSN having mostly a coordination role. The resources allocated by IRSN to the project were:

   - Phase 1: 1 specialist full time + 1 specialist part time
   - Phase 2: 1 specialist part time

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

See EDF answer.

8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?

   See EDF answer.

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

   No quantified data form ICDE database was used in the IRSN PSA projects. ICDE insights were used to support the definition of CCF groups.

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

   The complexity of the ICDE database looks like being one of the challenges for the final users. In the present status, the ICDE public reports are not really useful for PSA and an improved content and presentation could be helpful. For example, a summary report giving an overview (in a condensed format) of the ICDE database may be useful.

   Moreover, a general problem with the CCF quantification is related to CCF model parameters estimation. The estimation of several CCF model parameters used in PSA (α or β factors) needs not only CCF events information but also independent failures and observed population information. In fact, the ICDE database is a complex structure which contains several types of information: CCF events, independent failure events and observed populations. The collection of this information is a difficult problem, both for providing data and for interpreting foreign data. Some more detailed guidance may be helpful.

Questionnaire for the FIRE data project

Questionnaire

Do you participate in the FIRE project?

- ☐ No and never have participated in the project *(please answer questions 11 - 13)*
- ☐ Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*
- ☒ Yes *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

- ☐ Resources associated with collecting/coding data are excessive
- ☐ Benefits of participation do not justify the cost
- ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
- ☐ Proprietary/confidentiality concerns with data
- ☐ Not an OECD/NEA member
- ☐ Other ______________________________

12. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the FIRE data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.
    IRSN is conducting a Fire PSA and the information of the OCDE Fire database is useful for this study. In addition, the application already performed by the OECD FIRE project, notably the fire statistical and the fire scenarios studies, are useful for deterministic safety assessment.

15. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?
       The national data provided to the OECD Fire project concerns more particularly the equipment that have been to the origin of fires, the number of equipment and the number of rooms of the French NPPs as well as the main information related to the fire scenarios development (detection and suppression of the fire, equipment damaged by the fire…).

    b. What is the source of the data that you have submitted?
       We had submitted information transmitted by the licensee.

    c. Have you used this data to support PSAs in your country?
       Yes, we have used this data for our Fire PSA.

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
       No, there isn't. All information related to the Operating Experience Feedback transmitted by the licensee can be transferred to the OECD Fire project.

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
    Two persons working partial time are involved in the OECD Fire project. Their involvement varies in function of the number of fire events to submit (usually 5 to 8 event per year, the submission of one event needing about half of a day for a person), the participation to the writing of the project report related to the applications of the database and the participation to the meetings.
    In addition, a lot of works performed in the frame of the fire PSA are used for the project OECD Fire project like for example the walkdown carried out to localize the equipment inside the NPs, the fire frequency estimation and the fire scenarios studies. Several databases developed for the fire PSA are used to provide information to the OECD Fire project like for example:
    - Database called « Equipements 900MWe », gives the rooms and equipment in NPP,
    - Database called « DuréeFeu », calculates the « calorific charges »and the duration of fire in a room by state of NPP,
    - Database called « FeuxREP », gives all fire events in French NPPs,
    - Database called « Câbles_état_puissance », gives the cable tray in a building of NPP and information about cables (functional analysis),
    - Database called « Source-cible BR », estimates the malfunction of component if an equipment is in fire in reactor building,
    - XCAD permit to localize equipment and cable trays in a room.

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?
    In general, the project data is readily accessible in a format that can be easily used for the purpose of our PSA. Nevertheless some improvement are possible notably concerning the search by key words (research of fire by kind of reactors PWR, BWR, CANDU…, research of events in a time period…)

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?

    No, the data collected for our national programs is similar to the one of the OECD Fire project. We note difficulties between treatment of national data and those needed for the OCDE Fire

    The obstacles are the quantification of event trees with few events fire.

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

    OCDE Fire Database was notably consulted and was useful notably to present fire induced by electrical cables and to identify fire scenarios due to human action during maintenance.

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    We can notice that the information transmitted by countries is very different. There are not totally homogenous. This heterogeneousness leads IRSN to use for the fire PSA preferentially the national data when the French Operating Experience Feedback is sufficient. For some particular data, notably for the one needed to quantify the fire detection and fire suppression, the national data are not sufficiently numerous for estimating accurate probabilities for the fire event trees quantification. For this particular data the FIRE project will be useful for improving our national data.

    Moreover, to complete the OECD Fire database, it will be interesting to have information about the sort of detection system and about the organization of the firefighting team in each country or NPP.

Questionnaire for the COMPSIS data project

Questionnaire

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

☒ No and never participated in the COMPSIS project (please answer questions 21 - 23)

IRSN participated during the preliminary phases, in order to assess the feasibility of a possible active further participation to the COMPSIS project. As EDF (data owner) interest in the project was very limited, the IRSN participation was also canceled.

☐ Did not participate in the final phase of the project, but participated in an earlier project phase (please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)

☐ Yes *(please answer questions 24 - 30)*

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

21. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

☐ Resources associated with collecting/coding data are excessive
☐ Benefits of participation do not justify the cost
☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)

☒ Proprietary/confidentiality concerns with data

The data source is EDF NPP operating experience.
☐ Not an OECD/NEA member
☐ Other ________________________________

22. With regard to you reasons for not participating in the project: What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

    a. What could have been done to encourage the participation of your organization in the COMPSIS data project?

    b. What advantages and disadvantages did you see to project participation? Had you joined the data project, what information could you have contributed?

    c. Do you believe that there was sufficient information available to support making an informed decision about your participation in the COMPSIS project? If not, what information would you have liked to know about the project?

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this

survey provides a summary of publicly available reports that have been published by the data projects.

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications?

28. Were there any consistency issues between how you data was collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the OPDE/CODAP data project

Questionnaire

Do you participate in the OPDE and/or CODAP project?

- ☐ No and never have participated in either the OPDE or CODAP projects *(please answer questions 31 - 33)*
- ☐ Do not currently participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ☒ Yes *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - ☐ Resources associated with collecting/coding data are excessive
    - ☐ Benefits of participation do not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ________________________________

32. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the CODAP data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

    Our main interest is to be granted an access to a large international database concerning the operating experience of pipeline failures in order to analyse it with our probabilistic tools.

35. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?
      None, since the French utility EDF who owns the information has not yet provided us with any data. Without this delivery, IRSN does not have access to the updated database.
   b. What is the source of the data that you have submitted?
      ./.
   c. Have you used this data to support PSAs in your country?
      ./.
   d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
      No information available.

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
    Very few, since the French participation to the project is in a stand-by state;

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?
    No.

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?
    That step of the project has not been reached yet.

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

    No
40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?
    No

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?
    At IRSN the new reactors data related activities are limited to the verification of the licensee data and approaches to establish data in the frame of new reactors PSA (EPR and ATMEA).
    There are no activities for advanced reactors (GEN IV).

It will be useful if the current database projects would treat specifically the new and evolutionary components and systems (like passive components, computerized systems, advanced human interfaces, high redundancies CCFs…)

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

    IRSN is interested in participating in new data projects.

    Particularly, information on operating experience related to external events is a subject of highest interest for IRSN, especially the impact on the water intake and/or power supply.

43. Other general comments?

    NO

Germany

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: GRS mbH

Type of Organization (please check the appropriate box):

- ☐ Regulatory Agency
- X Government Technical Support Organization
- ☐ Commercial Technical Support
- ☐ Utility/Operator
- ☐ Other _________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

Safety assessment (for licensing and supervision of nuclear installations), R&D

____

Responder Name: Dr. Marina Röwekamp

Address: GRS mbH

Schwertnergasse 1, 50667 Köln

Country: Germany

Telephone/e-mail: +49-(0)221-2068-898 / Marina.Roewekamp@grs.de

Questionnaire for the ICDE data project

Questionnaire

Do you currently participate in the ICDE project?

- ☐ No and never have participated in the project *(please answer questions 1 - 3)*
- ☐ Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- X Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

   - ☐ Resources associated with collecting/coding data are excessive
   - ☐ Benefits of participation do not justify the cost
   - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - ☐ Proprietary/confidentiality concerns with data
   - ☐ Not an OECD/NEA member
   - ☐ Other ________________________________

2. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the ICDE data project?

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

   c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

Initial interest: systematic and complete feedback from operating experience with common cause failure (CCF) events in nuclear power plants; enlarge the information base for early identification of non or little known CCF phenomena including their causes and effects to support own comprehensive assessment of potential CCF phenomena which may occur at safety important components; experience with preventive measures taken in nuclear power plants of other countries; get information regarding partly different methods in collecting, evaluating and modeling CCF events in different countries.

Benefits up to now: excellent feedback and lessons learned from international operating experience with CCF events at NPP; improvement of methods for qualitative assessment of CCF and potential CCF events observed in national operating experience (e.g. impairment vector method, assessment of simultaneity of failures) and development of national CCF event database accordingly and creation of a commonly accepted national approach for assessing CCF and potential CCF events; improvement of methods for quantitative assessment of CCF probabilities (e.g. quantification of impairments) and application of improved methods for generation of quantitative generic CCF data sets published in the technical documents on PSA methods /FAK 05/ and data /FAK 05a/ accomplishing the national PSA Guideline; identification of numerous CCF phenomena not yet observed in national operating experience and deduction of respective recommendations for checking and improving of component specific CCF defense measures in national NPP.

/FAK 05/ Facharbeitskreis (FAK) Probabilistische Sicherheitsanalyse für Kernkraftwerke, Methoden zur Quantifizierung von Ereignisablaufdiagrammen und Fehlerbäumen, Stand: August 2005, BfS-SCHR-37/05, Salzgitter; Oktober 2005

/FAK 05a/ Facharbeitskreis (FAK) Probabilistische Sicherheitsanalyse für Kernkraftwerke, Daten zur Quantifizierung von Ereignisablaufdiagrammen und Fehlerbäumen, Stand: August 2005, BfS-SCHR-38/05, Salzgitter; Oktober 2005

5. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?

      Complete set of CCF events on all component types collected in the ICDE database for the time period 1990 to 2002 and partly up to 2005.

   b. What is the source of the data that you have submitted?

      The source of data submitted to ICDE is the German national database on reportable events including the underlying information on these events by the German licensees.

   c. Have you used this data to support PSAs in your country?

      This data has been used for the technical documents supporting the national German PSA Guideline (see question 4) as well as for most of the PSA having been performed for NPP in Germany in the frame of Periodic Safety Reviews and other PSA studies by the utilities.

   d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

      No.

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

   Specialists and experts on operating experience, technological components and PSA from GRS and the German utilities have been involved in event selection, assessment and coding, and for collection, description and coding of the observed sets of components (exposure data). Finally, the data have been checked and quality assured by the national coordinator, the utilities and the operating agent.

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

   The data is readily available and in a format that can be easily used for various purposes (see questions 4 and 9, for recognized limitations see question 10). In addition, all supporting information, e.g. generic component coding guidelines, specific component coding guidelines and database tools user manual are fully available.

   No proposals for changes or improvements at present.

8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?

   The most important issue is the different language. All event and component descriptions have to be translated in English. Furthermore, the qualitative codes used in ICDE are similar but not identical to the codes used in the German CCF database. But, as the ICDE codes are clearly defined in the ICDE coding guidelines, the submitted data can be coded manually according to the ICDE definitions. Parts of the German CCF database have been adjusted according to the ICDE codes (see question 4).

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

   Data in the project database has been used to support general equipment performance insights activities by GRS (see question 4 on identification of CCF phenomena). The respective reports are not publicly available. However, there are some presentations from conferences available:

   /KRE 10/ Kreuser, A., C. Verstegen: Common-Cause Failure Analysis – Recent Developments in Germany, in: Conference Proceedings of PSAM10 Conference, Seattle, 7-10 June

   /KRE 08/ Kreuser, A., C. Verstegen: Auswertung von Ereignissen mit gemeinsam verursachten Ausfällen (GVA) aus dem internationalen GVA Datenaustauschprojekt ICDE (in German), GRS FACHFORUM, Köln, 07./08. April 2008

   Furthermore, there have been improvements in German CCF quantification methods. The GRS coupling model has been developed with insights from the ICDE project:

   Further development of the coupling model, , Kerntechnik 71 (2006)

   /KRE 06/ Kreuser, A., J. Peschke, J.,-C. Stiller: Coupling Model: A Common-Cause-Failure-Model with Consideration of Interpretation Uncertainties, Nuclear Technology 136, 2001

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    The most significant challenge to using the project data for quantification is the availability of detailed technical description of the exposed components. Such information is necessary to assess the applicability of data for quantification. For some of the collected sets of components this information is available in verbal descriptions. However, providing such information would need huge resources and is therefore limited by the available resources in the participating organizations. Furthermore, as it is not possible to provide such technical detail in coded form, using such information from many 1000 sets of components would also need huge resources for evaluation.

    There are no recommendations for improvement at present.

Questionnaire for the FIRE data project

Questionnaire

Do you participate in the FIRE project?

- No and never have participated in the project *(please answer questions 11 - 13)*
- Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*

X Yes *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ________________________________

12. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the FIRE data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

Initial interest: broader database for application in fire PSA, in particular fire occurrence frequencies, and feedback from operating experience with fire events in nuclear power plants;
Benefits up to now: excellent feedback and lessons learned from international operating experience with fire events at NPP, detailed information and data on high energy arcing fault (HEAF) fire events, first insights on event combinations of fires and other hazards.

15. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?
    Germany has provided data on all fire events, which obligatory have to be reported from German NPP corresponding to the German reporting criteria valid at the time of the event occurrence and a few non-reportable, but however publicly and/or well-known and sufficiently documented NPP fire events.

    b. What is the source of the data that you have submitted?
    The source of the German fire events is mainly the German national database on reportable events including the underlying information on these events by the German licensees, information notices written by GRS and, to some extent (see a.) event reports on the non-.reportable events.

    c. Have you used this data to support PSAs in your country?
    This data has been partly (not completely) used for the more recent Fire PSA having been performed for NPP in Germany in the frame of periodic safety reviews.

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
    Data on fire events in German NPP being non-reportable ones according the German reporting criteria could be used, however these data are not openly available (proprietary licensee data), access to these is unfortunately very difficult (but not totally impossible).

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
For support of the project, fire specialists and experts (senior and junior experts) have been involved in data collection and coding, finally the data have been checked and quality assured by the national coordinator (senior expert) together with the operating agent.

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?
Not all project data are readily accessible and available in a format for direct use in PSA. Depending on the time of the events, for which data were collected – older data are often of less quality and details than more recent event data – and on the country having provided data – information provided on events from NPP in some countries is relatively poor quality with insufficient level of detail – data can principally be used for Fire PSA purposes. The quality of the data provided to the OECD FIRE Database is continuously increasing with the number of events provided. For countries providing information/data on all fire events (without any reporting thresholds), data can to some extent be used as generic data for PSA.

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in

the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?

There are consistency issues between how your data is collected/coded for national programs versus the OECD FIRE data project, since some countries (e.g. Sweden, Finland and Czech Republic) provide event data for all fire events without any reporting criteria and/or thresholds being applied, while others (e.g. Germany and USA) do collect only data from reportable events according to national reporting criteria, which, in addition, might even vary over time. However, these issues do not represent a significant obstacle to the German participation in the data project. From the German point of view, any additional data provide useful information for analysis. Nevertheless, we suggest trying to gather also event data from non-reportable fire events. Furthermore, additional collection on fire protection features failures (reliability data) would be highly beneficial.

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

Experience feedback has continuously being used to account for additional issues up to now not being covered in PSA (e.g. HEAF fire events or events combinations of fires and other internal and external hazards). A first approach on the use of the OECD FIRE Database for event sequence analysis has been recently published at PSAM11. The following references can be mentioned:

/BER 09/ Berg, H. P., B. Forell, N. Fritze, M. Röwekamp: First National Applications of the OECD Fire Database, in: Proceedings of SMiRT 20, 11th International Seminar on Fire Safety in Nuclear Power Plants and Installations, August 17-19, 2009, Helsinki, Finland, 2009

/BER 10/ Berg, H. P., B. Forell, N. Fritze, M. Röwekamp: Exemplary Applications of the OECD FIRE Database, in: Jahrestagung Kerntechnik 2010, Hrsg. Deutsches Atomforum, INFORUM-Verlag, Bonn, Germany, 2010

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/BER 11/ Berg, H.P., N. Fritze: First experiences from international databases on nuclear power plant fire brigade activities, in: Proceedings of SMiRT 21, 12th International Seminar on Fire Safety in Nuclear Power Plants and Installations, München, Germany, September 13-15, 2011, Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH, GRS-A-3651, Köln, Germany, September 2011

/ROE 11b/ Röwekamp, M., H. P. Berg: Anwendbarkeit der internationalen Brandereignisdatenbank OECD FIRE bei Brand-PSA, Präsentation (CD) beim "Symposium '11, Probabilistische Sicherheitsanalysen in der Kerntechnik, Heidelberg, Germany, 26. – 27. Mai 2011": Mai 2011 (in German only)

/ROE 12/ Röwekamp, M., S. Katzer, J. Klindt, H.-P. Berg: Insights from Investigations of High Energy Arcing Fault "HEAF" Events in German Nuclear Power Plants, Paper 54158 in: Proceedings of the 20th International Conference on Nuclear Engineering collocated with the ASME 2012 Power Conference ICONE20-POWER2012, July 30 – August 3, 2012, Anaheim, CA, USA, ASME, August 2012

/TUE 12/ Türschmann, M., W. Werner, M. Röwekamp: Application of OECD FIRE Data for Plant Specific Fire Event Trees, in: Conference Proceedings of PSAM11 Conference, Helsinki, Finland, 2012

/WER 11/ Werner, W., R. Bertrand, A. Huerta, J. S. Hyslop, N. Melly, M. Röwekamp: Enhancements in the OECD FIRE Database - Fire Frequencies and Severity of Events, in: Proceedings of SMiRT 21, 12th International Seminar on Fire Safety in Nuclear Power Plants and Installations, München, Germany, September 13-15, 2011, Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH, GRS-A-3651, Köln, Germany, September 2011

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    Several OECD FIRE database applications feedback indicated that some coded fields were sometimes incomplete or could be misleading, and that additional codes and/or coded field were needed. As far as practicable and feasible in view of the goals of the project the improvements recognized to be necessary have already been implemented. However, it cannot be excluded that further improvements might become necessary in future depending on the practical applications of the Database.

    One further recommendation is to apply this database not only to commercially operated nuclear power plants but also to research reactors. The data could be useful for application in the frame of periodic safety reviews being performed for these reactors.

Questionnaire for the COMPSIS data project

Questionnaire

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

- ☐ No and never participated in the COMPSIS project *(please answer questions 21 - 23)*
- ☐ Did not participate in the final phase of the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- X Yes *(please answer questions 24 - 30)*

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

21. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

    - ☐ Resources associated with collecting/coding data are excessive
    - ☐ Benefits of participation do not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ________________________________

22. With regard to you reasons for not participating in the project: What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

    a. What could have been done to encourage the participation of your organization in the COMPSIS data project?

    b. What advantages and disadvantages did you see to project participation? Had you joined the data project, what information could you have contributed?

    c. Do you believe that there was sufficient information available to support making an informed decision about your participation in the COMPSIS project? If not, what information would you have liked to know about the project?

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

    Initial interest: systematic feedback from operating experience with failure events of software based digital instrumentation and control equipment in nuclear power plants; enlarge the information base for early identification of non or little known failure phenomena including their causes and effects to support own comprehensive assessment of phenomena which may occur at safety important digital I&C equipment.

    Benefits up to now: some feedback and some lessons learned from international operating experience with events related to digital I&C at NPP

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?
       Complete set of events for the time period 1990 to 2010.

    b. What is the source of the data that you have submitted?
       The source of data submitted to COMPSIS was the German national database on reportable events including the underlying information on these events by the German licensees.

    c. Have you used this data to support PSAs in your country?
       No

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
       No.

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

    Specialists and experts on operating experience and I&C from GRS have been involved in event selection, assessment and coding. Finally, the data have been checked and quality assured by the national coordinator, the utilities and the operating agent.

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications?

    The database is readily available including documentation such as the Coding Guideline. However, it can only be used for qualitative assessments. It is unsuitable for quantification purposes, as information on the observed equipment populations has not been part of the data collection. Failure modes have also not been coded in COMPSIS.

28. Were there any consistency issues between how you data was collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?

    No

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

    Data in the project database has been used to support general digital I&C equipment performance insights activities by GRS.

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    The event coding scheme in our view became overly complex. For future digital I&C event collection efforts a significantly simpler coding should be utilized.

Questionnaire for the OPDE/CODAP data project

Questionnaire

Do you participate in the OPDE and/or CODAP project?

- No and never have participated in either the OPDE or CODAP projects *(please answer questions 31 - 33)*
- Do not currently participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*

X Yes *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

- Resources associated with collecting/coding data are excessive
- Benefits of participation do not justify the cost
- Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
- Proprietary/confidentiality concerns with data
- Not an OECD/NEA member
- Other ______________________________

32. With regard to the potential for future project participation:

a. What can be done to encourage the participation of your organization in the CODAP data project?

b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

- Sharing German operating experience with passive mechanical components,
- Structured access to corresponding foreign operating experience,
- Platform for discussion on relevant issues with experts from other countries,
- Extending knowledge base.

35. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

       - Data on events affecting safety related piping in German NPPs
       - Data on events affecting other safety related mechanical components in German NPPs

    b. What is the source of the data that you have submitted?

       - Reportable events, supplemented by information from root cause analyses
       - Additional information from German operators in individual cases

    c. Have you used this data to support PSAs in your country?

       Limited, see item 39

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

       No

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

    Projects funded by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

    The format is perfect. However, there are some doubts regarding the suitability of the data for PSA because of its inhomogeneity, particularly caused by the differing scope of contributions from the participating countries. Qualified use for PSA requires background knowledge on the project history and the limits of the databases.

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?

    The GRS databases which contain information on the operating experience with passive mechanical components in German NPPs (KomPass DB, Internals DB) are structured in a very similar manner.

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

Recently, GRS has investigated the influence of learning effects, i.e. of measures taken after understanding of the root causes of events, on the leak and break frequencies of safety related piping on behalf of the Federal Ministry of Economics and Technology (BMWi). In the frame of these activities data from OPDE were used among others. The work performed is documented in a GRS report /GRE 10a/.

/GRE 10/ Grebner, H., et al., Weiterentwicklung von Methoden zur Ermittlung von Leck- und Bruchhäufigkeiten druckführender Komponenten, Technischer Fachbericht, GRS-A-3555, Gesellschaft für Anlagen und Reaktorsicherheit (GRS) mbH, Köln, Juli 2010 (in German only)

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Data from OPDE / CODAP are mainly used at GRS for generic evaluation of operating experience, in particular for:

- Identification of weak points (susceptible materials / component areas),
- Enhancement of knowledge on relevant degradation mechanisms,
- Enhancement of knowledge on appropriate measure to be taken.

For this reason, the implementation of an additional knowledge base (as already scheduled in CODAP) will be helpful.

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?

Since Germany will phase out of nuclear until 2022, there are actually no new and advanced reactors intended to be built. This is the reason that the data products are not used for new and/or advanced reactors.

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

From the German viewpoint, there are actually no needs for additional projects. However, extending the existing projects, as e.g. mentioned for the FIRE Data Project in the German answer to question 18, might be necessary to some extent.

43. Other general comments?

./.

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: Institut für Sicherheitstechnologie (ISTec) GmbH

Type of Organization

- ☐ Regulatory Agency
- ☐ Government Technical Support Organization
- ☑ Commercial Technical Support
- ☐ Utility/Operator
- ☐ Other _________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

software qualification, independent verification and validation,

research & development

Responder Name: Arndt Lindner

Address: Boltzmannstr. 14

85748 Garching

Country: Germany

Telephone/e-mail: +49(89)32004 529 / arndt.lindner@istec-gmbh.de

Questionnaire for the ICDE data project

Questionnaire

Do you participate in the ICDE project?

- ☑ No *(please answer questions 1 - 3)*
- ☐ Yes *(please answer questions 4 - 10)*

If you are not a participant in the ICDE data project:

1. Why not?

   - ☐ Resources associated with collecting/coding data
   - ☐ Benefits of participation does not justify the cost
   - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - ☐ Proprietary/confidentiality concerns with data
   - ☐ Not an OECD/NEA member
   - ☑ Other Interest is focused on digital I&C only

2. What can be done to encourage the participation of your organization in the ICDE data project? If you were to join, what information would you be able to contribute?

   If the COMPSIS project will be continued in ICDE data project we will contribute with our expertise on digital I&C together with GRS.

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

   Up to now, only little data about events with digital safety I&C is available. Insufficient for PSA. Data must be collected in the future.

If you are a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

5. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?

   b. What is the source of the data submitted?

   c. Have you used this data to support the PSAs in your country?

   d. Is there additional national data that could be used, but is not due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

7. Is the data in the project database provided by the project readily accessible and is it available in a format that can be easily used for the purposes of PSA (including availability of user manuals)?

8. Are there consistency issues between how data is collected/coded for national programs vs. OECD data projects? Do these issues represent a significant obstacle to the use of the data, and how have they been addressed by your organization?

9. Has data in the project database been used to support PSA activities (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports.

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the FIRE data project

<u>Questionnaire</u>

Do you participate in the FIRE project?

- ☐ No *(please answer questions 11 - 13)*
- ☐ Yes *(please answer questions 14 - 20)*

If you are not a participant in the FIRE data project:

11. Why not?

    - ☐ Resources associated with collecting/coding data
    - ☐ Benefits of participation does not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other <u>Not in the scope of our organisation</u>

12. What can be done to encourage the participation of your organization in the FIRE data project? If you were to join, what information would you be able to contribute?

    Nothing.

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

15. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data submitted?

    c. Have you used this data to support the PSAs in your country?

    d. Is there additional national data that could be used, but is not due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

17. Is the data in the project database provided by the project readily accessible and is it available in a format that can be easily used for the purposes of PSA (including availability of user manuals)?

18. Are there consistency issues between how data is collected/coded for national programs vs. OECD data projects? Do these issues represent a significant obstacle to the use of the data, and how have they been addressed by your organization?

19. Has data in the project database been used to support PSA activities (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports.

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the COMPSIS data project

Questionnaire

Do you participate in the COMPSIS project?

- ☐ No *(please answer questions 21 - 23)*
- ☑ Yes *(please answer questions 24 - 30)*

If you are not a participant in the COMPSIS data project:

21. Why not?

    - ☐ Resources associated with collecting/coding data
    - ☐ Benefits of participation does not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ______________________________

22. What can be done (or could have been done) to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

    There are still great uncertainties in determination of reliability of digital safety I&C and therefore uncertainties in licensing processes. The COMPSIS project should improve the situation.

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?
       Data have been provided by GRS.

    b. What is the source of the data submitted?
       National system to collect data about events in German NPPs.

    c. Have you used this data to support the PSAs in your country?
       Not yet.

d. Is there additional national data that could be used, but is not due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

   No, it isn’t. German data provider feed the database with all available information.

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

    Coding, development of coding guideline and procedures.

27. Is the data in the project database provided by the project readily accessible and is it available in a format that can be easily used for the purposes of PSA (including availability of user manuals)?

    Not yet sufficient events to use data in PSA.

28. Are there consistency issues between how data is collected/coded for national programs vs. OECD data projects? Do these issues represent a significant obstacle to the use of the data, and how have they been addressed by your organization?

    No, it isn’t.

29. Has data in the project database been used to support PSA activities (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports.

    Not yet.

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    Continue collecting of data.

Questionnaire for the OPDE/CODAP data project

Questionnaire

Do you participate in the OPDE and/or CODAP project?

- ☐ No *(please answer questions 31 - 33)*
- ☐ Yes *(please answer questions 34 - 40)*

If you are not a participant in the OPDE or CODAP data project:

31. Why not?

- ☐ Resources associated with collecting/coding data
- ☐ Benefits of participation does not justify the cost
- ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
- ☐ Proprietary/confidentiality concerns with data
- ☐ Not an OECD/NEA member
- ☐ Other Not in the scope of our organisation

32. What can be done to encourage the participation of your organization in the FIRE data project? If you were to join, what information would you be able to contribute?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a participant in the FIRE data project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

35. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data submitted?

    c. Have you used this data to support the PSAs in your country?

    d. Is there additional national data that could be used, but is not due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

37. Is the data in the project database provided by the project readily accessible and is it available in a format that can be easily used for the purposes of PSA (including availability of user manuals)?

38. Are there consistency issues between how data is collected/coded for national programs vs. OECD data projects? Do these issues represent a significant obstacle to the use of the data, and how have they been addressed by your organization?

39. Has data in the project database been used to support PSA activities (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports.

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?

    No, we don't.

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

    No, we don't.

43. Other general comments?

Japan

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: Japan Nuclear Energy Safety Organization (JNES)

Type of Organization (please check the appropriate box):

- ☐ Regulatory Agency
- ■ Government Technical Support Organization
- ☐ Commercial Technical Support
- ☐ Utility/Operator
- ☐ Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

Support for NISA (regulatory body in Japan) regarding licensing and inspection of NPPs and make research and development

Responder Name: Haruo Fujimoto

Address: Toranomon Towers Office, 4-1-28 Toramon, Minato-ku, Tokyo, Japan 105-0001

____

Country: Japan

Telephone/e-mail: +81-3-4511-1711 fujimoto-haruo@jnes.go.jp

Questionnaire for the ICDE data project

Questionnaire

Do you currently participate in the ICDE project?

- ☐ No and <u>never</u> have participated in the project *(please answer questions 1 - 3)*
- ☐ Do not <u>currently</u> participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ■ Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

   - ☐ Resources associated with collecting/coding data are excessive
   - ☐ Benefits of participation do not justify the cost
   - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - ☐ Proprietary/confidentiality concerns with data
   - ☐ Not an OECD/NEA member
   - ☐ Other ________________________________

2. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the ICDE data project?

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

   c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

   ・We participate in this database project with aiming at the following objectives and applications;

- To obtain a wide variety of data on events of Common Cause Failure in nuclear power plants from international society.
- To obtain information on root cause of events, experience feedback of events, preventive countermeasures, and reliability attributes.
- To utilize such information obtained to prevent the occurrence of events, to study of improving safety of nuclear power plants, and to develop technical information at sharing the information.

5. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?

      ・So far, we have provided Japanese event data to the ICDE database. The data include administrative documents issued by the nuclear regulatory authority and related reports submitted by utilities.

   b. What is the source of the data that you have submitted?

      ・The sources of the provided data are as follows;
      - Nuclear power plant event reports submitted to the regulatory agency by the utilities pursuant to the related laws.
      - Data from **NUC**lear **I**nformation **A**rchives **"NUCIA"** operated by the **JA**pan **N**uclear **T**echnology **I**nstitute **"JANTI"**.

   c. Have you used this data to support PSAs in your country?

      ・No, we have not used these data to support PSAs, because we don't have enough Japanese CCFs data.

   d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

      ・No, there are no additional Japanese data that could be used.

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

   ・Yes, the project data is readily accessible and available.
   ・No, there is no our recommendation.

8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?

   ・There is no consistency issue.

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

   ・No, data in the project are not used to support PSA activities.

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    ・No, there have neither been the significant challenges nor recommendations in terms of using project data to support PSA activities.

Questionnaire for the FIRE data project

Questionnaire

Do you participate in the FIRE project?

- ☐ No and never have participated in the project *(please answer questions 11 - 13)*
- ☐ Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*
- ■ Yes *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - ☐ Resources associated with collecting/coding data are excessive
    - ☐ Benefits of participation do not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ________________________________

12. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the FIRE data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

    - To apply the project database to quantify fire frequency for Fire PSA

- To refer the fire events contained in the fire database when we review fire protection program licensees developed

15. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?
    The fire events reported to government based on the requirements of the following laws:
    - Law for Regulations of Nuclear Source Material, Nuclear Fuel Material and Reactors and its ordinance
    - The Electric Utility Law and its ordinance

    b. What is the source of the data that you have submitted?
    The event reports provided to government by licensees based on laws and their ordinances (see the above item).

    c. Have you used this data to support PSAs in your country?
    Yes. We analyzed ignition mechanisms for a part of fire PSA methodology enhancement. The results were summarized in NEA/CSNI/R(2009)6 report.

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
    Yes, we have one national fire event not registered in the database. This event was fatal and injury event and it is still on judicial trial. We will register the event after the conclusion of the judicial trial.

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
    The three staffs of JNES have been committing to collecting, coding and submitting of fire events in NPPs of Japan.

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?
    - The project database includes coding items relevant to all phases and activities of event progress. Furthermore, the database contains narrative explanation on each event. These features are helpful for the understanding each events, which is necessary to quantify fire frequency.
    - There is no problem for us on accessibility and availability of the database since the member countries of the project have been extensively discussing structures, formats and coding guide of the project database in every steering meetings. Therefore, we do not have any recommendation about them.

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you

have any suggestions for improving the consistency of your national data programs with the FIRE project?

There is no consistency issue.

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

    We analyzed ignition mechanisms for a part of fire PSA methodology enhancement. This effort is described in the following publicly available report;

    "Development of Fire PSA Methodology," JNES/SAE 06-090, Aug 2006 (in Japanese)

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    The interpretation of fire events is very important for both of fire PSA and fire event analyses. Therefore, the benchmark of interpretation of specified events in the database may be useful for harmonization of fire PSA in member countries. Such a benchmark may help the improvement of coding for the project database.

Questionnaire for the COMPSIS data project

Questionnaire

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

- ■ No and never participated in the COMPSIS project (please answer questions 21 - 23)
- ☐ Did not participate in the final phase of the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ☐ Yes *(please answer questions 24 - 30)*

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

21. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

    - ☐ Resources associated with collecting/coding data are excessive
    - ■ Benefits of participation do not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ________________________________

22. With regard to you reasons for not participating in the project: What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

    a. What could have been done to encourage the participation of your organization in the COMPSIS data project?

    b. What advantages and disadvantages did you see to project participation? Had you joined the data project, what information could you have contributed?

    c. Do you believe that there was sufficient information available to support making an informed decision about your participation in the COMPSIS project? If not, what information would you have liked to know about the project?

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications?

28. Were there any consistency issues between how you data was collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the OPDE/CODAP data project

Questionnaire

Do you participate in the OPDE and/or CODAP project?

- ☐ No and never have participated in either the OPDE or CODAP projects *(please answer questions 31 - 33)*
- ☐ Do not currently participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ■ Yes *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

- ☐ Resources associated with collecting/coding data are excessive
- ☐ Benefits of participation do not justify the cost
- ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
- ☐ Proprietary/confidentiality concerns with data
- ☐ Not an OECD/NEA member
- ☐ Other ________________________________

32. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the CODAP data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

    ・We participate in this database project with aiming at the following objectives and application;

- To obtain a wide variety of data on events of pipe items and static components in nuclear power plants from international society.
- To obtain information on root cause of events, experience feedback of events, preventive countermeasures, reliability attributes, structural integrity evaluation, and regulation of maintenance/ aging management.
- To utilize such information obtained to prevent the occurrence of events, to study of improving safety of nuclear power plants, and to develop technical information bases aiming at sharing the information.

35. In relation to the national data provided to the project:
    a. What national data have you already provided to this project?

    ・So far, we have provided event data to the OPDE database and SCAP-SCC database. Regarding SCAP project, the data included administrative documents issued by the nuclear regulatory authority and reports and technical documents summarized by the authority based on the reviewing the related reports submitted by utilities.

    b. What is the source of the data that you have submitted?

    ・The sources of the provided data are as follows;
    - Nuclear power plant event reports submitted to the regulatory agency by the utilities pursuant to the related laws.
    - Regarding SCAP project, the meeting materials at advisory and/or consultant meeting organized by the Nuclear and Industrial Safety Agency.

    c. Have you used this data to support PSAs in your country?
    Yes, we have.

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

    ・Yes, the project data is readily accessible and available.

    ・No, there is no our recommendation.

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?

    ・There is no consistency issue.

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

    ・Yes, we have the data for parameter estimation. A publicly available reference (file name: 4608K2) is attached.

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    ・No, there have neither been the significant challenges nor recommendations in terms of using project data to support PSA activities.

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

43. Other general comments?

Korea

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: Korea Atomic Energy Research Institute (KAERI)

Type of Organization

- ☐ Regulatory Agency
    - ☐ Government Technical Support Organization
- ☐ Commercial Technical Support
- ☐ Utility/Operator
- ☐ Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

Research & development (Government-supported research institute)

____

Responder Name: Kwang-Il AHN

Address: Integrated Safety Assessment Div., Korea Atomic Energy Research Institute, 150 Deokjin-dong, Yuseong-gu, Daejeon, 305-353

Country: Korea (Republic of)

Telephone/e-mail: (82) 42-868-2657, kiahn@kaeri.re.kr

Questionnaire for the ICDE data project

Questionnaire

Do you participate in the ICDE project?

- ☐ No *(please answer questions 1 - 3)*

- ☐ **Yes** *(please answer questions 4 - 10)*

If you are not a participant in the ICDE data project:

1. Why not?

   - ☐ Resources associated with collecting/coding data
   - ☐ Benefits of participation does not justify the cost
   - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - ☐ Proprietary/confidentiality concerns with data
   - ☐ Not an OECD/NEA member
   - ☐ Other ______________________________

2. What can be done to encourage the participation of your organization in the ICDE data project? If you were to join, what information would you be able to contribute?

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

   We have used the generic CCF parameters of NRC for the domestic PSA because we don't have CCF raw data. It is necessary to estimation the specific CCF parameters for a plant to obtain realistic PSA results. Thus, we participated in this project to obtain CCF raw data.

5. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?

      We provided the data for MOV, EDG, MDP (Centrifugal), CV, and breakers.

   b. What is the source of the data submitted?

The data extracted from operating experiences.

c. Have you used this data to support the PSAs in your country?

   We didn't use yet, but we only performed a case study.

d. Is there additional national data that could be used, but is not due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

   We submitted only the data for 5 components, so we have additional data that could be used. Additional data will be collected and analyzed from this year. Also, we need some data for the low power shutdown PSA

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

   Data for 5 components are collected, coded according to the guideline and submitted.

7. Is the data in the project database provided by the project readily accessible and is it available in a format that can be easily used for the purposes of PSA (including availability of user manuals)?

   There is no problem to access to the database, but database is lack of data for detail analysis. Also, there is no a program for the quantification that is internationally used.

8. Are there consistency issues between how data is collected/coded for national programs vs. OECD data projects? Do these issues represent a significant obstacle to the use of the data, and how have they been addressed by your organization?

   Since we didn't have our own data collection or coding guide, there are no consistency issues. However, some countries' data are not recorded according to the collection and coding requirements.

9. Has data in the project database been used to support PSA activities (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports.

   Only a case study was performed so far.

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

   We would like to recommend that ICDE project estimate ICDE generic CCF parameters such as NUREG CCF data. The generic CCF parameters could be used as a reference to most countries which don't have database, and the countries which are not participated in the project will be interested in ICDE database.

Questionnaire for the FIRE data project

Questionnaire

Do you participate in the FIRE project?

- No *(please answer questions 11 - 13)*
- **Yes** *(please answer questions 14 - 20)*

If you are not a participant in the FIRE data project:

11. Why not?

- Resources associated with collecting/coding data
- Benefits of participation does not justify the cost
- Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
- Proprietary/confidentiality concerns with data
- Not an OECD/NEA member
- Other ________________________________

12. What can be done to encourage the participation of your organization in the FIRE data project? If you were to join, what information would you be able to contribute?

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

    Main reasons are to understand fire events and their causes in order to get measures for their prevention and to mitigate their consequences. Another reason is to use the OECD data for domestic fire PSA.

15. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

       Korea has provided six fire event data for operating nuclear power plants.

    b. What is the source of the data submitted?

Most data came from the reports of fire event prepared by the regulatory agency (KINS) and the utility (KHNP).

c. Have you used this data to support the PSAs in your country?

   No.

d. Is there additional national data that could be used, but is not due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

   No.

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

    Since the fire events are rarely occurred, resources to support the project were not of main concerns.

17. Is the data in the project database provided by the project readily accessible and is it available in a format that can be easily used for the purposes of PSA (including availability of user manuals)?

    Yes.

18. Are there consistency issues between how data is collected/coded for national programs vs. OECD data projects? Do these issues represent a significant obstacle to the use of the data, and how have they been addressed by your organization?

    No.

19. Has data in the project database been used to support PSA activities (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports.

    No.

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    Comparing with NUREG/CR-6850, the number of fire event data is too small to use them in the fire PSA. Moreover, some countries' data are not recorded according to the collection and coding guidelines.

Questionnaire for the COMPSIS data project

<u>Questionnaire</u>

Do you participate in the COMPSIS project?

- ☐ No *(please answer questions 21 - 23)*

- ☐ **<u>Yes</u>** *(please answer questions 24 - 30)*

If you are not a participant in the COMPSIS data project:

21. Why not?

- ☐ Resources associated with collecting/coding data
- ☐ Benefits of participation does not justify the cost
- ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
- ☐ Proprietary/confidentiality concerns with data
- ☐ Not an OECD/NEA member
- ☐ Other ________________________________

22. What can be done (or could have been done) to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

    The reason is to collect reliability data for digital I&C PSA.

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

       Yes, we have done

    b. What is the source of the data submitted?

       Digital-induced trip occurrence data for commercial operating NPP were submitted.

    c. Have you used this data to support the PSAs in your country?

       Not yet.

d. Is there additional national data that could be used, but is not due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

   Yes, it is, including digital I&C component failure data.

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

27. Is the data in the project database provided by the project readily accessible and is it available in a format that can be easily used for the purposes of PSA (including availability of user manuals)?

    Yes, the COMPSIS database is accessible. However, it is not appropriate for the purposes of PSA.

28. Are there consistency issues between how data is collected/coded for national programs vs. OECD data projects? Do these issues represent a significant obstacle to the use of the data, and how have they been addressed by your organization?

    COMPSIS data has been collected in the limited scope of high-level events, e.g., digital-failure-induced trip events, In other words, there are no low-level events such as safety-related digital I&C component failure data. It is the significant limitation to the use of the data for digital I&C PSA.

29. Has data in the project database been used to support PSA activities (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports.

    Not at all. However, COMPSIS data is helpful for understanding failure mechanism of digital I&C component and system.

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    We'd like to recommend that the scope of COMPSIS data include low-level operational failure data, e.g., safety-related DI&C component failure data.

Questionnaire for the OPDE/CODAP data project

Questionnaire

Do you participate in the OPDE and/or CODAP project?

- ☐ No *(please answer questions 31 - 33)*

- ☐ **Yes** *(please answer questions 34 - 40)*

If you are not a participant in the OPDE or CODAP data project:

31. Why not?

- ☐ Resources associated with collecting/coding data
- ☐ Benefits of participation does not justify the cost
- ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
- ☐ Proprietary/confidentiality concerns with data
- ☐ Not an OECD/NEA member
- ☐ Other ________________________________

32. What can be done to encourage the participation of your organization in the OPDE data project? If you were to join, what information would you be able to contribute?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a participant in the OPDE data project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

    We wanted to obtain more piping failure data, since piping failure in safety significant area of NPP is a rare event. With the data, we were to calculate piping failure frequency for RCS piping rupture frequency and flooding frequency. By participating in the OPDE data project, we obtained enough data to calculate piping failure frequency, and as a result KAERI and KINS developed a Korean specific piping failure database and developed an ISI method with the piping failure frequency.

35. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

       We have provided data about 50 piping failures occurred in Korean NPPs.

b. What is the source of the data submitted?

Replacement program report, corrective action report, root cause report, LER etc.

c. Have you used this data to support the PSAs in your country?

We tried to use the data for flooding PSA with flooding frequency and Level 1 PSA with LOCA frequency, but we did not apply the data in practice.

d. Is there additional national data that could be used, but is not due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

No

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

There was a guideline for collecting, coding, and submitting data. We followed the guideline. The guideline for OPDE project required detailed information.

37. Is the data in the project database provided by the project readily accessible and is it available in a format that can be easily used for the purposes of PSA (including availability of user manuals)?

It is convenient to access the database provided by the project and also it is not difficult to change the format for PSA.

38. Are there consistency issues between how data is collected/coded for national programs vs. OECD data projects? Do these issues represent a significant obstacle to the use of the data, and how have they been addressed by your organization?

There was no national program for piping failure database when we started OPDE project. We examined piping failure event one by one with various report. After participating in the project, we developed Korean piping failure database. The format the Korean specific DB is similar to OPDE DB.

39. Has data in the project database been used to support PSA activities (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports.

We have researched to calculate flooding frequency and RCS piping rupture frequency for PSA activities.

[References]:

[1] Sun Yeong Choi, Young Hwan Choi, and Jae Joo Ha, Evaluation of RCS Piping Rupture Frequency by Using OPDE Database, Transactions of KPVP, Vol 1. No.1, September 2005.

[2] Sun Yeong Choi and Joon-Eon Yang, Flooding PSA by Considering the Operating Experience Data of Korean PWRs, Nuclear Engineering and Technology, Vol.39 No.3 June 2007.

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

No, we did not encounter any significant challenges so far.

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

43. Other general comments?

It is necessary for the countries have plenty of data to open their data fully to other countries for PSA.

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: Korea Institute of Nuclear Safety (KINS)

Type of Organization (please check the appropriate box):

- ☐ Regulatory Agency
- ☐ Government Technical Support Organization
- ☐ Commercial Technical Support
- ☐ Utility/Operator
- ☐ Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

Licensing

Responder Name: Taesuk Hwang

Address: 62 Kwahak-ro, Yuseong-gu, Daejon-city, KOREA

Country: KOREA

Telephone/e-mail: +82-42-868-0653/tshwang@kins.re.kr

Questionnaire for the ICDE data project

Questionnaire

Do you currently participate in the ICDE project?

- No and never have participated in the project *(please answer questions 1 - 3)*
- Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

   - Resources associated with collecting/coding data are excessive
   - Benefits of participation do not justify the cost
   - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - Proprietary/confidentiality concerns with data
   - Not an OECD/NEA member
   - Other KAERI is currently participating in ICDE as a Korean delegate

2. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the ICDE data project?

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

   c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

   ICDE website has several valuable data information publicly available, but not fully sufficient. We have experience in reviewing the licensee's PSA results with reference of information in your reports, such as "NEA/CSNI/R(2003)15, Collection and analysis of common-cause failure of check-valves".

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

5. In relation to the national data provided to the project:

a. What national data have you already provided to this project?

b. What is the source of the data that you have submitted?

c. Have you used this data to support PSAs in your country?

d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the FIRE data project

Questionnaire

Do you participate in the FIRE project?

- No and never have participated in the project *(please answer questions 11 - 13)*
- Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ________________________________

12. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the FIRE data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.
    To understand the current fire protection activities
    To get the information of fire events
15. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

There is no specific national data but some data of fire events occurred in operating nuclear power plants had been provided already.

b. What is the source of the data that you have submitted?
4 fire events had been submitted.

c. Have you used this data to support PSAs in your country?
Those data are not used due to insufficient number of data.

d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
There are no additional data.

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
Fund of long term research project supported by Korean government is used in this project.
4 staffs are involved in this project.

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?
No but it may not be difficult to transform the data format.
Not now but we will consider the recommendation after the fire data sufficient to PSA work are collected.

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?
There is no issue on consistency because we don't have the official national program to collect the fire data until now..
No. We don't have any issues to be an obstacle to participate the FIRE project.
Concerning the consistency issue, we would like to suggest that it is better to have the consistency of FIRE DB with EPRI fire DB.

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).
No, we do not use the FIRE DB for PSA activities yet.

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?
No. There have not been any other significant challenges because FIRE DB is not sufficient to use in PSA work.

Questionnaire for the COMPSIS data project

Questionnaire

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

- No and never participated in the COMPSIS project *(please answer questions 21 - 23)*
- Did not participate in the final phase of the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 24 - 30)*

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

21. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ______________________________

22. With regard to you reasons for not participating in the project: What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

    a. What could have been done to encourage the participation of your organization in the COMPSIS data project?

    b. What advantages and disadvantages did you see to project participation? Had you joined the data project, what information could you have contributed?

    c. Do you believe that there was sufficient information available to support making an informed decision about your participation in the COMPSIS project? If not, what information would you have liked to know about the project?

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

    As computer based systems are widely being used in NPPs, events induced by computer systems are also increasing. But it is difficult to analyze or find the failure mechanisms and root causes because of the complexity of those systems. We have experienced several events caused by digital systems. So we have joined the COMPSIS project to share our experiences and get the information from other countries. We think we could have made better regulatory decision with the information of COMPSIS project data during the evaluation process regarding the computer based systems

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?
       We have provided the data of 4 events

    b. What is the source of the data that you have submitted?
       The data are based on the event reports prepared by KINS

    c. Have you used this data to support PSAs in your country?
       No.

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
       No additional national data.

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

    Manager of I&C department and one staff of KINS were involved to collect, code and submit data.

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications?

    Data of COMPSIS project is not readily accessible format for the purposes of PSA. Data of COMPSIS project contains qualitative descriptions such as plant information, cause analysis, consequence analysis, lessons learned and corrective actions etc.

28. Were there any consistency issues between how you data was collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?

    There were no consistency issues. The data was coded according to the event coding guidelines developed by member countries

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

The data was not used to support PSA activities

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

There were no significant challenges to using project data

Questionnaire for the OPDE/CODAP data project

Questionnaire

Do you participate in the OPDE and/or CODAP project?

- No and never have participated in either the OPDE or CODAP projects *(please answer questions 31 - 33)*
- Do not currently participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ________________________________

32. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the CODAP data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

KINS participates in OPDE/CODAP data project in order to gain feedback from failure events and the related corrective actions, to understand aging mechanisms and determine effective aging management program, and to utilize failure data as a validation source for a probabilistic safety assessment code.

35. In relation to the national data provided to the project:

a. What national data have you already provided to this project?
KINS has provided information on pipe failure data in domestic nuclear power plants.

b. What is the source of the data that you have submitted?
The source of the data includes regulatory periodic inspection report, utility's inspection and maintenance report and repair/replacement program.

c. Have you used this data to support PSAs in your country?

Yes. KINS analyzed pipe failure data in domestic nuclear power plants and evaluate pipe rupture frequencies of the very small LOCA, feedwater line break events, and flood events. The resulting pipe rupture frequencies were used as initiating event frequencies for the PSA of Korean PWR plants.

d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
No.

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

National long term research project fund is used and 1 manager / 1 staff are involved in this project.

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

All accumulated project data are available and easily accessible to participants. Even though data processing is needed to use it for other application including PSA, OPDE project published 'OPDE Database Applications Handbook' to provide descriptions of the data processing steps and examples of application.

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?

No.

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

    KINS analyzed pipe failure data in domestic nuclear power plants and evaluate pipe rupture frequencies of the very small LOCA, feedwater line break events, and flood events. The resulting pipe rupture frequencies were used as initiating event frequencies for the PSA of Korean PWR plants.

    Reference: International Journal of Pressure Vessels and Piping, Vol. 90, pp. 56-60, Application of piping failure database to nuclear safety issues in Korea

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    Pipe population data (i.e. total number of welds with similar condition etc.) is needed to evaluate a pipe failure frequency. However, this information is difficult to obtain from the utility. It would be helpful if there are some reference values of pipe population data to some representative plant types and system.

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?

    The fire event data in FIRE project are not depending on the reactor type so we don't think there is a need to changes in applying FIRE DB to new and advanced reactors.

    KINS launched the project on data collection of repair welding of piping and components for advanced reactors this year.

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

    Not in specific data at this moment, but KINS is interested in supporting a new project if a new data is valuable.

43. Other general comments?

    No.

Slovakia

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1

Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)

Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: UJD SR, RELKO Ltd

Type of Organization (please check the appropriate box):

- ❖ Regulatory Authority (UJD SR)
- ☐ Government Technical Support Organization
- ❖ Commercial Technical Support (RELKO Ltd)
- ☐ Utility/Operator
- ☐ Other _________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

Nuclear plant safety and PSA

Responder Name: Jan Husarcek (UJD SR) and Zoltan Kovacs (RELKO)

Address: Bajkalska 27 Bratislava (UJD SR),

Racianska 75, Bratislava (RELKO)

Country: Slovakia

Telephone/e-mail: +421 2 58221-153 (UJD SR), +421 2 44460138 (RELKO)

Questionnaire for the ICDE data project

Questionnaire

Do you currently participate in the ICDE project?

- ❖ No and never have participated in the project *(please answer questions 1 - 3)*
- Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

   - Resources associated with collecting/coding data are excessive
   - ❖ Benefits of participation do not justify the cost
   - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - Proprietary/confidentiality concerns with data
   - Not an OECD/NEA member
   - Other ________________________________

2. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the ICDE data project? *We are not familiar with the project, more detailed information is needed about the project.*

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute? *The advantages are in transfer of know how in this area. The disadvantages are regarding the applicability of the results for the WWER plants. The experience from the Slovak NPPs would be provided*

   c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project? *Sufficient information is not available, as it was already mentioned in point a., detailed description is needed mainly about the used methodology, data collection and analyses, implementation of the results, what was done in the past and what will be done in the future.*

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects. *Very limited information is available about the project for non-participant PSA developers. The publicly available reports are not enough to make decision about the participation in the project.*

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

5. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?

   b. What is the source of the data that you have submitted?

   c. Have you used this data to support PSAs in your country?

   d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the FIRE data project

Questionnaire

Do you participate in the FIRE project?

❖ No and never have participated in the project *(please answer questions 11 - 13)*

- Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*

- Yes *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

- Resources associated with collecting/coding data are excessive

❖ Benefits of participation do not justify the cost

- Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)

❖ Proprietary/confidentiality concerns with data

- Not an OECD/NEA member
- Other ________________________________

12. With regard to the potential for future project participation:

a. What can be done to encourage the participation of your organization in the FIRE data project? *We are not familiar with the project, more detailed information is needed about the project.*

b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute? *The advantages are in transfer of know how in this area. The disadvantages are regarding the applicability of the results for the WWER plants. Slovak data can be provided for the project.*

c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project? *Sufficient information is not available, as it was already mentioned in point a., detailed description is needed mainly about the used methodology, data collection and analyses, implementation of the results, what was done in the past and what will be done in the future.*

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data

projects. *Very limited information is available about the project for non-participant PSA developers.The publicly available reports are not enough to make decision about the participation.*

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

15. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the COMPSIS data project

Questionnaire

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

❖ *No and never participated in the COMPSIS project (please answer questions 21 - 23)*

☐ Did not participate in the final phase of the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*

☐ Yes (please answer questions 24 - 30)

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

21. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

    ☐ Resources associated with collecting/coding data are excessive
    ❖ Benefits of participation do not justify the cost
    ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    ❖ Proprietary/confidentiality concerns with data
    ☐ Not an OECD/NEA member
    ☐ Other ________________________________

22. With regard to you reasons for not participating in the project: What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

    d. What could have been done to encourage the participation of your organization in the COMPSIS data project? *We are not familiar with the project, more detailed information is needed about the project.*

    e. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute? *The advantages are in transfer of know how in this area. The disadvantages are regarding the applicability of the results for the WWER plants. Slovak data can be provided for the project*

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project? *Sufficient information is not available, as it was already mentioned in point a., detailed description is needed mainly about the used methodology, data collection and analyses, implementation of the results, what was done in the past and what will be done in the future.*

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data

projects.*Very limited information is available about the project for non-participant PSA developers.The publicly available reports are not enough to make decision about the participation.*

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted? .

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications? The project data

28. Were there any consistency issues between how you data was collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the OPDE/CODAP data project

Questionnaire

Do you participate in the OPDE and/or CODAP project?

- ❖ No and never have participated in either the OPDE or CODAP projects *(please answer questions 31 - 33)*

- Do not currently participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*

- Yes *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - ❖ Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ________________________________

32. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the CODAP data project? To provide more detailed information about the project

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute? *The advantages are in transfer of know how in this area. The disadvantages are regarding the applicability of the results for the WWER plants. Slovak data can be provided for the project*

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project? *Sufficient information is not available, as it was already mentioned in point a., detailed description is needed mainly about the used methodology, data collection and analyses, implementation of the results, what was done in the past and what will be done in the future.*

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data

projects. *Very limited information is available about the project for non-participant PSA developers. The publicly available reports are not enough to make decision about the participation.*

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

35. In relation to the national data provided to the project:

    e. What national data have you already provided to this project?

    f. What is the source of the data that you have submitted?

    g. Have you used this data to support PSAs in your country?

    h. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors? *All these data projects are focused on western designed PWR and BWR. The WWER data are not implemented. Better support is possible after implementation of data from all type of reactors in operation and to discuss the issue of applicability of data from one type of reactors to other types.*

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project? *We do not see at the present time such needs.*

43. Other general comments? *No*

Spain

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: CSN Spain

Type of Organization (please check the appropriate box):

- ☐ Regulatory Agency.
- ☐ Government Technical Support Organization
- ☐ Commercial Technical Support
- ☐ Utility/Operator
- ☐ Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

Licensing, inspection, NPP control and oversight.

Responder Name: Mª Teresa Vázquez

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Country: Spain

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Questionnaire for the ICDE data project

Questionnaire

Do you currently participate in the ICDE project?

- ☐ No and never have participated in the project *(please answer questions 1 - 3)*
- ☐ Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ☐ Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

   - ☐ Resources associated with collecting/coding data are excessive
   - ☐ Benefits of participation do not justify the cost
   - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - ☐ Proprietary/confidentiality concerns with data
   - ☐ Not an OECD/NEA member
   - ☐ Other ________________________________

2. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the ICDE data project?

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

   c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

CSN understands that one of the threats to safety in NPP is common cause failures, so the best way to face them is to have the maximum knowledge about them. In order to achieve this goal CSN has been participating in ICDE project since the beginning.

The benefits are to get and share the experience from different countries and to apply this experience to develop approach and mechanisms for their prevention. In addition we also used the knowledge for improving our risk based inspections.

5. In relation to the national data provided to the project:
   a. What national data have you already provided to this project?

      It depends on the NPP. In general it covers 10 years operational experience for: Centrifugal pumps, check valves, breakers, batteries and motor operates valves.
   b. What is the source of the data that you have submitted?

      Spanish NPP provided all the data. The CCF data analysis is made by the PSA data group in the PSA team in each NPP.

      As a part of the PSA data analysis, Spanish NPP make a qualitative and quantitative CCF data analysis. The qualitative analysis is sent to ICDE project.
   c. Have you used this data to support PSAs in your country?

      In the quantitative analysis in the PSA, NPP use their own data, they do not use ICDE database. However the general coding guidelines are used as a guide for NPP.
   d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

      No.
6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

   I cannot give a clear estimation about resources.
7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

   It would be difficult for us to use the ICDE data as a source of quantification for PSA, as far as the description, scope of components; groups of analysis and etc. are not the same that Spanish PSA. However we think that they are very useful in order to identify and to analyze the failure information from the NPP.
8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?

   See previous answered

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

   See previous answered

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    No challenges. No suggestion.

Questionnaire for the FIRE data project

Questionnaire

Do you participate in the FIRE project?

- ☐ No and never have participated in the project *(please answer questions 11 - 13)*
- ☐ Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*
- ☐ Yes *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - ☐ Resources associated with collecting/coding data are excessive
    - ☐ Benefits of participation do not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ________________________________

12. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the FIRE data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

    CSN understands that fires are one of the main threats to safety in NPP. Fires can cause failures on different components at the same time, so the best way to face them is to have the maximum knowledge about them. In order to achieve this goal CSN has been participating in FIRE project since the beginning.

The benefits are to get and share the experience from different countries and to apply this experience to develop approach and mechanisms for their prevention.

15. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

       Spain has provided data of each NPP. All the fire events that have been informed to CSN since the starting of each NPP

    b. What is the source of the data that you have submitted?

       The source of data is the events which had been informed to the CSN

    c. Have you used this data to support PSAs in your country? .

       Some NPP use their events as a source of data for initiating frequencies.

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)? NO

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

    I cannot give a clear estimation about resources.

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

    There are not problems with accessibility or availability of data.

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?

    Data from FIRE database have not used in Spanish PSA. It is difficult to be sure about the homogeneity for all sources and gathering process of data in all countries, but it does not mean a problem for our participation in the project.

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available). No

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement? No

Questionnaire for the COMPSIS data project

Questionnaire

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

- No and never participated in the COMPSIS project *(please answer questions 21 - 23)*
- Did not participate in the final phase of the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 24 - 30)*

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

21. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other We don´t have any kind of experience in Computer-based Systems Important to Safety. None Spanish NPP have installed these systems.

22. With regard to you reasons for not participating in the project: What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project? Nothing at all

    a. What could have been done to encourage the participation of your organization in the COMPSIS data project?

    b. What advantages and disadvantages did you see to project participation? Had you joined the data project, what information could you have contributed?

    c. Do you believe that there was sufficient information available to support making an informed decision about your participation in the COMPSIS project? If not, what information would you have liked to know about the project?

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

    Spanish CSN has not used these data project

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications?

28. Were there any consistency issues between how you data was collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the OPDE/CODAP data project

Questionnaire

Do you participate in the OPDE and/or CODAP project?

- No and never have participated in either the OPDE or CODAP projects *(please answer questions 31 - 33)*
- Do not currently participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ________________________________

32. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the CODAP data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

The reasons are those specified in the goals of the project. The benefits of the participation : having a database of piping failure at international level with a quite large number of events; getting reports prepared by the participants or by the clearinghouse, on issues related to piping failure; exchange operating experience with the other participants in the project, knowing applications of the database performed by other participants, ...

35. In relation to the national data provided to the project:

    i. What national data have you already provided to this project?

       Spain has provided the data related to 20 piping failure events. Some other events were already in the original database.

    j. What is the source of the data that you have submitted?

       The data were taken from the records of those events provided by the NPPs.

    k. Have you used this data to support PSAs in your country?

       No, so far.

    l. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

       Yes, there are additional data on piping failure events that could be provided to the project. The reason to not have provided them yet is due to budgetary problems, as it is very costly to collect data from past events.

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

    12 months.man for collecting and submitting data to the project.

    The national coordinator participated in almost all project meetings (2 days every six months); review of the Coding Guidelines, QA program, User's Manual. Organization of one project meeting in Spain, preparation of presentations with events occurred in Spain to be presented at the project meetings, preparation of presentations with the potential applications of the database in Spain.

    A three days course on how to use the database was held at CSN.

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

    The database (about 4.000 events) is available in ACCESS format. In the CSN the database and all documents related to this project are in a network space accessible to the people potentially interested in these data and reports (about 40 people from different technical areas including, Mechanical Engineering, ISI, PSA Nuclear Systems, Operating Experience, Safety Analysis, ...). So far, the database was not used for PSA purposes. Only few queries were done at CSN for other purposes.

    We still don't know what changes are needed to use the database for PSA purposes. It's something to be analyzed.

    One aspect to be considered in what concerns the use of the database for PSA purposes, is database completeness. It is not guaranteed that all piping failure events in all participating countries are included in the database. There are different approaches in the participating countries in what concerns data submission, because of the different reporting criteria in each country. There is a need to establish the same reporting criteria for all participating countries (for the purposes of data submission) and a strong commitment of all participating countries with the project in the sense that all events be included in the database. So far, this is not the case.

Another aspect related to the use of the database for PSA purposes is that the database does not include the number of areas, piping length, etc., so probabilities cannot be determined. This is an issue of big concern, because of the difficulties associated with this task. So far, only one country stated its commitment in doing it.

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?

    The data submitted by Spain were done in a particular basis. There is not consistency between OPDE and any other national program. The fields required in OPDE are of much higher detail than any other national database.

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

    So far no, as stated in 37.

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    The format of the database, ACCESS, is not necessarily well known by the technicians that could be interested in the use of this database. This is an important aspect to be taken into account, as queries are not so easy to perform. A deep knowledge of the database is needed to get something out of it, and this knowledge is not on each person potentially interested. The project, through the Clearinghouse (who really knows the database), should prepare reports on topics suggested or required by National Coordinators.

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors? No

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project? No

43. Other general comments?

    No comments

Sweden

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: Swedish Radiation Safety Authority (SSM)

Type of Organization
- Regulatory Agency

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

Regulation, licensing, inspection, research & development

Responder Name: Ralph Nyman

for OECD/ICDE, OECD/FIRE, OECD/OPDE

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Country: Sweden

Telephone/e-mail: ralph.nyman@ssm.se

Responder Name: Bo Liwång for COMPSIS

Address: Solna Strandväg 96

SE-17116 Stockholm

Country: Sweden

Telephone/e-mail: bo.liwang@ssm.se

Questionnaire for the ICDE data project

Questionnaire

Do you participate in the ICDE project?

- Yes *(please answer questions 4 - 10)*

If you are not a participant in the ICDE data project:

1. Why not?

   - Resources associated with collecting/coding data
   - Benefits of participation does not justify the cost
   - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - Proprietary/confidentiality concerns with data
   - Not an OECD/NEA member
   - Other ________________________________

2. What can be done to encourage the participation of your organization in the ICDE data project? If you were to join, what information would you be able to contribute?

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.
   - Former SSM (the SKI) initiated the ICDE project together with NRC, GRS and HSI in mid 90ies. SSM interest is of course to provide and exchange CCF data with other member countries. Sweden is a small country with few plants and therefore also with a limited experience of CCFs. To change data with other members gives 90% more data back than we can provide.

5. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?
   - SE has participated in all component data collections

   b. What is the source of the data submitted?
   - SE Licensee Event Reports

   c. Have you used this data to support the PSAs in your country?
   - Yes

   d. Is there additional national data that could be used, but is not due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

- In the ICDE project the component boundaries do follow the boundaries established in the T-Book (Reliability data on safety related components in Nordic NPPs)
- SE has very good data on single critical failures on safety related components – presented in the so called T-Book
- SE has been quite active in interpretation and testing the collected ICDE data in Nordic projects, with Germany etc to develop CCF parameters to be used in the PSA:s.

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
   - In SE the licensees have established a working group with responsibility to collect relevant CCF event records from the past, to do the expected data work according to the ICDE component specific coding guidelines. Data is collected from licensees and SSM

7. Is the data in the project database provided by the project readily accessible and is it available in a format that can be easily used for the purposes of PSA (including availability of user manuals)?
   - All SE data is transparent and can be found in the domestic LER databases. All old CCF data that is provided to the ICDE project is also quality assured in separate reports, published by the Nordic PSA Group (NPSAG).

8. Are there consistency issues between how data is collected/coded for national programs vs. OECD data projects? Do these issues represent a significant obstacle to the use of the data, and how have they been addressed by your organization?
   - Yes. There is difference in the SE LER form and in the ICDE database structure. ICDE format is more complex regarding search for dependent failures of course. ICDE data have to be prepared by specialist prior to the use of the data.

9. Has data in the project database been used to support PSA activities (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports.
   - Yes. The ICDE CCF data is used by SSM in regulatory matters as examples e.g., the existancy of dependent and CCF:s failures in own as well as other countries.
   - There are several SSM reports providing the Nordic country interpretations of ICDE data as;
     - SSM report 2009:07,
     - SKI report 2007:41
     - SKI report 2004:04
     - Several Nordic PSA Group (NPSGA) reports are now under finalization

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?
    - One problem is to incorporate the ICDE results (new CCF parameters) fully in the domestic PSA:s. One cause is that it takes so long time to reach final results from the OECD ICDE components studies and after that on national level create new/updated CCF parameters. The challenge is to communicate the interesting findings by time to the licensees.

- One challenge is to find other countries to participate with in benchmarks of the ICDE data and to interpret other countries CCF data to the own conditions. The fact is that small countries have to develop larger population groups to be able to find data to count on and to decrease the uncertainties.

Questionnaire for the FIRE data project

Questionnaire

Do you participate in the FIRE project?

- Yes *(please answer questions 14 - 20)*

If you are not a participant in the FIRE data project:

11. Why not?

    - Resources associated with collecting/coding data
    - Benefits of participation does not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ________________________________

12. What can be done to encourage the participation of your organization in the FIRE data project? If you were to join, what information would you be able to contribute?

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.
    - Former SSM (the SKI) together with STUK strongly recommended CSNI to start up a FIRE. SSM interest is of course to provide and exchange FIRE data with other member countries. Sweden donated the SE FIRE database to OECD when the project started ones upon the time.

15. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?
    - All SE fire data

    b. What is the source of the data submitted?
    - All known SE LER report, rescue services reports, licensee´s fire report

    c. Have you used this data to support the PSAs in your country?
    - Still to be done

    d. Is there additional national data that could be used, but is not due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
    - No

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
    - In SE the licensees have established a working group with responsibility to collect relevant FIRE event records from the past, to do the expected data work according to the FIRE component specific coding guidelines. Data is collected from licensees and SSM. The licensees do nowadays use the FIRE Coding guideline form in reporting of fires to SSM and the OECD FIRE project.

17. Is the data in the project database provided by the project readily accessible and is it available in a format that can be easily used for the purposes of PSA (including availability of user manuals)?
    - Yes

18. Are there consistency issues between how data is collected/coded for national programs vs. OECD data projects? Do these issues represent a significant obstacle to the use of the data, and how have they been addressed by your organization?
    - Yes. FIRE data have to be prepared by specialist prior to the use of the data.

19. Has data in the project database been used to support PSA activities (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports.
    - Yes. Fire frequencies have been developed and used in SE FIRE PSA

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?
    - No
    - It takes long time get results from certain FIRE analysis or topics on the agenda.
    - One challenge is to communicate the interesting findings by time to the licensees.

Questionnaire for the COMPSIS data project

<u>Questionnaire</u>

Do you participate in the COMPSIS project?

- ☐ Yes *(please answer questions 24 - 30)*

If you are not a participant in the COMPSIS data project:

21. Why not?

- ☐ Resources associated with collecting/coding data
- ☐ Benefits of participation does not justify the cost
- ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
- ☐ Proprietary/confidentiality concerns with data
- ☐ Not an OECD/NEA member
- ☐ Other ________________________________

22. What can be done (or could have been done) to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.
    - It was a forum for exchange of information. Most for the qualitative part, not so much for the quantitative.

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?
        - An event in Ringhals

    b. What is the source of the data submitted?
        - National LER

    c. Have you used this data to support the PSAs in your country?
        - No

    d. Is there additional national data that could be used, but is not due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

- o There are some more (one or two) national data that could be used.

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
    - There are no records on this

27. Is the data in the project database provided by the project readily accessible and is it available in a format that can be easily used for the purposes of PSA (including availability of user manuals)?
    - No. The data is too small to be used in a quantitative way.

28. Are there consistency issues between how data is collected/coded for national programs vs. OECD data projects? Do these issues represent a significant obstacle to the use of the data, and how have they been addressed by your organization?
    - No answer

29. Has data in the project database been used to support PSA activities (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports.
    - No

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    - No answer

Questionnaire for the OPDE/CODAP data project

<u>Questionnaire</u>

Do you participate in the OPDE and/or CODAP project?

- ☐ Yes *(please answer questions 34 - 40)*

If you are not a participant in the OPDE or CODAP data project:

31. Why not?

    - ☐ Resources associated with collecting/coding data
    - ☐ Benefits of participation does not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ________________________________

32. What can be done to encourage the participation of your organization in the FIRE data project? If you were to join, what information would you be able to contribute?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a participant in the FIRE data project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.
    - The obvious reason is to save R&D money on data collection and database development. The reasons for participating are to deliver data but also to obtain much more quality assured data from other countries. The OPDE have been tested and used in SE PSA:s as well as in a number of applications worldwide.

35. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?
        - all known SE data on piping components

    b. What is the source of the data submitted?
        - SE LERs, metallurgical reports

    c. Have you used this data to support the PSAs in your country?
        - Yes.

    d. Is there additional national data that could be used, but is not due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
        - No

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
    - In the beginning of the SKI SLAP project (later the OPDE project) lot of resources have been spent on data collection and on database development. Nowadays normal follow-up domestic experiences and maintenance of the SE piping failure data

37. Is the data in the project database provided by the project readily accessible and is it available in a format that can be easily used for the purposes of PSA (including availability of user manuals)?
    - The data is not easily accessible to users outside the OCDE OPDE project. Users outside the database project require a special approval from the national coordinator, to obtain an anonymous database. The OPDE database requires skilled persons to use the stored information.

38. Are there consistency issues between how data is collected/coded for national programs vs. OECD data projects? Do these issues represent a significant obstacle to the use of the data, and how have they been addressed by your organization?
    - SE data to the OPDE have to be tailored according to the coding guidelines.

39. Has data in the project database been used to support PSA activities (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports.

    Yes. The Nordic PSA Group (NPSAG) has undertaken to develop a piping reliability parameter handbook for use in risk-informed applications that involve the consideration of structural integrity of piping systems. The scope of the handbook is to establish high quality reliability parameters that account for the Nordic and worldwide service experience with safety related and non-safety-related piping systems in a consistent and realistic manner. The report aims to demonstrate the complete workaround process including modelling approaches.

    While the work to develop the handbook was finalised at the beginning of 2010, the planning for its preparation has been underway for fifteen years. An important step towards the handbook development project was the SKI SLAP (SKI LOCA Affected Pipes) database work. This research project started in 1994 and the very first goals was to investigate possibilities for deriving pipe failure rates and rupture probabilities from service experience with piping components in commercial nuclear power plants, as an alternative to probabilistic fracture mechanics.

- References:

    - SSM Rapport 2011:06, R-Book Phase 2, Reliability Data Handbook for Piping Components in Nordic Nuclear Power Plants
    - SSM Report 2008:1, Reliability Data for Piping Components in Nordic Nuclear Power Plants "R-Book" Project Phase I, Anders Olsson and Bengt Lydell, January 2008.
    - SKI Report 1995:58, Reliability of Piping System Components. Volume 1: Piping Reliability – A Resource Document for PSA Applications.
    - SKI Report 1995:59, Reliability of Piping System Components. Volume 2: Review of Methods for LOCA Frequency Assessment.
    - SKI Report 1995:60, Reliability of Piping System Components. Volume 3: A Bibliography of Technical Reports and Papers Related to Piping Reliability.

- SKI Report 1995:61, Reliability of Piping System Components. Volume 4: The Pipe Failure Event Database.
- SKI Report 1996:20, Piping Failures in United States Nuclear Power Plants: 1961-1995.
- SKI Report 1996:24, An Overview of Stress Corrosion in Nuclear Reactors from the Late 1950s to the 1990s.
- SKI Report 1996:39, Failure Frequencies and Probabilities Applicable to BWR and PWR Piping.
- SKI Report 1997:26, Reliability of Piping System Components.
- SKI Report 1998:30, Failure Rates in Barsebäck-1 Reactor Coolant Pressure Boundary Piping.

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?
    - X

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

43. Other general comments?

Switzerland

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: Swiss Federal Nuclear Safety Inspectorate (ENSI)

Type of Organization (please check the appropriate box):

- **Regulatory Agency**
- Government Technical Support Organization
- Commercial Technical Support
- Utility/Operator
- Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

Nuclear oversight, nuclear regulation, Support of research in nuclear safety

Responder Name: Gerhard Schoen

Address: Swiss Federal Nuclear Safety Inspectorate

Industriestrasse 19, CH-5200 Brugg AG

Country: Switzerland

Telephone/e-mail: gerhard.schoen@ensi.ch

Questionnaire for the ICDE data project

Do you currently participate in the ICDE project?

No and <u>never</u> have participated in the project *(please answer questions 1 - 3)*
Do not <u>currently</u> participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
☐ **<u>Yes</u>** *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

   ☐ Resources associated with collecting/coding data are excessive
   ☐ Benefits of participation do not justify the cost
   ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   ☐ Proprietary/confidentiality concerns with data
   ☐ Not an OECD/NEA member
   ☐ Other ________________________________

2. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the ICDE data project?

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

   c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

   <u>It has always been a concern to ENSI that Common Cause Failures (CCFs) be accounted for in PSA studies. As CCFs are rare events, it was deemed important to gain experience on the mechanisms and root causes that could lead to a CCF in order to better understand such events and to define measures</u>

to prevent them. As a participant in the ICDE project, Switzerland has gained access to other countries data and was able to share its experiences with other ICDE participants.

5. In relation to the national data provided to the project:

   e. What national data have you already provided to this project?

      Switzerland has collected CCF data for the following components: diesel generators, centrifugal pumps, batteries, motor-operated valves, safety & relief valves and check valves.

   f. What is the source of the data that you have submitted?

      The source of the data submitted to ICDE is mainly the licensees‘ PSA studies and event reports.

   g. Have you used this data to support PSAs in your country?

      ICDE experience has proved very useful in enhancing the modeling of CCFs in Swiss PSAs and was taken into account when developing the Swiss regulatory guidelines on the use of PSA. In particular, the regulatory guideline ENSI-A05 prescribes the development of plant-specific CCF parameters and defines the minimum scope of components, for which modeling of CCFs is expected. The definition of the minimum scope of CCFs to be considered is also based on the components, which are considered in the ICDE project.

   h. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

      No. There are no such cases, where events were not submitted to ICDE due to proprietary/confidentiality concerns.

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

   Substantial resources have been applied to collect and analyse data for the ICDE project. Resources are currently scarce for taking part in data collection for new components. The main resources are devoted to keep up-to-date the data for the components, for which we are collecting CCF information.

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

   Data in the ICDE database is formatted in such a way that data could be used for PSA quantification purpose. However, essential statistical data as single failures or exposure time are not available for all defined component collectives (observed population). Therefore ICDE data cannot be readily used for the purpose of PSA quantification (for instance for CCF parameter estimation).

8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you

have any suggestions for improving the consistency of your national data programs with the ICDE project?

There is no national program for collecting/coding CCF events in order to have a quantification database.

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

   The ICDE project has contributed to a better understanding and awareness of the CCFs also among non-PSA specialists. The ICDE database has been used in PSA for analysis purposes or for getting information regarding the state of the art of CCF analysis (e.g. for a known component type: what is the main mechanism that could lead to a CCF, what kind of CCFs have been internationally observed). ICDE data have also been used for defining ENSI‘s expectations (guideline ENSI-A05) regarding modeling of CCFs in the licensees‘ PSAs.

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    ENSI has the following suggestions:
    - In recent years major efforts were made to improve the quality of the data in the databank (e.g. function in the ―ICDE tool‖ to verify that all data fields have been filled in). In order to be ready for PSA quantification, the quality of data in the databank should be further improved.
    - Based on the quantification of the available data, the ICDE project could develop own CCF parameters that could be compared to other generic data.
    - The possibility of inter-system CCFs could be investigated.

Questionnaire for the FIRE data project

Do you participate in the FIRE project?

No and never have participated in the project *(please answer questions 11 - 13)*

Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*

□ **Yes** *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    □ Resources associated with collecting/coding data are excessive
    □ Benefits of participation do not justify the cost
    □ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    □ Proprietary/confidentiality concerns with data
    □ Not an OECD/NEA member
    □ Other ______________________________

12. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the FIRE data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

    The reason for participating in the FIRE data project is to gain a better understanding of the causes, propagation and consequences of fires at nuclear power plants.

15. In relation to the national data provided to the project:

    e. What national data have you already provided to this project?

       Data regarding fire events at Swiss NPPs were provided to the database.

    f. What is the source of the data that you have submitted?

       Main source of information are the licensees‘ reports on fire events.

    g. Have you used this data to support PSAs in your country?

       All Swiss NPPs have plant-specific fire PSAs. OECD FIRE data are not directly used in Swiss PSAs. For the verification of the licensees‘ fire PSAs, it is important to have an up-to-date database on fire events.

    h. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

       No.

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

    Switzerland is participating actively in the project, providing data and taking part in the discussions and analyses.

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

    Improvements of the databank are discussed within the project.

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?

    There is no such national program.

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

    No.

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    The databank should be consistently extended such that generic failure data can be derived.

Questionnaire for the COMPSIS data project

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

No and never participated in the COMPSIS project *(please answer questions 21 - 23)*

Did not participate in the final phase of the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*

□ **Yes** *(please answer questions 24 - 30)*

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

21. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

□ Resources associated with collecting/coding data are excessive
□ Benefits of participation do not justify the cost
□ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
□ Proprietary/confidentiality concerns with data
□ Not an OECD/NEA member
□ Other ______________________________

22. With regard to you reasons for not participating in the project: What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

   a. What could have been done to encourage the participation of your organization in the COMPSIS data project?

   b. What advantages and disadvantages did you see to project participation? Had you joined the data project, what information could you have contributed?

   c. Do you believe that there was sufficient information available to support making an informed decision about your participation in the COMPSIS project? If not, what information would you have liked to know about the project?

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

To get more experience on failure modes which are produced by computer based I&C systems and to exchange Swiss expert knowledge with other country members. In relation to the national data provided to the project:

25. In relation to the national data provided to the project:

    e. What national data have you already provided to this project?

       The corresponding description of one event was provided.

    f. What is the source of the data that you have submitted?

       Licensee event reports and specifiable discussions with the originator of the report.

    g. Have you used this data to support PSAs in your country?

       No.

    h. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

       There is no such case.

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

    ENSI participated into the meeting and delivered the required data.

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications?

    The project was incorporated into the ICDE project. Suggestions on the databank can be discussed within the ICDE project.

28. Were there any consistency issues between how you data was collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?

    The project was incorporated into the ICDE project.

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

No.

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    No.

Questionnaire for the OPDE/CODAP data project

Do you participate in the OPDE and/or CODAP project?

No and never have participated in either the OPDE or CODAP projects *(please answer questions 31 - 33)*

Do not currently participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*

 Yes *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

 Resources associated with collecting/coding data are excessive
 Benefits of participation do not justify the cost
 Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
 Proprietary/confidentiality concerns with data
 Not an OECD/NEA member
 Other ________________________________

32. With regard to the potential for future project participation:

a. What can be done to encourage the participation of your organization in the CODAP data project?

b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

The reason for participating in the CODAP data project is to gain a better understanding of the underlying causes of the piping failure mechanism, to get detailed information on recent flaws related to material degradation mechanism and to support a databank which could be used to derive piping failure frequencies.

35. In relation to the national data provided to the project:

    e. What national data have you already provided to this project?

       Data from the Swiss NPPs have been delivered.

    f. What is the source of the data that you have submitted?

       Licensees deliver the input data for the databank.

    g. Have you used this data to support PSAs in your country?

       No.

    h. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

       There is no such case.

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

    Switzerland is participating actively in the project, providing data and taking part in the discussions and analyses.

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

    Improvements of the databank are discussed within the project.

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?

    There is no such national program.

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

    The data has not been used so far for the PSA. A pilot study demonstrating a procedure how this data can be used to estimate parameters for the PSA would be very useful.

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    No.

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?

    There are no such programmes.

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

    No.

43. Other general comments?

    A number of data projects have collected a substantial amount of data. It should be demonstrated within these projects (or by a separate group) how this data can be used in order to estimate parameters for the PSA. This demonstration should outline the calculation procedure (and - if possible - derive generic data).

Taiwan

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1

Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)

Activity Questionnaire for WGRISK Members and Data Users

<u>Respondent Information</u>

Please identify your organization: Institute of Nuclear Energy Research

Type of Organization

- ☐ Regulatory Agency
- ☑ Government Technical Support Organization
- ☐ Commercial Technical Support
- ☐ Utility/Operator
- ☐ Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

research & development

Responder Name: Hui-Wen Huang

Address: No. 1000, Wenhua Road, Chiaan Village, Longtan Township, Taoyuan County, 32546, Taiwan (R.O.C.)

Country: Taiwan (R.O.C.)

Data Project Affiliation: OECD/NEA Computer-based System Important to Safety (COMPSIS) Project

Telephone/e-mail: 886-3-4711400 Ext. 6352 / hwhwang@iner.gov.tw

Questionnaire for the ICDE data project

Questionnaire

Do you participate in the ICDE project?

☑ No *(please answer questions 1 - 3)*

☐ Yes *(please answer questions 4 - 10)*

If you are not a participant in the ICDE data project:

1. Why not?

   ☐ Resources associated with collecting/coding data
   ☐ Benefits of participation does not justify the cost
   ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   ☐ Proprietary/confidentiality concerns with data
   ☐ Not an OECD/NEA member

   ☑ Other N/A

2. What can be done to encourage the participation of your organization in the ICDE data project? If you were to join, what information would you be able to contribute?

   N/A
3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

   N/A

If you are a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

5. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?

   b. What is the source of the data submitted?

   c. Have you used this data to support the PSAs in your country?

   d. Is there additional national data that could be used, but is not due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

7. Is the data in the project database provided by the project readily accessible and is it available in a format that can be easily used for the purposes of PSA (including availability of user manuals)?

8. Are there consistency issues between how data is collected/coded for national programs vs. OECD data projects? Do these issues represent a significant obstacle to the use of the data, and how have they been addressed by your organization?

9. Has data in the project database been used to support PSA activities (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports.

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the FIRE data project

Questionnaire

Do you participate in the FIRE project?

☑ No *(please answer questions 11 - 13)*

☐ Yes *(please answer questions 14 - 20)*

If you are not a participant in the FIRE data project:

11. Why not?

☐ Resources associated with collecting/coding data
☐ Benefits of participation does not justify the cost
☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
☐ Proprietary/confidentiality concerns with data
☐ Not an OECD/NEA member

☑ Other N/A

12. What can be done to encourage the participation of your organization in the FIRE data project? If you were to join, what information would you be able to contribute?

N/A

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

N/A

If you are a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

15. In relation to the national data provided to the project:

a. What national data have you already provided to this project?

b. What is the source of the data submitted?

c. Have you used this data to support the PSAs in your country?

d. Is there additional national data that could be used, but is not due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

17. Is the data in the project database provided by the project readily accessible and is it available in a format that can be easily used for the purposes of PSA (including availability of user manuals)?

18. Are there consistency issues between how data is collected/coded for national programs vs. OECD data projects? Do these issues represent a significant obstacle to the use of the data, and how have they been addressed by your organization?

19. Has data in the project database been used to support PSA activities (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports.

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the COMPSIS data project

Questionnaire

Do you participate in the COMPSIS project?

- ☐ No *(please answer questions 21 - 23)*

- ☑ Yes *(please answer questions 24 - 30)*

If you are not a participant in the COMPSIS data project:

21. Why not?

    - ☐ Resources associated with collecting/coding data
    - ☐ Benefits of participation does not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ________________________________

22. What can be done (or could have been done) to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

    To obtain lessons learned by analyzing the digital I&C digital I&C system failure event data from the COMPSIS project.

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

       Taiwan has provided 8 digital I&C system failure event data.

    b. What is the source of the data submitted?

       - Atomic Energy Council (AEC) takes lead to run COMPSIS project in Taiwan.
       - Taiwan Power Company (TPC) provides failure data.
       - Institute of Nuclear Energy Research (INER) uploads the failure data and also analyzed the failure data of COMPSIS project.

    c. Have you used this data to support the PSAs in your country?

       Not yet.

d. Is there additional national data that could be used, but is not due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

   No.

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
    (1) Providing 8 failure event data of Taiwan
    (2) Partially involving coding guideline work
    (3) Providing failure event reporting regulation of Taiwan
    (4) Analyzing the failure event data of COMSIS project and finalizing the event analysis chapter in COMSIS project report

27. Is the data in the project database provided by the project readily accessible and is it available in a format that can be easily used for the purposes of PSA (including availability of user manuals)?
    No

28. Are there consistency issues between how data is collected/coded for national programs vs. OECD data projects? Do these issues represent a significant obstacle to the use of the data, and how have they been addressed by your organization?
    Taiwan has no obstacle on data collected/coded issue.

29. Has data in the project database been used to support PSA activities (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports.
    Not yet.

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?
    The qualitative data analysis are sufficient for lessons learned on digital I&C system. However, the number of failure data are far beneath for quantitative data analysis (by statistics).

    If we can collect huge number of digital I&C failure data, it would imply that digital I&C system is not reliable. It is obviously not true in real world.

    To develop a technique to obtain digital I&C system failure rate with limited data may be a way to support PSA activities.

Questionnaire for the OPDE/CODAP data project

Questionnaire

Do you participate in the OPDE and/or CODAP project?

☑ No *(please answer questions 31 - 33)*

☐ Yes *(please answer questions 34 - 40)*

If you are not a participant in the OPDE or CODAP data project:

31. Why not?

- ☐ Resources associated with collecting/coding data
- ☐ Benefits of participation does not justify the cost
- ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
- ☐ Proprietary/confidentiality concerns with data
- ☐ Not an OECD/NEA member
- ☑ Other N/A

32. What can be done to encourage the participation of your organization in the FIRE data project? If you were to join, what information would you be able to contribute?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a participant in the FIRE data project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

35. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data submitted?

    c. Have you used this data to support the PSAs in your country?

d. Is there additional national data that could be used, but is not due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

37. Is the data in the project database provided by the project readily accessible and is it available in a format that can be easily used for the purposes of PSA (including availability of user manuals)?

38. Are there consistency issues between how data is collected/coded for national programs vs. OECD data projects? Do these issues represent a significant obstacle to the use of the data, and how have they been addressed by your organization?

39. Has data in the project database been used to support PSA activities (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports.

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?
42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?
43. Other general comments?

UK

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: EDF Energy

Type of Organization (please check the appropriate box):

- Regulatory Agency
- Government Technical Support Organization
- Commercial Technical Support
- √ Utility/Operator
- Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

Operational and safety case support

Responder Name: Kevin Brook (collation of internal responder feedback)

Address: Barnett Way, Barnwood, Gloucester, GL4 3RS

Country: UK

Telephone/e-mail: 01452 654812/kevin.brook@edf-energy.com

Questionnaire for the ICDE data project

Questionnaire

Do you currently participate in the ICDE project?

Not sure how to answer this as EDF Energy is drawn into certain aspects of the ICDE project due to the UK regulator being members. However for the purposes of this survey it has been answered from the no and never have participated in the project as EDF Energy are not formally members.

- √ No and never have participated in the project *(please answer questions 1 - 3)*
- ☐ Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ☐ Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

   - ☐ Resources associated with collecting/coding data are excessive
   - √ Benefits of participation do not justify the cost
   - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - ☐ Proprietary/confidentiality concerns with data
   - ☐ Not an OECD/NEA member
   - ☐ Other ________________________________

2. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the ICDE data project?

      Demonstrate that the nuclear safety benefit is worth the cost of participation – this issue has been discussed a number of times with the UK regulator

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

      See response to a. above. Data on various components from EDF Energy's Stations has been provided to the ICDE but via contractors employed by the UK regulator.

   c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

      EDF Energy is currently planning to move to the alpha factor CCF approach and as part of this process will be investigating how much use can and/or could be made of ICDE data as part of the quantification process. This will help inform us as to the potential benefit of future project participation.

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

EDF Energy has undertaken a survey of a number of utilities to identify what CCF data is used, and if generic, what justification is provided to support its use in the utilities PSA. EDF Energy intends to adopt currently accepted good practice whilst being cognisant of international PSA guidance documents.

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

5. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?

   b. What is the source of the data that you have submitted?

   c. Have you used this data to support PSAs in your country?

   d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the FIRE data project

Questionnaire

Do you participate in the FIRE project?

- √ No and never have participated in the project *(please answer questions 11 - 13)*
- Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

- Resources associated with collecting/coding data are excessive
- Benefits of participation do not justify the cost
- Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
- Proprietary/confidentiality concerns with data
- Not an OECD/NEA member
- √ Other EDF Energy currently don't supply information to this database as figures collected across Europe are not consistent. EDF Energy does compare and share data with peers in EDF France, but EDF Energy has taken the current decision that if our data was fed into the OECD project there is a strong chance it will be misread as we report to a lot lower level than a lot of our European peers. Currently very few Europeans are inputting to this database and there is little useful information to be gained.

12. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the FIRE data project?

       Ensure level of reporting that is of use to EDF Energy and usefulness of information contained.

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

       See Q11 response

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

       See Q11 response

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.
    A pilot “modern standards” fire PSA has been undertaken for one of EDF Energy Gas Cooled Reactors without using FIRE project data – not possible to list sources of data used instead as colleague not available to ask at the time of writing. SZB fire PSA frequency data informed from

keyword searches of the INPO Plant Event Database and WANO OE Events Database together with other information such as the NRC Fire Events OPEX reviews e.g. :

- Fire Events – Update of US Operating Experience 1986-1999, Dec 2001, US NRC RES/OERAB/S01-01 Vol 1
- Special Study: Fire Events – Feedback of US Operating Experience, June 1997 by US NRC, AEOD/S97-03

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

15. In relation to the national data provided to the project:
    a. What national data have you already provided to this project?
    b. What is the source of the data that you have submitted?
    c. Have you used this data to support PSAs in your country?
    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the COMPSIS data project

Questionnaire

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

√ No and never participated in the COMPSIS project (to the best of my knowledge)*(please answer questions 21 - 23)*

☐ Did not participate in the final phase of the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*

☐ Yes *(please answer questions 24 - 30)*

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

21. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

☐ Resources associated with collecting/coding data are excessive
☐ Benefits of participation do not justify the cost
☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
☐ Proprietary/confidentiality concerns with data
☐ Not an OECD/NEA member

√ Other I was not aware of this project and received no feedback on COMPSIS from the wide range of colleagues contacted for feedback on use of these OECD projects. (which is not to say that we're unaware of the project, just that I've received no feedback).___

22. With regard to you reasons for not participating in the project: What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

a. What could have been done to encourage the participation of your organization in the COMPSIS data project?

Make us aware of its existence and potential benefits of being involved (assuming we're not aware of it).

b. What advantages and disadvantages did you see to project participation? Had you joined the data project, what information could you have contributed?

Unable to answer.

c. Do you believe that there was sufficient information available to support making an informed decision about your participation in the COMPSIS project? If not, what information would you have liked to know about the project?

Unable to answer.

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this

survey provides a summary of publicly available reports that have been published by the data projects.

Have used reliability studies undertaken by the OEM for SZB systems supplemented by other techniques as described in the Station Safety Report.

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications?

28. Were there any consistency issues between how you data was collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the OPDE/CODAP data project

Questionnaire

Do you participate in the OPDE and/or CODAP project?

√ No and never have participated in either the OPDE or CODAP projects (to the best of my knowledge) *(please answer questions 31 - 33)*

- Do not currently participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

 Resources associated with collecting/coding data are excessive
 Benefits of participation do not justify the cost
 Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
 Proprietary/confidentiality concerns with data
 Not an OECD/NEA member

√ Other I was not aware of this project and received no feedback on CODAP data project from the wide range of colleagues contacted for feedback on use of these OECD projects. (which is not to say that we're unaware of the project, just that I've received no feedback).___

32. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the CODAP data project?

      Make us aware of its existence and potential benefits of being involved (assuming we're not aware of it)

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

      Unable to answer.

   c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

      Unable to answer.

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.
    SZB pipe break frequencies derived from reviewing international OPEX when could result in an initiating fault on the fault schedule. Pipe failures currently excluded from SZB PSA system fault trees. Failure of Essential Service Water System (sea water system for cooling the component cooling

water system) considered as potential internal flood source but flood frequency dominated by potential maintenance induced flooding scenario rather than random ESWS pipework failure.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

35. In relation to the national data provided to the project:

    e. What national data have you already provided to this project?

    f. What is the source of the data that you have submitted?

    g. Have you used this data to support PSAs in your country?

    h. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?

    Unable to answer, would need to speak to New Nuclear Build.

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

    Consider whether it is worth collecting "time to repair" data for components given different types of observed failures – this is in the context of potentially modelling longer mission times for certain scenarios where repair may want to be considered in the PSA. However the data collected may not be that valid for use in such scenarios

43. Other general comments?

    Just a general comment on, from a personal perspective, lack of visibility of most of these projects.

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: Magnox Limited

Type of Organization (please check the appropriate box):

Regulatory Agency
Government Technical Support Organization
Commercial Technical Support
☐ **Utility/Operator**
Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

Safety case production

____

Responder Name: D. Hamblen

Address: Magnox Limited, Oldbury Technical Center, Oldbury Naite, Thornbury,
South Gloucestershire, BS35 1RQ

____

Country: United Kingdom

Telephone/e-mail: (44) 01454 422206

Questionnaire for the ICDE data project

Do you currently participate in the ICDE project?

No and <u>never</u> have participated in the project *(please answer questions 1 - 3)*

 <u>Do not currently participate in the project</u>, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*

Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

   Resources associated with collecting/coding data are excessive

    <u>Benefits of participation do not justify the cost</u>

   Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)

   Proprietary/confidentiality concerns with data

   Not an OECD/NEA member

   Other ________________________________

2. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the ICDE data project?

      We have one reactor with less than three years remaining life. No benefit can be accrued in this period.

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

      See Question 2(a) answer

   c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

      Yes, we have sufficient information.

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

   Yes.

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

Data gathered has allowed lessons to be learned and supported safety case and continued operation.

5. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?

      Various systems for all operating sites.

   b. What is the source of the data that you have submitted?

      Operating experience

   c. Have you used this data to support PSAs in your country?

      Yes.

   d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

      No.

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

   Estimated resource to value ~ £100k per annum or more but shared with former British Energy.

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

   Generally requires further analysis to be of use.

8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?

   Yes, there are difficulties in matching our data to ICDE requirements.

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

General performance insights used.

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    Applicability of data to gas cooled reactors always an issue.

Questionnaire for the FIRE data project

Questionnaire

Do you participate in the FIRE project?

- **No and never have participated in the project** *(please answer questions 11 - 13)*
- Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - **Benefits of participation do not justify the cost**
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ________________________________

    (came late in Magnox tranche life)

12. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the FIRE data project?

    Nothing

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    None

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

    Yes

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

    The work for Wylfa used data supported by generic data from a German study.

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

15. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the COMPSIS data project

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

- **No and never participated in the COMPSIS project** *(please answer questions 21 - 23)*
- Did not participate in the final phase of the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 24 - 30)*

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

21. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - **Benefits of participation do not justify the cost**
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ________________________________

    Magnox tranche now decommissioning except for 1 reactor at Wylfa

22. With regard to you reasons for not participating in the project: What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

    a. What could have been done to encourage the participation of your organization in the COMPSIS data project?

    Nothing

    b. What advantages and disadvantages did you see to project participation? Had you joined the data project, what information could you have contributed?

    None

    c. Do you believe that there was sufficient information available to support making an informed decision about your participation in the COMPSIS project? If not, what information would you have liked to know about the project?

    Yes

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this

survey provides a summary of publicly available reports that have been published by the data projects.

Unclear what to say here.

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications?

28. Were there any consistency issues between how you data was collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the OPDE/CODAP data project

<u>Questionnaire</u>

Do you participate in the OPDE and/or CODAP project?

- **<u>No and never have participated in either the OPDE or CODAP projects</u>** *(please answer questions 31 - 33)*
- Do not <u>currently</u> participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - **<u>Other</u>** **<u>Lack of awareness of this project</u>**

32. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the CODAP data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

    Please provide further details of the range of pipework covered as Magnox ( ) for the future will move toward decommissioning site pipework.

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

    Would not view the data as priority input to PSA. Rather would look for support in terms of lessons learned.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

35. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?

    No

42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

Failure rates/modes associated with site decommissioning facilities would be of interest

43. Other general comments?

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: Office for Nuclear Regulation (ONR) _______

Type of Organization (please check the appropriate box):

X Regulatory Agency
☐ Government Technical Support Organization
☐ Commercial Technical Support
☐ Utility/Operator
☐ Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

Assessment, inspection and licensing________________

____

Responder Name: Shane Turner________________________

Address: Redgrave Court, Merton Road, Bootle, Merseyside, L20 7HS___

____

Country: UK____________________________

Telephone/e-mail: +44 (0)151 951 3995, shane.turner@hse.gsi.gov.uk________

Questionnaire for the ICDE data project

Questionnaire

Do you currently participate in the ICDE project?

- No and never have participated in the project *(please answer questions 1 - 3)*
- Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- X Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ______________________________

2. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the ICDE data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

    The main initial reason for participation related to a specific regulatory issue on PSA. The regulator had some concern over the methodology for common cause failure (CCF) analysis in UK gas reactor PSAs, namely use of the Unified Partial beta-factor Method and required a way of potentially calibrating the UPM. ICDE was seen as a potential source of data to aid calibration. Further information on this can be found within ONR’s Nuclear Research Index for 2011 (www.hse.gov.uk/nuclear/nri-topics/section-k.pdf)

Further reasons include:

- CCFs are extremely important to nuclear safety. Participation provides greater knowledge about CCF events.
- Access to the event data to provide operational experience of common cause failures, there causes, and defences. As CCFs are relatively rare, ICDE participation gives access to a larger population of data.
- Share knowledge with international experts on CCFs.

Key benefits from participation:

- Visibility on what other countries do with respect to CCFs (including reporting and quantification for PSA);
- Good practice in the treatment of common cause failures in terms of management, engineering and modelling across a variety of components;
- Access to international experts in this area;
- As a consequence of the above, access to relevant papers prepared by the above, and some of the benefits of their research;
- Development of our own (ONR and licensees') familiarity and expertise in the area;
- Access to a database which records CCF events at various nuclear power plants around the world – this provides a wealth of operational experience. From this lessons can be learned from a wider range of events, than would be the case based on UK operational experience or indeed worldwide experience from alternative sources;
- The impetus for licensees to look into UK CCFs in more detail, for example to pull together operational experience specifically relating to CCFs and look for trends. It is noted that although this activity was not organised by the ICDE project, the licensees would probably not have done this if they had not been involved in the ICDE project; and
- Benefits in terms of forming relationships with other organisations within the nuclear industry in other countries, including the regulatory bodies, who are involved in CCF analysis.

5. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?
   CCF events and observed populations have been provided for the following components across all UK operational power stations (AGRs, Magnox and PWR):
      i. Batteries (1990-1998)
      ii. Breakers (1995-2002)
      iii. Centrifugal pumps (1990-2001)
      iv. Control rod drive assemblies (1995-2003)
      v. Diesel generators (1990-2001)
      vi. Level measurement (PWR only) (1995-2003)
      vii. Safety and relief valves (1990-2002)

   b. What is the source of the data that you have submitted?
   This data has been provided by the licensees of the operating UK reactors. The data was collected specifically for ICDE.

   c. Have you used this data to support PSAs in your country?
   The data has not been used directly within the PSAs. However, various studies have been carried out to compare the CCF probabilities from the UPM (as used by the licensees in their PSAs) with those from parametric approaches based on ICDE data. Furthermore, there is currently ongoing

work moving the AGR PSAs from using the UPM approach to the alpha-factors approach. ICDE and other data sources are being considered although it is noted that ICDE components are either not risk significant for the AGR PSAs or already included in other data source, e.g. US INL data.
In addition, the collected data has been reviewed for qualitative lessons and these have been shared with the licensees.
ONR also use the public reports along with other information (non-ICDE) to support its assessment of licensees' PSAs and safety cases.

d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?
There are no propriety or confidentiality concerns preventing further data being submitted. The limitations are that suitable data is not routinely collected by the licensees, and specific work and significant effort would be required to collect this data.

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?
A significant amount of effort has been applied for each data collection exercise, as suitable data is not already collected by the licensee. This includes resource in the licensees, the regulator and technical support contractors. It is difficult to estimate the level of resource due to fluctuations, although it is likely to have been of the order of 6 person months effort per year, particularly during the periods of active data collection and analysis.

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?
The data is stored in a database that can be interrogated by a specific tool. This is available to all licensees, regulator and technical support organizations supporting the licensees or regulator. The database tool has evolved significantly over recent years making analysis reasonably straight forward and flexible. There is also considerable documentation for the tool as well as advice available from the Operating Agent. Therefore there are no changes I would currently recommend.

8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?
As the data collected in the UK was carried out explicitly for ICDE, there are no consistency issues. This is not a factor in our participation. Furthermore, the ICDE coding guides and operating procedures try to minimize the consistency issues.

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).
The data has been used to support PSA activities in ONR, although there are no publicly available reports as these contain proprietary licensee event data. Examples of such studies include:
    - Comparison of licensee PSA CCF probabilities with those derived using ICDE data to gain confidence in the licensee's claims;
    - Insights from the UK data for each component where data was collected and insights from the wider data, not seen in the UK data.

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?
    Most significant challenges to use of the data have been resolved; for example: completeness of data, consistency, quality, accessibility have been focus of much attention in recent years with notable improvements. Notwithstanding this, the data for a given component remains fairly heterogeneous, which is expected for a data collection over many countries and licensees. This potentially limits the usefulness of the data for supporting CCF quantification.

    Key improvements would be gained from a wider range of components and greater number of participants in the project.

Questionnaire for the FIRE data project

<u>Questionnaire</u>

Do you participate in the FIRE project?

- X No and <u>never</u> have participated in the project *(please answer questions 11 - 13)*
- Do not <u>currently</u> participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - X Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - X Other

    ONR understand that the information gathered as part of the OECD FIRE data project is based upon larger fire events which does not necessarily provide UK licensees with sufficiently detailed information with regard to fires including smaller fires and precursors to fire. In addition, the level of reporting of incidents by some UK licensees considers events such as smoke generation, consequences of fire, fire services intervention, fire near miss events, outage related fires, etc which ONR do not believe are captured within the data. ONR would not wish the level of licensee reporting to reduce based upon the designation of reportable fires to be increased.

    In addition, ONR are hesitant to join the OECD FIRE data project as there are limited numbers of fires in nuclear plant worldwide to base nuclear safety related claims upon especially when it comes to larger fires that could threaten more than one train of protection.

    Finally, there is the need to consider the level of reporting to ensure that they are applied consistently and given that fire event reporting within some of the UK licensees involves the reporting of precursors and near misses, the results from the UK could appear skewed and misrepresent the very low instances of "real" fire events as reported within the OECD FIRE data project.

12. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the FIRE data project?

       ONR would need to be able to have further resource available to be able to contribute to the further development of the classification of both fire events and precursors. However, given the limited resource available within ONR this is unlikely. Numerous discussions have taken place with the OECD FIRE data project. However, there are a number of aspects of the data gathering that ONR would seek to change in order for the information to be applicable to the reporting criteria in place for existing UK licensees.

b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

Advantages:

- greater sharing of knowledge relating to fire events worldwide; and
- greater international co-operation between member countries.

Disadvantages:

- potential under or over reporting of fire events resulting in results from a particular country being skewed and either showing large numbers of fires or very few;
- the potential for fire frequency data to be used to support nuclear safety claims in the area of fire which may not be supportable from the data already gathered by existing UK licensees;
- the lack of resource within ONR to adequately contribute and have oversight of the FIRE data project; and
- the potential impact on the existing level of reporting should the level of reporting be reduced.

c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

Responses are based on discussions that were had some 2-3 years ago and provided feedback similar to the above previously. If the OECD FIRE data project believe that the situation has changed such that UK involvement in this project would offer value to ONR and UK licensees ONR would welcome further discussion. Likewise, the UK would be happy to contribute to such a project providing the approach to reporting levels would not lead to a reduction in the level of reporting already undertaken by UK licensees in general.

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

Information available is considered limited for non-participant PSA developers, although it does provide useful qualitative insights.

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

15. In relation to the national data provided to the project:

a. What national data have you already provided to this project?

b. What is the source of the data that you have submitted?

c. Have you used this data to support PSAs in your country?

d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the COMPSIS data project

Questionnaire

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

- X No and never participated in the COMPSIS project *(please answer questions 21 - 23)*
- Did not participate in the final phase of the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 24 - 30)*

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

21. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

    X Resources associated with collecting/coding data are excessive

    X Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member

    X Other Awareness of project was limited amongst computer system specialists. ONR would need convincing that data would be sufficiently extensive, generic and applicable to provide meaningful input to regulatory decisions.

    Data is unlikely to be already collected by UK licensees making it resource intensive to collect information to feed into the project.

    Unlikely that the output from the data project would be able to support PSA.
22. With regard to you reasons for not participating in the project: What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

    a. What could have been done to encourage the participation of your organization in the COMPSIS data project?

    Specific communication about the background to the project, the benefits of membership and data available would be required as well as a clear case that the benefits of membership outweighed the disadvantages.

    ONR would need to have sufficient resource and also be able to convince licensees of the benefit to them.

    b. What advantages and disadvantages did you see to project participation? Had you joined the data project, what information could you have contributed?

    Due to lack of detailed knowledge of the project it is difficult to provide a list of advantages and disadvantages. However, the key disadvantage relates to the perceived resource requirements to be actively involved.

    c. Do you believe that there was sufficient information available to support making an informed decision about your participation in the COMPSIS project? If not, what information would you have liked to know about the project?

Insufficient information is available about making an informed decision. ONR would need to understand the resource implications of participation (particularly those related to collecting the required data in the UK) and the key benefits to both the licensee and ONR. Furthermore, such a project would need promoting more widely within the licensees and the regulator.

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

    ONR are not aware of any publicly available information of sufficient quantity and quality to affect PSA judgments on appropriate failure values to assign computer-based systems. Given the variety and number of variables in these systems (e.g. differences in development methods), it is unclear as to whether this is possible.

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

25. In relation to the national data provided to the project:

    a. What national data have you already provided to this project?

    b. What is the source of the data that you have submitted?

    c. Have you used this data to support PSAs in your country?

    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications?

28. Were there any consistency issues between how you data was collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

Questionnaire for the OPDE/CODAP data project

Questionnaire

Do you participate in the OPDE and/or CODAP project?

X No and never have participated in either the OPDE or CODAP projects *(please answer questions 31 - 33)*
 Do not currently participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
 Yes *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

X Resources associated with collecting/coding data are excessive

X Benefits of participation do not justify the cost
 Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
 Proprietary/confidentiality concerns with data
 Not an OECD/NEA member

X Other

ONR would need convincing that data would be sufficiently extensive, generic and applicable to provide meaningful input to regulatory decisions.

Data is unlikely to be already collected by UK licensees in the form required making it resource intensive to collect information to feed into the project.

32. With regard to the potential for future project participation:

a. What can be done to encourage the participation of your organization in the CODAP data project?

ONR would need to have sufficient resource and also be able to convince licensees of the benefit to them.

b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

ONR can see potential advantage in joining the OPDE project, but does not retain sufficient data of statistical quality to be able to contribute in its own right.

c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

Yes there is sufficient information available.

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

The publicly available information provides some information that may be able to support PSA activities, although this appears to be at a relatively high level. It would be helpful if failure rates were also published. ONR has not used this information to support PSA activities to date.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

35. In relation to the national data provided to the project:

    i. What national data have you already provided to this project?

    j. What is the source of the data that you have submitted?

    k. Have you used this data to support PSAs in your country?

    l. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?

    No data activities are ongoing for new and advanced reactors. The UK are currently only involved in ICDE, which will be used as a source of information, along with other sources, to support licensing and permissioning of new nuclear reactors, particularly in the review of the licensees' PSAs. Similarly the publicly available information for the other data products will be utilised where possible and necessary to inform ONR's regulatory decision making.
42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

    A further data need has not been identified.
43. Other general comments?

    No.

USA

CSNI Activity Proposal Sheet (CAPS) WGRISK (2011)-1
Use of OECD Data Project Products in Probabilistic Safety Assessment (PSA)
Activity Questionnaire for WGRISK Members and Data Users

Respondent Information

Please identify your organization: United States Nuclear Regulatory Commission

Type of Organization (please check the appropriate box):

- ☐ Regulatory Agency
- ☐ Government Technical Support Organization
- ☐ Commercial Technical Support
- ☐ Utility/Operator
- ☐ Other ________________

Main areas of responsibility (e.g., licensing, inspection, research & development, etc.):

The NRC Office of Nuclear Regulatory Research (NRC/RES) performs research related to the development and improvement of PSA methods. NRC/RES) also develops the technical bases and PSA tools needed to support regulatory decisions and inspection activities.

Responder Name: Kevin Coyne

Address: U.S. NRC, Mail Stop: C 4 A07M

Washington, DC 20555

Country: USA

Telephone/e-mail: 00 1 301 251 7586

Questionnaire for the ICDE data project

Questionnaire

Do you currently participate in the ICDE project?

- ☐ No and never have participated in the project *(please answer questions 1 - 3)*
- ☐ Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ☐ Yes *(please answer questions 4 - 10)*

If you do not currently participate in the ICDE data project:

1. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

   - ☐ Resources associated with collecting/coding data are excessive
   - ☐ Benefits of participation do not justify the cost
   - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
   - ☐ Proprietary/confidentiality concerns with data
   - ☐ Not an OECD/NEA member
   - ☐ Other ________________________________

2. With regard to the potential for future project participation:

   a. What can be done to encourage the participation of your organization in the ICDE data project?

   b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

   c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

3. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the ICDE data project:

4. Please describe your reasons for participating, including the benefits you have received from your participation.

   The NRC participates in the ICDE project to gain access to a comprehensive international database of CCF events and to stay informed about CCF analysis approaches and tools. The NRC maintains a separate CCF database of domestic CCF events, which is used to estimate CCF parameters. One of the benefits that the NRC has gained through its participation is the ability to use the ICDE database to derive CCF parameters for comparison to the parameters derived from the domestic database. This comparison is particularly useful for components where there is a limited amount of CCF data available and high uncertainty associated with the CCF parameter estimates. The NRC also benefits by being able to review CCF phenomena that have occurred in other countries. U.S. plants may also be susceptible to these same phenomena. Awareness and understanding of the phenomena can help to establish defenses to prevent similar CCF occurrences at U.S. plants. Another benefit to participating in the ICDE project is that it provides a forum for discussing new and different CCF analysis approaches. Each participating country brings knowledge and experience that can help the NRC improve its own CCF analysis methods.

5. In relation to the national data provided to the project:

   a. What national data have you already provided to this project?

   The NRC has provided CCF data cover 10 different component types. The components and the years that the data has been evaluated are shown in the table below.

Component	**Evaluated time period**
Batteries	1/1/1990 to 12/31/2010
Breakers	1/1/1990 to 12/31/2010
Centrifugal Pumps	1/1/1990 to 12/31/2010
Check valves	1/1/1990 to 12/31/2010
Diesel Generators	1/1/1990 to 12/31/2010
Heat Exchangers	1/1/1990 to 12/31/2010
Motor Operated Valves	1/1/1990 to 12/31/2010
Safety and Relief Valves	1/1/1990 to 12/31/2010
Control Rod Drive Assembly	1/1/1990 to 12/31/2001
Level measurement	1/1/1990 to 12/31/2001

   The NRC provides CCF event records and observed population records for each component. Each CCF event record includes an event description, failure mode, and other coded fields that support CCF parameter quantification. Each observed population record includes the observed time period and the number of independent failures during that period.

   b. What is the source of the data that you have submitted?

   The NRC maintains its own CCF database, which is used for quantifying CCF parameters for use in NRC's PSA models. The data shared with the ICDE project come from the NRC CCF database. The Idaho National Laboratory (INL) serves as a technical support organization to the NRC and maintains the NRC's CCF database. The source of raw data for the NRC CCF database is the Equipment Performance and Information Exchange (EPIX) System Database, which is maintained by the Institute of Nuclear Power Operations (INPO). The INL reviews the information in the

EPIX database, identifies CCF events, and provides the necessary analysis and coding for inclusion in the NRC's CCF database. Because EPIX is used as the original source of the data, the NRC has agreed to allow INPO to review all U.S. data that NRC intends to share with the ICDE project.

c. Have you used this data to support PSAs in your country?

The ICDE data have not been directly used to support PSAs. The data has been used for comparison to the NRC's CCF database.

d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

No, there is not additional national data that could be used. The NRC has an agreement with INPO, which allows them to review the national data before it is transmitted to the ICDE project. Up to now, this agreement with INPO has not limited the data that NRC shares with the ICDE project.

6. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)

To support the ICDE project, one NRC staff member attends the ICDE Steering Group meetings twice per year. In addition, the NRC also contributes approximately 200 staff-hours per year for supporting ICDE tasks (e.g., developing component reports, reviewing work notes, responding to quality assurance comments on submitted data). The NRC also has contractual support from INL to provide a data update to the ICDE project once per year.

7. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

The data are available in a format that can be used to support a PSA. The database format must be able to support different CCF methods because the participating countries have different approaches for performing CCF quantification. The database is able to support different quantification methods.

8. Are there any consistency issues between how your data is collected/coded for national programs versus the ICDE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the ICDE project?

There have been consistency issues between the national data program and the ICDE project. These consistency issues have generally been addressed on a case-by-case basis as they arise. Because the participating countries have different approaches to data collection and coding, the ICDE database cannot be made to be consistent with all the different national data programs. To address consistency issues, the ICDE database has established a general coding guidelines document. The coding guidelines are regularly updated based on input from the ICDE Steering Group, which includes representatives from each participating country. The latest revision was completed in October 2011 and is publicly available in the report, "NEA/CSNI/R(2011)12 ICDE General Coding Guidelines – Updated version." There are also component-specific coding guidelines for each of the components where data are exchanged. The countries are able to comment on the component coding guidelines before the data exchange takes place. The use of coding guidelines establishes a standard to which all participating countries are expected to adhere.

9. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

   Data from the ICDE project has not been directly used to support CCF parameter estimates in PSA models, but it has been used to develop general CCF insights. The ICDE data were used to compare CCF parameters for certain components where the amount of U.S. data available is limited. The three components that have been compared are: batteries, heat exchangers, and component cooling water motor-driven pumps. CCF parameters were estimated using ICDE data (excluding U.S. data) and with U.S. data. The parameters agreed well for all three components, and the comparison helped to reduce uncertainty associated with the limited data available for these components. The NRC has also used the ICDE data to review CCF phenomena that have occurred in other countries and for general insights on CCF analysis. These activities are not a formal part of the NRC's data analysis program, but they are performed on an as-needed basis. There are no publicly available reports on these activities.

10. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    There have not been significant challenges to using the ICDE data. An area where the project could improve is to increase the qualitative analysis and insights that can be gathered from the data. The ICDE project has had some recent activities that may help meet those objectives. Examples of recent activities include initiating a task to identify interesting events in the database, and holding a workshop to discuss events related to external environmental impacts.

Questionnaire for the FIRE data project

Questionnaire

Do you participate in the FIRE project?

- No and never have participated in the project *(please answer questions 11 - 13)*
- Do not currently participate in the project, but participated in an earlier project phase (*please answer questions 11 - 13 to describe your reasons for leaving the project, and questions 14 - 20 with regard to the earlier phase(s) in which you participated)*
- Yes *(please answer questions 14 - 20)*

If you are not currently a participant in the FIRE data project:

11. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - Resources associated with collecting/coding data are excessive
    - Benefits of participation do not justify the cost
    - Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - Proprietary/confidentiality concerns with data
    - Not an OECD/NEA member
    - Other ________________________________

12. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the FIRE data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

13. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are (or were) a participant in the FIRE data project:

14. Please describe your reasons for participating, including the benefits you have received from your participation.

    The project provides a cost effective method for collecting operational experience related to fire events at nuclear power plants. The NRC benefits from this participation include:

viii. Additional source of fire event information for comparison with the national database maintained by the Electric Power Research Institute (EPRI).

ix. Identification of any fire safety issues that may be applicable to U.S. plants.

x. Providing a venue to share unique fire scenarios that have occurred in other member countries and have been documented in the OECD fire events database. Countries present lessons learned at semi-annual meetings. Recent presentation topics include:
   1. Swedish Containment Air Test Fire, May 10 2011
   2. Onagawa seismically induced high energy arcing fault (HEAF) fire, March 11, 2011
   3. Finland, vacuum cleaner fire
   4. identification of HEAF research testing need.

15. In relation to the national data provided to the project:

a. What national data have you already provided to this project?

The U.S. national coordinator(s) have provided U.S. fire events that are documented in licensee event reports (LERs).

b. What is the source of the data that you have submitted?

U.S. LERs submitted to the NRC per U.S Code of Federal Regulations 10 CFR 50.73(x) are the source of the information provided to the OECD fire events database project. This regulation requires licensees to report any event that posed an actual threat to the safety of the nuclear power plant or significantly hampered site personnel in the performance of duties necessary for the safe operation of the nuclear power plant including fires, toxic gas release, or radioactive releases.

c. Have you used this data to support PSAs in your country?

No. NRC has used it as a comparison to the U.S. fire events database developed and maintained by EPRI. This information is then used to identify trends and any possible changes to the fire ignition frequency.

d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

Yes. Utilities experience many fire events that do not meet the threshold for being reported as a LER under 10 CFR 50.73(x). As such, the NRC has no process or mechanism for providing those events to the OECD fire events database.

16. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

NRC Office of Nuclear Regulatory Research (NRC/RES) staff resources have been used to collect, code, and submit LER events into the OECD fire events database.

17. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

Data is readily available on the project website, and the data is distributed semi-annually to the national coordinators on a cd. The information available is complete and available for manipulation by each member country. The reporting threshold is the only limitation to the usefulness of the project.

This was identified as a project limitation at the project onset and cannot be changed at this time do to country specific challenges.

18. Are there any consistency issues between how your data is collected/coded for national programs versus the FIRE data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the FIRE project?

    NRC does not maintain the U.S. national fire events database. The information provided to the OECD fire events database has to be manually extracted from the text of LERs. Although it takes time to code the LERs it is not excessively burdensome to the staff. If the information were made available from the EPRI database to be transferred to the OECD fire events database, then a significant effort (several man years) would be required to transfer the massive amount of data.

19. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

    No. NRC has used it as a comparison to the U.S. fire events database developed and maintained by EPRI. This information is then used to identify trends and any possible changes to the fire ignition frequency. The U.S. also plans to perform a trend analysis when the full EPRI/NRC database and frequency effort is complete, which is projected to be during year 2013. There are no publicly available references on the work at this time.

20. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    No. NRC has not experienced significant challenges to using the FIRE project and has no recommendations.

Questionnaire for the COMPSIS data project

Questionnaire

Did you participate in the COMPSIS project during the last project phase (i.e., participated through December 2011)?

- ☐ No and never participated in the COMPSIS project *(please answer questions 21 - 23)*
- ☐ Did not participate in the final phase of the project, but participated in an earlier project phase (*please answer questions 1 - 3 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ☐ Yes *(please answer questions 24 - 30)*

If you never participated in the COMPSIS project or left the project after participating in an earlier phase:

21. Why did you choose not to participate or terminate your participation (please provide all reasons that apply)?

    - ☐ Resources associated with collecting/coding data are excessive
    - ☐ Benefits of participation do not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ________________________________

22. With regard to you reasons for not participating in the project: What could have been done to encourage the participation of your organization in the COMPSIS data project? What information could you have contributed to the project?

    a. What could have been done to encourage the participation of your organization in the COMPSIS data project?

    b. What advantages and disadvantages did you see to project participation? Had you joined the data project, what information could you have contributed?

    c. Do you believe that there was sufficient information available to support making an informed decision about your participation in the COMPSIS project? If not, what information would you have liked to know about the project?

23. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how the information was used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you were a participant in the COMPSIS data project:

24. Please describe your reasons for participating, including the benefits you have received from your participation.

NRC participated in the COMPSIS project because it was intended to improve the safety of nuclear facilities by utilizing operating experience and providing common resources for the analytical framework of qualitative and quantitative assessments.

25. In relation to the national data provided to the project:

a. What national data have you already provided to this project?

No information was available on the national data provided to the project.

b. What is the source of the data that you have submitted?

c. Have you used this data to support PSAs in your country?

The data have not been used directly to support PSAs. There was an effort to quantify failure rates; however, this only included a limited number of data points (22 events).

d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

Some participating countries had restrictions limiting the data that was shared with the project. These issues were not identified or addressed in the early stages of developing the project.

26. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

The COMPSIS webpage and data processing system took the project Operating Agent a significant amount of time to set up, verify and finalize. The quality of the data processing and validating of event information was very high, and the requirements for having data accepted were very stringent. The effort to complete the entry of one event was a minimum of 4 to 5 hours. This caused limitations for several countries.

27. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would have recommended to improve the usefulness of project data for your PSA applications?

The COMPSIS data project did not develop to the point where it could be easily used for the purposes of supporting a PSA. There was never a way to collect the final number of exposed systems. This was information that participating countries were not willing to release.

28. Were there any consistency issues between how you data was collected/coded for national programs versus the COMPSIS data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions that could have improved the consistency of your national data programs with the COMPSIS project?

The COMPSIS project database process provided a very well defined method to mix different events reported from different standards and then segment them accordingly. However, due to other limitations of the project the implementation of this feature was never fully tested and verified.

29. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

    The COMPSIS data has not been used to support PSA activities by the NRC, and the COMPSIS project has been discontinued. The NRC is performing its own database collection and review of operational experience. This will provide a way to include outside sources of event types and relate lessons learned at nuclear power plant environments.

30. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    There have been challenges in developing and using the COMPSIS project. These can provide lessons for future digital safety system database projects. In order to succeed a project must have a reasonable concept and expectations for its members' conduct and resources. If the events do not exist for a research safety grade type collection for use in a PSA calculation, then the project course should be corrected to find useful objectives within the limitations and available experience.

Questionnaire for the OPDE/CODAP data project

Questionnaire

Do you participate in the OPDE and/or CODAP project?

- ☐ No and never have participated in either the OPDE or CODAP projects *(please answer questions 31 - 33)*
- ☐ Do not currently participate in the CODAP project, but participated in an earlier project phase of the OPDE project (*please answer questions 31 - 33 to describe your reasons for leaving the project, and questions 4 - 10 with regard to the earlier phase(s) in which you participated)*
- ☐ Yes *(please answer questions 34 - 40)*

If you are not a current participant in the CODAP data project:

31. Why did you choose not to participate or terminate your participation in the project (please provide all reasons that apply)?

    - ☐ Resources associated with collecting/coding data are excessive
    - ☐ Benefits of participation do not justify the cost
    - ☐ Data project duplicates a national program that provides needed data (if so, can you describe your national data collection program?)
    - ☐ Proprietary/confidentiality concerns with data
    - ☐ Not an OECD/NEA member
    - ☐ Other ________________________________

32. With regard to the potential for future project participation:

    a. What can be done to encourage the participation of your organization in the CODAP data project?

    b. What advantages and disadvantages do you see to project participation? If you were to join, what information would you be able to contribute?

    c. Do you believe that there is sufficient information available to support making an informed decision about future project participation? If not, what information would you like to know about the project?

33. Is there sufficient publicly available data project information available for non-participant PSA developers to benefit from the project? If you have used publicly available information, please describe what reports have been used and how was the information used. The attachment to this survey provides a summary of publicly available reports that have been published by the data projects.

If you are a current participant in the CODAP data project or participated in an earlier phase of the OPDE project:

34. Please describe your reasons for participating, including the benefits you have received from your participation.

    Operational experience related to degradation and ageing issues is reported to NRC through the Licensee Event Report (LER) system. Prior to participating in this project, the NRC did not have a systematic process for categorizing and organizing this operating experience. Participation in this project provides access to a centralized operational experience database with standardized coding guidelines. The database structure allows the user to easily search for specific degradation and ageing events.

The OPDE/SCAP/CODAP databases have been used to inform NRC regulatory decision making. The NRC licensing offices will occasionally ask for information of a certain type of event (e.g., bolting failures). One example involved the possibility of stress corrosion cracking in stainless steel fuel canisters used for dry storage of spent fuel. Operating experience from the SCAP database was used to demonstrate that stainless steel tanks and pipes exposed to a marine environment have exhibited stress corrosion cracking at domestic nuclear power plants.

35. In relation to the national data provided to the project:
    a. What national data have you already provided to this project?

       The NRC has reviewed data submitted through the LER system. The LERs that are deemed applicable to the database project are documented in spreadsheet format and submitted to the project. The submitted data includes historical LERs from year 1970 to the present.
    b. What is the source of the data that you have submitted?

       The NRC reviews LERs to identify operational experience that is applicable to the database project.
    c. Have you used this data to support PSAs in your country?

       Presently, the data is not used to support PSAs. However, there have been studies that have explored the use of this data to develop failure probabilities and initiating event frequencies. NRC is currently developing a method to use data from the OPDE and CODAP databases to estimate conditional failure probabilities for observed pipe degradations. Although not directly related to the OECD/NEA data projects, several past NRC projects have used operational data to estimate failure rates for benchmarking fracture mechanics calculations. For example, operational data was used to estimate LOCA frequencies that were compared to frequencies using other estimation approaches in NUREG-1829, "Estimating Loss-of-Coolant Accident (LOCA) Frequencies Through the Elicitation Process."
    d. Is there additional national data that could be used, but is not submitted due to proprietary/confidentiality concerns (If so, please describe the circumstances)?

       The LERs are the basis for all data shared with the project. All applicable LERs are available to be shared. Other sources of data have not been pursued. It is possible that U.S. licensees could provide additional information on replacement and repair activities. Access to this additional information would require agreement and approval from the U.S. nuclear industry.

36. What level of resources has been applied to support the project (including collecting, coding, submitting data, etc.)?

    The resources required to participate in the project are minimal compared to the benefits. Once per year the LERs are reviewed to identify those applicable to the database. The national coordinator must perform some minimal processing of the data by summarizing the LERs in a spreadsheet table. Most of the data coding is performed by the project contractor.

37. Is project data readily accessible and available in a format that you can easily use for the purposes of PSA (including availability of user manuals)? Are there any data collection or formatting changes you would recommend to improve the usefulness of project data for your PSA applications?

    The project data is accessible and is in a useable format. Although it has not been extensively used in PSA applications, the format does not prevent it from being used. Past versions of the databases (OPDE, SCAP) have been distributed in MS Access database. CODAP uses a web-based database tool. The tool has searchable fields that make identifying and categorizing events easy.

38. Are there any consistency issues between how your data is collected/coded for national programs versus the OPDE/CODAP data project? Do these issues represent a significant obstacle to your participation in the data project, and, if so, how have project obstacles been addressed by your organization? Do you have any suggestions for improving the consistency of your national data programs with the CODAP project?

    There have been no consistency issues with how the data is collected or coded.

39. Has data in the project database been used to support PSA activities by your organization (e.g., parameter estimation, general equipment performance insights)? If yes, how? Please provide references to any publicly available reports (if available).

    The data is not directly used to support PSA models, but NRC has a project to explore the use of data to develop conditional failure probabilities for observed pipe degradations. The initial work on this project was presented at the PSAM 11 and ESREL 2012 Conference.

    J. Wood, *et al*, "Estimating Conditional Failure Probabilities of Observed Piping Degradations," PSAM 11 and ESREL 2012 Conference on Probabilistic Safety Assessment June 25-29, 2012, Helsinki, Finland.

40. Have there been other significant challenges to using data project data? Do you have any recommendations for improvement?

    The project could benefit from improving awareness of methods and approaches for using the data to estimate failure probabilities and frequencies. Providing references to established methods would be helpful.

General Questions

41. Are you conducting any data activities to address the limited operational experience with new and advanced reactors? Are data project products being used to support these efforts? If not, how could data projects products better support your programmes for new and advanced reactors?

    The data projects are generally directed at supporting the needs of operating reactors. The COMPSIS project was potentially useful for new and advanced reactors because the new and advanced designs will involve computer-based I&C systems, but this project is no longer in operation. The NRC does not have any data activities that are being used to address issues with new and advanced reactors. The current data projects (ICDE, FIRE, CODAP) are not actively being used to address new and advanced reactors. It may be useful to see how the current data projects are, or are not, applicable to new and advanced reactors.
42. Are there any other data needs that could be addressed through a joint OECD/NEA data project? If a new data need is identified, would your organization be interested in supporting a new project?

    No specific data needs have been identified at this time. If a new data need is identified, then the NRC would be interested in supporting the project.

43. Other general comments?

    None.

APPENDIX H: CONTACT INFORMATION

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