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NUCLEAR ENERGY AGENCY
COMMITTEE ON THE SAFETY OF NUCLEAR INSTALLATIONS

WORKING GROUP ON FUEL CYCLE SAFETY

Fuel Incident Notification and Analysis System (FINAS) GUIDELINES

December 1995

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COMMITTEE ON THE SAFETY OF NUCLEAR INSTALLATIONS

The Committee on the Safety of Nuclear Installations (CSNI) of the OECD Nuclear Energy Agency (NEA) is an international committee made up of senior scientists and engineers. It was set up in 1973 to develop, and co-ordinate the activities of the Nuclear Energy Agency concerning the technical aspects of the design, construction and operation of nuclear installations insofar as they affect the safety of such installations. The Committee's purpose is to foster international co-operation in nuclear safety among the OECD Member countries.

The CSNI constitutes a forum for the exchange of technical information and for collaboration between organisations which can contribute, from their respective backgrounds in research, development, engineering or regulation, to these activities and to the definition of the programme of work. It also reviews the state of knowledge on selected topics on nuclear safety technology and safety assessment, including operating experience. It initiates and conducts programmes identified by these reviews and assessments in order to overcome discrepancies, develop improvements and reach international consensus on technical issues of common interest. It promotes the co-ordination of work in different Member countries including the establishment of co-operative research projects and assists in the feedback of the results to participating organisations. Full use is also made of traditional methods of co-operation, such as information exchanges, establishment of working groups, and organisation of conferences and specialist meetings.

The greater part of the CSNI's current programme is concerned with the technology of water reactors. The principal areas covered are operating experience and the human factor, reactor coolant system behaviour, various aspects of reactor component integrity, the phenomenology of radioactive releases in reactor accidents and their confinement, containment performance, risk assessment, and severe accidents. The Committee also studies the safety of the nuclear fuel cycle, conducts periodic surveys of the reactor safety research programmes and operates an international mechanism for exchanging reports on safety related nuclear power plant accidents.

In implementing its programme, the CSNI establishes co-operative mechanisms with NEA's Committee on Nuclear Regulatory Activities (CNRA), responsible for the activities of the Agency concerning the regulation, licensing and inspection of nuclear installations with regard to safety. It also cooperates with NEA's Committee on Radiation Protection and Public Health and NEA's Radioactive Waste Management Committee on matters of common interest.

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FOREWORD

The Committee on the Safety of Nuclear Installations (CSNI) Working Group on Fuel Cycle Safety, at its 11th meeting in September 1990, proposed instituting a Fuel Cycle Incident Reporting System, similar to the Incident Reporting System (IRS) used for nuclear power plants. Members stated that no system currently exists for exchanging experience on a regular basis, other than perhaps regular meetings of this sort of group of experts. The Working Group noted the importance and effectiveness of having a data base system to share operating experience between Member countries. The CSNI approved instituting a similar system, as proposed, on a trial basis, for nuclear fuel cycle facilities.

A guideline document, NEA/SIN/DOC(91)6 was developed and the Fuel Incident Notification and Analysis System (FINAS) was initiated in 1992. During the first 3 years of operation (thru the end of 1994), approximately 40 incident reports have been compiled and transmitted through the system. At the 15th meeting of the Working Group, in September 1994, members reviewed the status and progress of the system. Discussion centered on several areas of concern including the type of events being reported, quality of reporting and distribution requirements. Based on these discussions the Working Group proposed setting up a task group to review these areas of concern. The CSNI endorsed this approach and requested that the results of this review be presented at the next annual meeting.

This revision of the FINAS guidance criteria is a result of these efforts.

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I. BASIS

Learning from experience is widely recognised as key to good safety management systems and the broader this experience can be the better. As in nuclear power plants, nuclear fuel cycle facilities experience many unexpected events, ranging from minor equipment failures, such as a small piping leak to significant accidents such as off-site releases of radioactive products. Members of the Working Group on Fuel Cycle Safety proposed instituting a reporting system for nuclear fuel cycle facilities, similar to the international Incident Reporting System (IRS), utilised for nuclear power plants. The Committee on the Safety of Nuclear Installations (CSNI) fully endorsed this concept. Based on these actions, the OECD/NEA ***Fuel Incident Notification and Analysis System (FINAS)*** was developed and started in 1992, in order to share information on incidents and enhance safety at these facilities.

FINAS has been established on a voluntary basis by representatives from the OECD/NEA Member countries involved in the nuclear fuel cycle process, but is not part of the regulatory process in force within these countries. Additionally, FINAS is not part of any existing (or foreseen) international reporting systems or severity scales. Unlike these other programmes and systems, FINAS is purely a technical tool and is not formulated to provide information to the general nuclear industry or the public. In setting up FINAS it was stressed that in order for the system to be effective, it is not only necessary but critical to have the co-operation of facility operators in obtaining information.

II. OBJECTIVES

FINAS is established in order to collect and disseminate safety-related information concerning events occurring at nuclear fuel cycle facilities and feedback appropriate conclusions from these incidents. FINAS is intended to serve as a tool for sharing "lessons learned" from safety significant events among the technical community participating in the reporting system.

FINAS is an independent system, intended for nuclear specialists who need to analyse operating experience from various countries and with the intent of identifying any potential weaknesses within their own nuclear fuel cycle facilities. Based on this analysis, these experts can determine remedies or corrective actions which could to be taken.

III. TYPES OF FACILITIES

The types of facilities included in FINAS are defined as any type of installation dealing with the nuclear fuel cycle other than reactors or long-term waste repositories. Associated activities related to these facilities such as radioactive waste management and decommissioning, are included. These include such facilities as, but not limited to:

- Uranium Mines
- Refining Facilities
- Conversion Facilities
- Enrichment Plants
- Fabrication Facilities

- Waste Conditioning Plants
- Intermediate Storage Facilities
- Reprocessing Facilities

Fuel transportation aspects are currently not considered a part of the reporting system (although individual Member countries may make their own determination to report on specific cases), but may be considered in the future. Similarily, Research Laboratories are also not part of the current reporting system, but also may be considered in the future. These and other associated activities require further study prior to being approved. Finally, FINAS does not address incidents or events related to fuel that occur at nuclear power plants, since these are taken into account by IRS. A listing of fuel cycle facilities in Member countries is provided in Appendix E.

IV. RESPONSIBILITIES/ROLES

Each participating Member country designates a FINAS Co-ordinator, whose responsibilities are defined below. FINAS Co-ordinators are organised as a sub-group of the CSNI Working Group on Fuel Cycle Safety. The OECD/NEA Secretariat for the Working Group also will have responsibilities, as defined below, for FINAS.

FINAS Co-ordinators

The FINAS co-ordinator collects and transmits available information from his or her country to the OECD/NEA Secretariat and will receive and distribute the information received from the Secretariat, as appropriate.

The FINAS Co-ordinator performs a key function in the process. His task involves assessing the safety significance of incidents occurring within his or her country to determine the interest on an international scale. This implies that the co-ordinator should have access[1] to serious safety incidents reported to the regulatory authority and of equal importance, to those incidents considered as minor in nature, but nevertheless, likely to create interest due to a "precursor aspect" or "lessons learned". Co-ordinators are also tasked with continuing review of the system to propose changes and modifications as necessary.

OECD/NEA Secretariat

The OECD/NEA Secretariat role is to ensure the task of central organisation. All information received regarding reported incidents will be compiled, stored and disseminated by the Secretariat.

In this role, he may contact FINAS Co-ordinators to request additional information on a specific incident reported elsewhere (e.g., from other reporting systems or sources) which appear to meet the FINAS reporting criteria.

Upon receipt of a report the information and data will be recorded and the Secretariat will transmit the report to FINAS CO-ordinators. Early notification of an incident should be as soon as possible. The recording process should consist of a central data base operated by OECD/NEA.

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[1] As previously noted this implies the necessity of having good co-operation between the FINAS Co-ordinator, who in most cases will be from the regulatory authority and those members and other contacts in the operating facilities.

V. TYPES OF INCIDENTS / EVENTS TO BE REPORTED

An important point regarding the sharing of operating experience is that it alerts Member countries operating similar facilities or facilities with similar equipment of the occurrence of events which are considered as "precursors". The main objective, as previously stated, of FINAS is to share "lessons learned" from safety significant events at nuclear fuel cycle facilities. Significant events are defined as "those events or incidents which are considered as directly affecting the safety of the installation and/or its environment or, although not directly affecting safety have been identified as precursors to such an event".

Those types of events that will have or could have jeopardised safety and, therefore, are considered important enough to be brought to the attention of the nuclear community, should be reported. Events of this type, which provide useful "lessons learned", whether major or minor in magnitude, are the principal class of events which should be reported. For example, the following types of incidents should be reported:

- An event in which it is determined that the situation is not covered by the design accident conditions.

- An event that involves multiple failures caused either by common mode failures or system interactions.

- Human errors that lead to a significant degradation of the facility safety and is liable to produce a major accident.

- Events originating from operating conditions such as equipment failure, maintenance, modification or surveillance activities showing evidence of potential safety degradation.

- Details of events which are published in Member countries to inform the public.

Other events which should be considered are nuclear hazards whenever they might involve criticality incidents, and loss of containment events likely to lead to radioactive exposure, radioactive release/dispersion or spontaneous heating. Additionally, non-nuclear hazards related to chemical materials release, fires, explosions, earthquakes, flooding, aircraft crashes, etc., should be considered. The human contribution to all events, both errors of omission and errors of commission, should also be taken into consideration.

VI. COMMITMENTS

Each FINAS Co-ordinator is charged with reporting incidents of safety significance occurring within his or her Member country. While no specific reporting commitment is established by the system, it is expected that events which are considered significant to the safety of the facility and/or the environment will be reported. Additionally, as detailed in the previous section, incidents which can be identified as a precursor to such an event or provide important "lessons learned", are valuable and should be considered, for reporting.

Other sections of these guidelines provide additional details on reporting criteria which can be utilised to establish a threshold level for reporting. In determining the need to report an event, the FINAS

Co-ordinator requires flexibility in order to properly assess the value. Therefore, the criteria has been established to allow complete discretion to the Co-ordinator in choosing and determining which events to include.

VII. REPORTS

Format

In order to ensure homogeneity and quality in reports, and to facilitate retrieval of information, each report will be furnished in a standard format, including a cover sheet, coding form, and the incident report. The Appendices (listed below) to this document provide guideline information for completing reports and examples.

Cover Sheet (Appendix A)

The cover sheet provides a brief documentation on the incident, in order to establish general information regarding the event such as what, when and where it occurred. An abstract is also provided to enable the reader to obtain rapid understanding of the problem.

Coding Form (Appendix B)

The Coding form is utilised by the Secretariat as an input to the central data base. The central data base system (currently under development) will be available to participants to use for performing routine searches to identify significant safety issues or concerns arising from the reports. The FINAS Co-ordinator, using the "dictionary of codes", selects the proper characterisation(s) for each category specified, based on his or her evaluation and assessment of the event.

The Secretariat will compile the second part of the coding form, a description of codes, prior to transmitting the report. This description will provide a concise listing of the characterisation for the reported incident .

Incident Report (Appendix C)

The incident report or event analysis provides a description of the incident, including such elements as: observed and root causes, actual and potential consequences, safety significance, lessons learned, corrective actions taken, etc.

Definitions (Appendix D)

A listing of terminology frequently utilised in association with fuel cycle facilities is provided for assistance in preparation of reports.

Types

Reports should provide sufficient details of the event in order to facilitate the full understanding of the incident. While it is important that a report be transmitted within as short a time period as possible, the quality of the report pertaining to the information, is more critical to those who will receive and

interpret the material presented. Therefore, it is recommended that FINAS Co-ordinators utilise the following method in reporting incidents:

Note: In most cases the preliminary report may be sufficient for reporting purposes. It is dependent upon the FINAS Co-ordinator and the Secretariat to determine if a full report is required, as described below.)

Preliminary Reports

For events of major significance or with a high public interest, an initial "preliminary" report consisting of a brief description and any preliminary assessment, should be sent. This "preliminary" report, which may include just the cover sheet and coding form, should be transmitted to the Secretariat as soon as practicable (within one month, if possible) after the occurrence or identification.

Full Reports

For other incidents of major significance (those for which it is determined that a preliminary report is not required or follow-up of a preliminary report) a "full" report, giving sufficient details and information as laid out in the guidelines, should be sent as soon as practicable, nominally within 6 months, following occurrence or identification.

Revisions or Modifications

Additional information or revised data regarding any report should be transmitted to the Secretariat, as necessary. These changes will be codified appropriately and the numbering sequence will identify such reports as a revision.

VIII. CLASSIFICATION

FINAS reports will be distributed to FINAS Co-ordinators under two basic classifications, "RESTRICTED" and "CONFIDENTIAL", as described below:

Note: The classification of the report will be prominently marked on the cover page and each page of the report.

Restricted

Unless specifically marked "CONFIDENTIAL", all FINAS reports will be distributed under the classification "RESTRICTED", which is the routine classification of OECD documents. Once a "RESTRICTED" report is transmitted to the competent authority (e.g., FINAS Co-ordinator) of a Member country, it is the responsibility of this authority to decide its further dissemination within the country, as far as it is used for "official purposes".

Confidential

If a reporting country requests that a report be classified "CONFIDENTIAL" the report will be distributed as such. Recipients of a "CONFIDENTIAL" report will be limited to the organisation or persons named in the **List of Confidential (*)** reports. Prior authorisation of the reporting country is required for further distribution of all "CONFIDENTIAL" reports.

The distribution list of Confidential reports will be maintained by the NEA Secretariat based upon designations made by the Member countries.

IX. ANALYSIS OF REPORTS

FINAS reports will constitute a resource of material for basic types of studies and activities, performed by the CSNI. The central data base system set up by the OECD/NEA Secretariat will be able to perform routine searches on behalf of Member countries (It is foreseen that after further development this system will be available to participants to perform their own searches on a personal computer, although this aspect requires additional consideration prior to being initiated).

Periodic examination of the data base by FINAS Co-ordinators, members of the Working Group on Fuel Cycle Safety, or other CSNI members can be used to identify significant safety issues or concerns. Upon approval by the CSNI, these issues can be selected for further study, such as in:

- Specialist Meetings organised to address specific topics shown by operating experience to be of importance.

- FINAS Co-ordinator meetings organised to discuss events of particular importance or specific interest.

- Task Group studies or reports established by Working Groups to provide in-depth examination of specific topics or issues.

X. LANGUAGE

Information exchanged through FINAS may be in either of the OECD official languages, English or French.

APPENDIX A

COVER SHEET

INSTRUCTIONS

Note: Reports are to be completed utilising the attached standard cover sheet as follows:

ITEM	RESPONSIBILITY	DESCRIPTION
1. FINAS No.	Secretariat	Sequential numbering to be provided upon receipt of report.
2. CLASSIFICATION	Co-ordinator	"RESTRICTED" or "CONFIDENTIAL"
3. EVENT TITLE	Co-ordinator	Brief one-line description or title of event.
4. NOTIFICATION DATE	Secretariat	Date received @ OECD/NEA.
5. EVENT DATE	Co-ordinator	Date of occurrence of event.
6. COUNTRY	Co-ordinator	Country where event occurred.
7. FACILITY	Co-ordinator	Name of facility and Licensee where event occurred (see Appendix E)
8. TYPE / CAPACITY	Co-ordinator	Type and Capacity of Facility (see Section 3)
9. CONDITION	Co-ordinator	Status of plant at time of incident.
10. ABSTRACT	Co-ordinator	Concise summary of incident including the major aspects.

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F I N A S

FUEL INCIDENT NOTIFICATION AND ANALYSIS SYSTEM

FINAS N° (1) (2) ***RESTRICTED*** / ***CONFIDENTIAL***

EVENT TITLE
(3)

NOTIFICATION DATE: (4)

EVENT DATE: (5)

COUNTRY: (6)

FACILITY: (7)

TYPE OF FACILITY/CAPACITY: (8)

FACILITY CONDITION: (9)

ABSTRACT

(10)

APPENDIX B

CODING SHEET

General

A) Coding is to be completed by the FINAS Co-ordinator on the attached standard coding sheet utilising the dictionary of codes, on the following pages.

B) Based on the specific issues involved in the incident several codes may be applicable in each category. Each of these codes should be listed.

C) A list of definitions for the terms listed is attached as Appendix D

D) The Secretariat will compile the second part of the coding sheet based on codes listed by the Co-ordinator.

DICTIONARY OF CODES

1. REPORTING CRITERIA CATEGORIES

1.1 Criticality (e.g: degraded fuel, unexpected criticality or potential criticality)
- 1.1.1 Unexpected
- 1.1.2 Potential

1.2 Unanticipated or Significant Release of Radioactive Materials

- 1.2.1 Inside the facility
- 1.2.2 Outside the facility

1.3 Significant Release and Discharge of Radioactive and Chemical Materials into the Environment. (e.g: event that results in release or uncontrolled discharge of radioactive materials into the environment or event that results in significant release of chemical materials and may contribute to an accident or emergency conditions)

- 1.3.1 Radioactive materials - Below authorised limits - onsite
- 1.3.2 Radioactive materials - Below authorised limits - offsite
- 1.3.3 Radioactive materials - Above authorised limits - onsite
- 1.3.4 Radioactive materials - Above authorised limits - offsite
- 1.3.5 Chemical materials - Below authorised limits - onsite
- 1.3.6 Chemical materials - Below authorised limits - offsite
- 1.3.7 Chemical materials - Above authorised limits - onsite
- 1.3.8 Chemical materials - Above authorised limits - offsite

1.4 Significant Exposure to Radioactive Materials. (e.g.: an event that results in a member of the public or in a facility personnel receiving a radiation dose or an event that results in contamination of large facility areas (propagation by spread of radioactive materials)

- 1.4.1 Public - Below authorised limits
- 1.4.2 Public - Above authorised limits
- 1.4.3 Personnel - Below authorised limits
- 1.4.4 Personnel - Above authorised limits

1.5 Significant or Potential Degradation of Facility Safety (e.g.: non-compliance with administrative limits or operating Technical Specifications, degradation of safety-related systems, significant or potential safety deficiencies in construction, design, operation, Quality Assurance, etc.)

- 1.5.1 Significant degradation of facility safety
- 1.5.2 Potential degradation of facility safety

1.6 Generic Event of Safety Interest

1.7 Event of External Origin
- 1.7.1 Fires
- 1.7.2 Explosions

1.7.3 Flooding
1.7.4 Aircraft crashes
1.7.5 Earthquakes
1.7.6 Other

1.8 Event which attracts Public Interest

2. PLANT STATUS (Prior to the event)

2.1 Operational
2.1.1 Full capacity
2.1.2 Transient
2.1.3 Maintenance
2.1.4 Shutdown

2.2 Pre-Operational
2.2.1 Construction
2.2.2 Commissioning
2.2.3 Testing

2.3 Testing or Maintenance

2.4 Decommissioning

2.5 Other

3. FAILED / AFFECTED SYSTEMS OR FACILITY

3.1 Uranium Mining and Milling
3.1.1 Retention structures
3.1.2 Pipelines
3.1.3 Ventilation
3.1.4 Filtering
3.1.5 Other

3.2 Uranium Refining and Conversion to UF_6
3.2.1 Feed and delivery systems
3.2.2 Process systems
3.2.3 UF_6 containers
3.2.4 Service systems
3.2.5 Chemical control
3.2.6 Instrumentation and Control systems
3.2.7 Electrical power supply
3.2.8 Fire protection systems
3.2.9 Other

3.3 Uranium Enrichment (gaseous diffusion and centrifuge facilities)
3.3.1 Feed and delivery systems
3.3.2 Criticality / purity control

3.3.3 Moderation of liquid or solid UF_6
3.3.4 Service systems
3.3.5 Chemical control
3.3.6 Instrumentation and Control systems
3.3.7 Electrical power supply
3.3.8 Fire protection systems
3.3.9 Facility containment
3.3.10 Other

3.4 Fuel Fabrication (Uranium Oxide, MOX)
3.4.1 UF_6 containers
3.4.2 Fluidised bed system
3.4.3 Furnaces
3.4.4 Service systems
3.4.5 Chemical control
3.4.6 Instrumentation and Control systems
3.4.7 Electrical power supply
3.4.8 Fire protection systems
3.4.9 Facility containment
3.4.10 Criticality control systems
3.4.11 Containment systems
3.4.12 Other

3.5 Spent Fuel Storage
3.5.1 Irradiated fuel pool cooling and cleaning systems
3.5.2 Make-up systems
3.5.3 Fuel handling systems
3.5.4 Other

3.6 Spent Fuel Reprocessing
3.6.1 Head end (fuel element handling, mechanical head end systems)
3.6.2 Liquid extraction systems
3.6.3 Waste streams
3.6.4 Service systems
3.6.5 Product streams
3.6.6 Instrumentation and Control systems
3.6.7 Electrical power supply
3.6.8 Fire protection systems
3.6.9 Criticality control systems
3.6.10 Ventilation
3.6.11 Dissolving systems
3.6.12 Other

3.7 Radioactive Waste Management (includes interim storage)
3.7.1 Cooling systems
3.7.2 Containment structures
3.7.3 Radiation shielding
3.7.4 Ventilation / air cleaning systems
3.7.5 Feed systems
3.7.6 Instrumentation and Control systems

3.7.7 Electrical power supply
3.7.8 Calcination / Vitrification facilities
3.7.9 Off-gas cleaning systems
3.7.10 Condensers
3.7.11 Compaction systems
3.7.12 Incineration systems
3.7.13 Chemical systems
3.7.14 Waste encapsulation
3.7.15 Other

3.8 Final Depositories[2]

3.9 Transport[3]
3.9.1 Land - Vehicles
3.9.2 Land - Rail
3.9.3 Air
3.9.4 Sea
3.9.5 Other

3.10 Other

4. FAILED / AFFECTED COMPONENTS

4.1 Instrumentation (e.g.: gauges, transmitters, sensors, etc.)
4.1.1 Pressure
4.1.2 Temperature
4.1.3 Level
4.1.4 Flow
4.1.5 Radiation
4.1.6 Concentration
4.1.7 Other

4.2 Mechanical
4.2.1 Pumps, compressors, fans
4.2.2 Turbines, engines
4.2.3 Valves / Diverters
4.2.4 Tanks, vessels, exchangers, evaporators
4.2.5 Piping / Ducting
4.2.6 Filters
4.2.7 Furnaces
4.2.8 Penetrations

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[2] Although Fuel Depositories are not currently within the scope of Working Group activities, it was determined that this category be entered, since no other source of reporting is available at this time, for future utilisation, if required. Further discussion and definition of this category will be undertaken by the Working Group.

[3] Reporting of incidents involving fuel transportation, while not considered as part of the system, can be reported on a case by case basis, as determined by individual Member countries.

4.2.9 Protective shielding (e.g., containment)
4.2.10 Other

4.3 Electrical
4.3.1 Switchyard equipment (switchgear, transformers, buses, etc)
4.3.2 Inverters, rectifiers, batteries, small power supplies, etc.
4.3.3 Circuit breakers or fuses
4.3.4 Motors
4.3.5 Emergency or standby generators
4.3.6 Relays, connectors, hand switches, pushbuttons, contacts, etc.
4.3.7 Wiring, logic circuitry, controllers, starters, cables, etc.
4.3.8 Alarms
4.3.9 Software systems (computer based)
4.3.10 Other

5./6. CAUSES (Observed and Root)

(Note: The same coding is utilised for both categories 5 and 6)

5.1/6.1 Mechanical Failures
5.1.1/6.1.1 Corrosion, erosion, fouling
5.1.2/6.1.2 Lubrication problem (wear, fretting, etc)
5.1.3/6.1.3 Fatigue
5.1.4/6.1.4 Overloading
5.1.5/6.1.5 Vibration
5.1.6/6.1.6 Leak
5.1.7/6.1.8 Break, rupture, crack, weld failure
5.1.8/6.1.8 Blockage, restriction, obstruction, binding, foreign material
5.1.9/6.1.9 Deformation, displacement, loose parts, etc.
5.1.10/6.1.10 Other

5.2/6.2 Electrical Failures
5.2.1/6.2.1 Short circuit
5.2.2/6.2.2 Overheating
5.2.3/6.2.3 Overvoltage
5.2.4/6.2.4 Bad contact, disconnection
5.2.5/6.2.5 Circuit failure, open circuit
5.2.6/6.2.6 Ground fault
5.2.7/6.2.7 Undervoltage, voltage breakdown
5.2.8/6.2.8 Faulty insulation
5.2.9/6.2.9 Other

5.3/6.3 Chemical or Physics Failures
5.3.1/6.3.1 Chemical contamination
5.3.2/6.3.2 Fire, burning, smoke, explosion
5.3.3/6.3.3 Uncontrolled chemical reaction
5.3.4/6.3.4 Inadequate chemical control
5.3.5/6.3.5 Blockage, fouling, corrosion caused by chemical reaction
5.3.6/6.3.6 Other

5.4/6.4 Hydraulic Failures
- 5.4.1/6.4.1 Water hammer, abnormal pressure
- 5.4.2/6.4.2 Loss of flow
- 5.4.3/6.4.3 Loss of pressure
- 5.4.4/6.4.4 Cavitation
- 5.4.5/6.4.5 Gas Binding
- 5.4.6/6.4.6 Other

5.5/6.5 Instrumentation Failures
- 5.5.1/6.5.1 Failure
- 5.5.2/6.5.2 False response, loss of signal, spurious signal
- 5.5.3/6.5.3 Set point drift
- 5.5.4/6.5.4 Computer hardware / software failure
- 5.5.5/6.5.5 Other

5.6/6.6 Environmental (Abnormal Conditions **inside** the Plant)
- 5.6.1/6.6.1 Temperature
- 5.6.2/6.6.2 Pressure
- 5.6.3/6.6.3 Humidity
- 5.6.4/6.6.4 Flooding
- 5.6.5/6.6.5 Freezing
- 5.6.6/6.6.6 Irradiation of parts
- 5.6.7/6.6.7 Other

5.7/6.7 Environmental (External to the Plant)
- 5.7.1/6.7.1 Lightning strokes
- 5.7.2/6.7.2 Flooding
- 5.7.3/6.7.3 Storm
- 5.7.4/6.7.4 Earthquake
- 5.7.5/6.7.5 Freezing
- 5.7.6/6.7.6 Airplane crash
- 5.7.7/6.7.7 Other

5.8/6.8 Human Factors
- 5.8.1/6.8.1 Design deficiency (including modifications)
- 5.8.2/6.8.2 Manufacturing, construction or installation errors or deficiencies
- 5.8.3/6.8.3 Operator errors (omission or commission)
- 5.8.4/6.8.4 Carelessness, confusion
- 5.8.5/6.8.5 Cognitive error, misunderstanding
- 5.8.6/6.8.6 Violation of technical specifications or any other procedure
- 5.8.7/6.8.7 Inspection, maintenance, testing or calibration errors
- 5.8.8/6.8.8 Repair and subsequent testing error
- 5.8.9/6.8.9 Communication problem
- 5.8.10/6.8.10 Management, organisation or work planing deficiencies
- 5.8.11/6.8.11 Inadequate training
- 5.8.12/5.8.12 Other

5.9/6.9 Security, Safeguards, Sabotage, or Tampering Incidents

7. EFFECT ON OPERATION

7.1 Load or capacity decrease / reduction

7.2 Activation of Engineered Safety Features

7.3 Unplanned or significant radiation exposure
- 7.3.1 Public
- 7.3.2 Facility personnel

7.4 Significant Injuries
- 7.4.1 Public
- 7.4.2 Facility personnel

7.5 Outage extension

7.6 Exceeding technical specification limits

8. CHARACTERISTICS OF THE INCIDENT (significant aspects)

8.1 Unexpected or potential criticality

8.2 Degraded containment

8.3 Loss or Significant Degradation of Safety Function

8.4 Loss of Power
- 8.4.1 On-site
- 8.4.2 Off-site

8.5 Discovery of Major Condition not Previously Considered or Analysed

8.6 Fuel Handling Incident

8.7 Radwaste Incident

8.8 Radiation Exposure

8.9 Release of Radiative Materials

8.10 Significant Injuries

9. TYPE OF FAILURE

9.1 Single Failures

9.2 Multiple Failures

9.3 Common Cause Failures

9.4 Significant or Unforeseen Interaction Between Systems

9.5 Other

APPENDIX B

FINAS CODING SHEET

Reference: Dictionary of codes and FINAS guidelines

1.	Reporting categories:	{_____} {_____} {_____} {_____}
2.	Plant status prior to incident:	{_____} {_____} {_____} {_____}
3.	Failed / affected systems:	{_____} {_____} {_____} {_____}
		{_____} {_____} {_____} {_____}
4.	Failed / affected components:	{_____} {_____} {_____} {_____}
		{_____} {_____} {_____} {_____}
		{_____} {_____} {_____} {_____}
5	Observed causes:	{_____} {_____} {_____} {_____}
		{_____} {_____} {_____} {_____}
6	Root causes:	{_____} {_____} {_____} {_____}
		{_____} {_____} {_____} {_____}
7.	Effect on Operation:	{_____} {_____} {_____} {_____}
		{_____} {_____} {_____} {_____}
8.	Characteristics of event:	{_____} {_____} {_____} {_____}
		{_____} {_____} {_____} {_____}
9.	Type of failure:	{_____} {_____} {_____} {_____}
	Proposed "new" codes	{_____} _____
		{_____} _____
		{_____} _____

CODING SHEET (Part 2)

Description of Codes
To be completed by Secretariat

APPENDIX C

INCIDENT REPORT

The incident report is a detailed analysis of the event. The details presented provide other with information required to properly assess the effect of the event on their own facilities. Therefore, each report should be formatted with the following sections to provide a consistent basis for this assessment:

- Description of Incident
- Identification of Causes
- Description of Consequences
- Corrective Actions
- Lessons Learned

1. Description of Incident - This section should characterise the incident and its safety significance including such facts as: how the incident was detected, detailed characterisation of the sequence and both the actual and potential safety significance .

2. Identification of Causes - This part of the report should identify what made the system and / or component fail to perform as expected. It should also detail what weaknesses were present and why they were not detected prior to the event, through such circumstances as surveillance programmes, inspections, testing, etc.

3. Description of Consequences - This part of the report should distinguish what the actual and potential consequences of the event to the facility, environment or personnel.

4. Corrective Actions - This section should identify areas where corrective actions and / or improvements need to be or will be implemented in order to enhance safety and availability in areas such as: training, procedures, modification, etc.

5. Lessons Learned - This section should outline the lessons learned in order to improve safety, operation and prevent re-occurrence of the incident.

APPENDIX D

DEFINITIONS

The following definitions are provided for use of such terminology in FINAS reports. They are furnished with the objective of ensuring homogeneity in their usage, although they may be slightly different with definitions already adopted elsewhere for use in international documents.

ACCIDENT

Sequence of events which result in radioactive release or associated chemical discharges beyond the authorised limits or which result in significant damage to the installation which will necessitate difficult repairs with radiological protection problems.

AUTHORISED LIMITS

Limits, such as set by the International Commission on Radiological Protection (ICRP), which have been established or accepted by the Regulatory Body

AUTHORISATION

The act of granting written permission to perform specified activities.

CALCINATION

Evaporation of a waste solution to dryness and heating the residue so as to convert the waste to the oxides of the metallic constituents.

COMMISSIONING

The process during which fuel cycle facility components and systems, having been constructed, are made operational and verified to be in accordance with design assumptions and to have met performance criteria.

CONDITIONING

Those operations which transform the concentrates produced by treatment and other disperse wastes into forms suitable for transport and/or storage and/or disposal.

CONSTRUCTION

The process of manufacturing and assembling the components of a fuel cycle facility, the erection of civils works and structures, the installation of components and equipment, and the performance of associated tests.

CONTAMINATION

Pollution caused by radioactive materials.

CRITICALITY

A condition in which a sufficient quantity of fissile material is assembled in the right arrangement for a self-sustaining chain reaction to take place.

DECOMMISSIONING

The process by which a fuel cycle facility is finally taken out of operation.

DESIGN

The process and the result of developing the concept, detailed plans, supporting calculations and specifications for a fuel cycle facility and its parts.

DISCHARGE (of Radioactive or Chemical Products)

The discharge of radioactive materials (liquid, aerosol or gaseous) or associated chemical products from a facility via the designed pathways, which do not exceed the authorised annual limits.

DISPOSAL

The release or emplacement of waste materials without the intention of retrieval.

DOSE

The mean energy imparted by radiation per unit mass of matter; it is expressed numerically in grays, symbol Gy, as the unit of radiation equal to the joule per kilogram. 1 Gy = 1 J/kg = 100 rad.

DOSE EQUIVALENT

The amount of absorbed radiation per unit mass of matter, it is expressed numerically in sieverts, symbol, Sv, as the unit of dose equivalent. 1Sv = 100 rem.

DOSE EQUIVALENT LIMITS

The radiation exposure limit recommended by the International Commission on Radiological Protection (ICRP).

FACILITY

Civil structures and engineered features for carrying out and safeguarding safe and reliable operation. A facility may also be made up of several sub-facilities provided there is a close physical and operational relation

FACILITY MANAGEMENT (or Management)

The members of operating personnel who have been delegated responsibility and authority by the operating organisation fro directing the operation of the fuel cycle facility.

FAILURE

The failure of a system, component or part in such a way that one or more design requirements can no longer be fulfilled.

FUEL CYCLE

The various stages involved in supplying fuel for nuclear power reactors and any subsequent treatment and disposal operations. It includes Front-end operations such as: Uranium mining and milling, refining and conversion, enrichment and fabrication of fuel elements and Back-end (following reactor operation) operations such as: spent fuel storage, reprocessing and waste management and waste disposal.

INCIDENT

Sequence of events the occurrence of which may prohibit the continuation of the operation of the facility or sub-facility. They are characterised by radioactive discharges below the authorised limits or by minor chemical discharges and by operating problems which may involve a significant reduction in safety revealing weaknesses in the installation.

LICENSEE

The organisation authorised by the Regulatory Body to operate a fuel cycle facility.

MIXED OXIDE FUEL (MOX)

Reactor fuel which contains more than one type of fissile nuclide, both being in the form of oxides. Most commonly referred to fuel containing both Uranium oxide and Plutonium oxide.

NUCLEAR SAFETY

The achievement of proper operation conditions, prevention of accidents or mitigation of accident consequences, resulting in protection of site personnel, the public and the environment from undue radiation hazards.

OPERATING PERSONNEL

Those members of the site personnel who are involved in the operation of the fuel cycle facility.

OPERATION

All activities performed to achieve the purpose for which the fuel cycle facility was constructed, including maintenance, refuelling, in-service inspection and other associated activities.

OPERATIONAL LIMITS and CONDITIONS

A set of rules which set forth parameter limits, the functional capability and the performance levels of equipment and personnel approved by the Regulatory Body for safe operation of the fuel cycle facility.

OPERATIONAL RECORDS

Documents, such as instrument charts, certificates, log books, computer print outs and magnetic tapes, made to keep an objective history of fuel cycle facility operation.

QUALITY ASSURANCE

All those planned and systematic actions necessary to provide adequate confidence that an item or service will satisfy given requirements for quality.

RADIOACTIVE WASTE

Any material containing or contaminated with radionuclides at concentrations greater than the values that the competent authorities would consider acceptable in materials suitable for uncontrolled use or release, and for which there is no foreseen use.

RADIOACTIVITY

Process whereby certain nuclides undergo spontaneous disintegration in which energy is liberated, generally in the formation of new nuclides. The process is accompanied by the emission of one or more types of radiation, such as alpha particles, beta particles and photons (electromagnetic radiation).

REGULATORY BODY

A national authority or a system of authorities designated by a Member state, assisted by technical and other advisory bodies, and having the legal authority for conducting the licensing process, for issuing licenses and thereby for regulating fuel cycle facility siting, design, construction, commissioning, operation and decommissioning or specific aspects thereof.

RELEASES (of Radioactive or Chemical Products)

The discharge of radioactive or associated chemical products from the facility which exceed the authorised annual release rate.

REPROCESSING

A chemical process, the purpose of which is to extract for further use Uranium and Plutonium from spent fuel; this operation also results in the separation of radioactive waste products.

SAFETY LIMITS

Limits upon process variables within which the operation of the fuel cycle facility has been shown to be safe.

SAFETY SYSTEMS

Systems important to the safety of a facility or sub-facility designed to protect the operating personnel, the population in the vicinity and the environment against the hazards involved in the operation or activity or to limit the consequences of anticipated operational occurrences and accident conditions.

SAFETY SYSTEM SETTINGS

Those points of actuation of appropriate automatic protective devices which are intended to initiate action to prevent a safety limit from being exceeded and to cope with anticipated operational occurrences and accident conditions.

SITE

The area containing the facility, defined by a boundary and under effective control of the facility management.

SITE PERSONNEL

All persons working on the site, either permanently or temporarily.

SPENT FUEL (Irradiated fuel)

Nuclear Fuel removed from a reactor following irradiation, which is no longer usable because of depletion of fissile material, poison build-up or radiation damage.

STORAGE

The emplacement of waste materials with the intent and in such a manner that the material can be retrieved later.

TREATMENT

Those operations which lead to the concentration of radionuclides in a smaller volume and to a corresponding reduction of the radioactivity in the remaining material, thereby enabling it to be discharged or recycled.

WASTE MANAGEMENT

The series of operations (including storage) carried out on the waste from arising to disposal.

APPENDIX E

FACILITIES

FUEL CYCLE FACILITIES IN OECD MEMBER COUNTRIES

COUNTRY	FACILITY / SITE	CAPACITY (THM/Y)	PRODUCT PROCESS
	URANIUM ORE PROCESSING		
AUSTRALIA	OLYMPIC DAM	1,600	Ore - U_3O_8
	RANGER	2,500	Ore - U_3O_8
BELGIUM	PUURS-ENGIS	50	UEx. HP_3O_4
CANADA	CLUFF LAKE	1,500	Ore - U_3O_8
	ELIOTT-LAKE STANLEIGH	900	Ore - U_3O_8
	KEY LAKE	5,700	Ore - U_3O_8
	RABBIT LAKE	5,400	Ore - U_3O_8
	CIGAR LAKE	5,400	In preparation
	MIDWEST JOINT VENTURE	1,600	In preparation
	MINATCO	2,500	Under construction
	MCARTHUR LAKE	---	In preparation
FRANCE	BESSINES	1,500	Ore - U_3O_8
	L'ECARPIER	650	Ore - U_3O_8
	LE CELLIER	300	Ore - U_3O_8
	LODEVE	1,000	Ore - U_3O_8
	MAILHAC / BERNADEN	500	Ore - U_3O_8
	ST MARTIN DU BOSC	850	Ore - U_3O_8
	ST PIERRE DU CANTAL	100	Ore - U_3O_8
GREECE	PANANESTI	150	Ore - U_3O_8
PORTUGAL	URGEIRICA	170	Ore - U_3O_8
SPAIN	LA HABA	25	Ore - U_3O_8
	SAELICES EL CHICO	190	Ore - U_3O_8
UNITED STATES	BLANDING	3,000	Ore - U_3O_8
	BRUNI	330	Ore - U_3O_8
	BURNS	400	Ore - U_3O_8
	CANON CITY	330	Ore - U_3O_8
	DONALDSONVILLE	150	Ore - U_3O_8
	GRANTS	1,000	Ore - U_3O_8
	HOBSON CENTRAL	400	Ore - U_3O_8
	JEFFREY CITY	500	Ore - U_3O_8
	LA SAL	500	Ore - U_3O_8
	MULBERRY	300	UEx. HP_3O_4
	PANNA MARIA	2,500	Ore - U_3O_8
	SHIRLEY BASIN	1,700	Ore - U_3O_8
	UNCLE SAM	300	Ore - U_3O_8
	WHITE MESA	339	Ore - U_3O_8
	ZANZOW	100	Ore - U_3O_8

URANIUM REFINING AND CONVERSION			
CANADA	BLIND RIVER PORT HOPE	18,000 10,000	U_3O_8 - U_3O U_3O_8 - UF_6
FRANCE	MALVESI PIERRELATTE	14,000 14,000	U_3O_8 - UF_6 + U UF_4 - UF_6
JAPAN	NINGYO-TOGE	200	U_3O_8 - UF_6
UNITED KINGDOM	SPRINGFIELDS	9,000	U_3O_8 - UF_6
UNITED STATES	METROPOLIS SEQUOIA FUELS, CONVERSION SEQUOIA FUELS, REDUCTION	12,700 9,090 3,400	U_3O_8 - UF_6 UOX - UF_6 UF_6 - UF_4
ENRICHMENT			
FRANCE	TRICASTIN	10,000,000	Diffusion
GERMANY	GRONAU	1,000,000	Centrifuge
JAPAN	NINGYO-TOGE ROKKASHO-MURA	200,000 600,000	Centrifuge Centrifuge
NETHERLANDS	ALMELO	1,200,000	Centrifuge
UNITED KINGDOM	CAPENHURST	950,000	Centrifuge
UNITED STATES	PADUCAH PORTSMOUTH	11,300,000 8,000,000	Diffusion Diffusion
FUEL FABRICATION			
BELGIUM	DESSEL DESSEL	35 400	MOX - LWR - FBR UO_2
CANADA	PETERBOROUGH TORONTO PORT HOPE	1,000 1,000 900	Fuel Bundles Fuel Pellets Fuel Bundles & Fuel Pellets
FRANCE	SCIN VEUREY CADARACHE ROMANS PIERRELATTE MARCOULE	140 25 750 500	Fuel Bundles & Fuel Pellets MOX - FBR UO_2 - PWR LWR
GERMANY	HANAU HANAU LINGEN	5 400 400	MOX - LWR UO_2 - LWR UO_2 - LWR
ITALY	BOSCO MARENGO SALLUGIA	200 60	UO_2 - LWR UO_2 - LWR
JAPAN	KUMATORI TOKAI-MURA YOKOSUKA	265 640 (LWR) + (MOX) 640	UO_2 - LWR LWR - MOX - FBR UO_2 - LWR
SPAIN	JUZBADO	200	UO_2 - LWR
SWEDEN	VASTERAS	400	UO_2 - LWR

UNITED KINGDOM	SPRINGFIELDS	350	UO_2 - GWR
	SPRINGFIELDS	1,500	U - MAGNOX
	SPRINGFIELDS	200	UO_2 - LWR
	SELLAFIELD	50	MOX - LWR
	SELLAFIELD	6	MOX - FBR
UNITED STATES	COLUMBIA	1,150	LWR
	LYNCHBURG	400	LWR
	RICHLAND	700	LWR
	WILMINGTON	1,100	LWR
	WINDSOR	275	LWR
AWAY FROM REACTOR STORAGE FOR SPENT FUEL			
FRANCE	CADARACHE (CASCAD)	180	Vault
	LA HAGUE	8,400	Pool
GERMANY	GORLEBEN	1,500	Dry Cask
	KARLSRUHE	55	Pool
	AHAUS	1,500	Dry Cask
	GREIFSWALDT	650	Dry Cask
JAPAN	TOKAI-MURA	97	Pool
SWEDEN	CLAB	3,000	Pool
UNITED KINGDOM	SELLAFIELD (MAGNOX)	3,500	Pool
	SELLAFIELD (LWR+THORP)	5,300	Pool
	SELLAFIELD (AGR)	2,200	Pool
UNITED STATES	MORRIS	750	Pool
	MRS	15,000	Dry Cask
REACTOR SITE STORAGE FOR SPENT FUEL			
UNITED KINGDOM	WYLFA	700	Vault
REPROCESSING			
FRANCE	LA HAGUE UP2 - 400	400	LWR
	LA HAGUE UP 2 - 800	800	LWR
	LA HAGUE UP 3	800	LWR
	MARCOULE UP 1	600	GCR
JAPAN	TOKAI-MURA	210	LWR
	ROKKASHO MURA	800	LWR
UNITED KINGDOM	DOUNREAY	8	MOX
	SELLAFIELD	1,500	MAGNOX
	SELLAFIELD (THORP)	1,200	LWR
WASTE HANDLING FACILITIES			