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NUCLEAR ENERGY AGENCY
RADIOACTIVE WASTE MANAGEMENT COMMITTEE

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Working Party on Decommissioning and Dismantling (WPDD)

Proceedings of the WPDD Topical Session on:
Emerging Issues and Trends in Regulatory Practices during Decommissioning and Dismantling of Nuclear Power Plants

Held on 24 October 2006
at the NEA Offices in Issy-les-Moulineaux, France

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FOREWORD

Set up by the Radioactive Waste Management Committee (RWMC), the WPDD brings together senior representatives of national organisations who have a broad overview of Decommissioning and Dismantling (D&D) issues through their work as regulators, implementers, R&D experts or policy makers. These include representatives from regulatory authorities, industrial decommissioners from the NEA Co-operative Programme on Exchange of Scientific and Technical Information on Nuclear Installation Decommissioning Projects (CPD), and cross-representation from the other NEA Committees. The EC is a member of the WPDD and the IAEA is participating as an observer. This broad participation provides good possibilities for the co-ordination efforts amongst activities in the international programmes.

At its seventh meeting, in Paris, 23-25 October 2006, the WPDD held a topical session on "Emerging issues and trends in regulatory practices during the decommissioning and dismantling of nuclear power plants". This report documents the topical session. The main text summarises the main points from the presentations and discussions and includes the rapporteur's reports. Appendix 1 and 2 provide the agenda of the topical session and all contributed papers respectively.

The topical session facilitated an exchange of information and experience on the following issues in particular:

- changes to the risk profile of a nuclear power plant shutdown and removal of spent nuclear fuel;
- consequential changes to the regulatory regime after shutdown; and
- striking a balance between requirements for flexibility and harmonisation of regulatory approaches.

Mr Larry Camper, USNRC, served as Chair of the Topical Session. Ms. Juliet Long, UK Environment Agency UK, moderated the discussion session on the competing needs of flexibility and harmonisation of regulatory approaches. Mr. Doug Metcalfe, Natural Resources Canada, served as rapporteur for the Topical Session.

At the end of each session time was allotted for a plenary discussion. The rapporteur reviewed the main points and the lessons learnt at the end of the Topical Session.

Acknowledgement

The WPDD wishes to express its gratitude to Mr. Camper, Ms. Long and Mr. Metcalfe, as well as to all those presenting papers, for their efforts in making the topical session a success.

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SUMMARY OF MAIN POINTS

Keynote addresses

Two keynote addresses were given at the Topical Session. In the first, Allan Duncan noted that, although the risks associated with a major nuclear excursion are eliminated by fuel removal, the transition from the operational phase of a nuclear power plant to D&D requires a new or modified site licence. This will reflect the change from operational nuclear safety risks towards risks concerned more with the industrial nature of D&D operations and with the potential for increased environmental impacts. In the situation where there is still relatively little experience of licensing the decommissioning of nuclear power plants, it appears that all Member Countries intend to keep the balance between nuclear site licence requirements and the risks associated with D&D operations under continuous review, and to modify conditions in the light of experience and changing circumstances. This may result in addition of new conditions, removal of redundant conditions, increased or decreased emphasis on some of the existing conditions and continuation of others.

In the second address Peter Lietava discussed WENRA's perspective on the harmonisation of European Union regulations, which had the aim to produce harmonised safety reference levels by 2006 in most areas, to be implemented by 2010 in each EU Member State. Harmonisation was defined in terms there being "no substantial differences between countries from the in terms of safety provisions, i.e. high level safety requirements in each country should be comparable, including in terms of their implementation. The Safety Reference Levels were being developed by identifying initially the relevant safety areas. They took account of the reference levels for reactor operational safety, and were closely aligned with the relevant IAEA safety standards, and took account of best practice in the EU.

In the discussion that followed the two keynote presentations, it was noted that stakeholder involvement was needed both at national and at local levels. This suggested a need for some integration of the approach to public participation between sites, rather than adopting a purely site-by-site approach. It was also noted that there was sometimes conflicting interests between authorities at national and at local levels, with the latter being more concerned about the possibility of reuse of the site for other purposes.

Facilitated discussion on the balance between harmonization and flexibility

Juliet Long opened the discussion by suggesting that there were potential benefits from harmonizing standards in terms of stakeholder confidence, e.g. clearance of material and disposal of waste may be easier to implement when there are standardised criteria. These potential benefits needed to be set against the consequential loss of flexibility.

There followed a discussion on the level at which harmonization should occur, i.e. at the level of safety principles or at the level of safety criteria (numbers). It was argued that harmonisation of high level principles was relatively straightforward, though the greatest benefits may result from harmonisation of numerical criteria, e.g. in the case of clearance. The latter was problematic because of the difficulty is gaining agreement to specific numbers, e.g. there may be a tendency to harmonise

around the most stringent criteria being applied regardless of their fitness for purpose. It was suggested that, before attempting harmonisation of safety criteria, there should be harmonisation of the higher-level safety principles.

Difficulties also arose because of the wide variations in national regulatory systems: different countries applied different premises in developing their safety criteria. It was suggested that, as a minimum, the process of arriving at specific criteria should be made clear by national authorities. As a first step towards greater harmonisation, it would be useful to have agreement on the process for arriving at specific criteria. In any event, regulatory authorities should always be encouraged to explain the assumptions underlying the criteria being used.

It was stated that the low levels of actual safety risk applying to decommissioning activities were often not well communicated to the general public. This important aspect should not be obscured by the differences in national safety criteria. It was also mentioned that, following discussions over a very long period, criteria for clearance of materials had been established by IAEA and these had been accepted by all its Member States. The criteria were nonetheless being applied differently in different countries. It was noted that IAEA's preferred strategy for decommissioning, under optimal conditions, involved immediate dismantling. In practice, IAEA recognised the need for flexibility in developing national strategies for decommissioning.

Closing the discussion, Juliet Long noted that no strong positions were expressed either in favour or against further rationalisation. There will inevitably always need to be some flexibility in regulatory criteria to accommodate differences in local situations. Larry Camper added that, current differences in national criteria can provide a misleading picture, as the numbers are in any event extremely low. In practice, there were unlikely to be significant differences between achieved levels of safety in different countries.

Facing the challenge of setting up a decommissioning regulatory regime

Presentations on the regulatory system for decommissioning in Sweden were given by Stig Wingefors (SKI perspective), Henrik Efraimsson (SSI perspective) and Bertil Hansson (Barsebäck NPP, licensee's perspective). The presentations noted that current areas of development of the regulatory system were concerned with:

- updating the regulations for planning of decommissioning;
- developing regulations on releases to the environment during decommissioning; and
- development of criteria and regulations for the release of sites.

The regulatory authorities were undertaking research on methods for radiological characterisation. From the implementer's perspective, it was noted that in the transition from an operating reactor to a 'Green field' site, the dominant risk-focus is rapidly changing from reactor safety and radiological risks to normal industrial safety risks. The requirements from the regulators must follow and harmonise with the actual risk, to guide the operator through the transition phase.

National presentations on lessons learned and adaptation of regulatory practice

Presentations on national practices in the US, Germany and Spain were given by Dominick Orlando, Karl-Heinz Kölschbach and José Luis Santiago respectively. The first presentation distinguished between the roles of the licensee and the regulator in the transition to decommissioning facilities in the US. For example, the former must consider how to undertake new safety-relevant activities and how to deal with new waste streams; the latter needs to ensure that reduced regulatory requirements remain

commensurate with the associated level of risk. There was increased stakeholder involvement in the decommissioning process, which included mandated public meetings and opportunities for review of decommissioning documentation. Significant efforts were also being applied to ensuring good coordination between different regulatory authorities.

The second presentation noted that decommissioning and dismantling of German nuclear power plants was performed in several phases, each of which were subject to individual licenses. The licensing authority was at the level of the federal states ("Länder") with overall supervision at the federal (national) level. The regulator's authorization of the decommissioning and dismantling phases addresses new aspects, such as assessment of the decommissioning and dismantling activities, as well as existing one such as precautions for waste management or security of the nuclear power plant. In those cases, in where no spent fuel is in the nuclear power plant, measures to control reactivity or the coolant are no longer required and thus are no longer subject to the authorization. Depending on the progress during dismantling of the nuclear power plant and on the related remaining radioactive inventory the requirements will be adapted accordingly, but without jeopardizing safety of the work forces, of the public and of the environment.

The third presentation noted that a consultation exercise for updating regulatory requirements for decommissioning was underway and revised requirements concerning licensing documentation were expected to be completed in early 2008. The regulatory requirements would take account of the new activities and risks associated with dismantling, and would include methodologies to define whether an SSC[1] is important for safety or for radiological protection, and to define the content of Technical Specifications. In addition, the content of regulatory surveillance programmes during the transition phase is also being developed.

L. Camper opened the ensuing discussion by noting that there were both differences and similarities between the approaches in each of the three countries. Coordination between the relevant competent authorities needed to be ongoing throughout the process and was potentially difficult. He noted that the decommissioning phase of a power plant was always dynamic, and therefore it was necessary to prepare for the unexpected. The significant level of regulatory resources engaged in overseeing decommissioning was clear from the presentations.

There followed a discussion about the increase in certain risks during decommissioning, as opposed to during operation – despite the general reduction in radiological risks following removal of the spent fuel. These resulted from the novelty of many of the processes (for a particular power plant) and the progressive removal of safety systems. It was noted that the increased risks generally resulted from normal industrial processes, such as from heavy loads, and applied largely to the plant workforce. In certain cases there is a greater potential for environmental contamination from activities taking place during decommissioning than during operation.

It was noted that the regulatory process during the transition phase focuses mainly on predefined activities that have implications for the licence, such as fuel handling and control room handling.

L. Camper summarized the discussion by emphasizing the need for a continuous update of regulatory requirements to take account of lessons being learnt from ongoing decommissioning projects. Maintaining stakeholder confidence in the overall process was crucial.

1. System, structure or component.

Implementer's perspective on regulatory issues

B. Hansson (Barsebäck NPP) gave a presentation in several parts, beginning with an overview of the planning scenarios for Barsebäck 1 and 2. According to this schedule, the final repository for dismantling waste will be ready for use before 2020 and the dismantling of Unit 1 will then proceed immediately. He went on to outline agreed industry positions on safe decommissioning as developed by the WNA[2] and the ENISS initiative[3]. As regards the former he mentioned *inter alia* the following points:

- site re-use is fundamental to the sustainable use of resources. Commercially, the best re-use of a successfully decommissioned site may well be the construction of a new nuclear facility in its place;
- uniformity in regulatory standards facilitates predictability, planning, and efficiency in all areas of practice, including the decommissioning process. There is thus an increasing effort internationally to develop agreed universal standards that will lend consistency and coherence to national regulatory regimes; and
- most decommissioning wastes are uncontaminated or have a very low level of radioactivity.

Finally, as regards the ENISS initiative, he noted that European NPP licensees support WENRAs harmonisation approach for existing plants because:

- diversity of national regulations could seriously distort competition in the deregulated EU electricity market;
- harmonising regulations is the best way of ensuring that industry can evolve in a stable legal framework; and
- Efforts in harmonisation processes increase transparency and public acceptance of nuclear energy.

In the discussion that followed this presentation it was noted that there were large differences in approach to achieving adequate safety, e.g. in some cases it may be necessary to evaluate risk from an aircraft crash even though no such analysis was undertaken to evaluate safety during the operational phase. The importance of dialogue between the regulator and the implementer was emphasized, e.g. to determine the content of the safety report. It was a responsibility of regulatory authorities to give guidance on such requirements.

Discussion of the regulatory factors seen as most critical to an effective and efficient decommissioning process

The final discussion was led by a panel comprising Walter Blommaert (FANC, Belgium), Dorothée Conte (DGSNR, France), Tadamichi Sato (JAPCO, Japan); and Ivo Tripputi (SOGIN, Italy). The panellists summarised pertinent issues from their national perspectives as an introduction to the discussion.

In Belgium, the main current priority areas for further development of the regulatory framework for decommissioning activities included:

- development of (generic) dose criteria for release of sites;

2. World Nuclear Association.

3. European Nuclear Installations Safety Standards Initiative.

- isotope specific clearance levels for surface contamination;
- improved coordination between federal and regional levels; and
- re-evaluation of the licensing procedure; involving a general methodology with special emphasis on specific hold points in the decommissioning process.

In Japan, amendments to the regulations for decommissioning came into force in December 2005. *Inter alia* the new regulations clarify that the provisions of the decommissioning plan apply immediately on plant shutdown, and the regulatory regime applying to decommissioning comes into effect. Once the spent fuel has been removed plant operating conditions relating to maintaining the safety functioning of relevant systems is no longer required, though new requirements are introduced governing the safety functions relevant to the new plant condition. There are also conditions relating to the final state of the wastes and of the site. The main ongoing reactor decommissioning project was the Tokai-1 NPP, which completed the first phase of decommissioning in March 2006.

In Italy, the intent was to follow a safety approach to decommissioning that is fit for purpose, in the sense that safety requirements reflect the different nature of the risks applying to a shutdown reactor. This approach is also felt to ensure that implementers remain focused on the issues that are safety significant and helps to maintain a good safety culture at the facility being decommissioned.

In the discussion following the papers waste management was identified as being one of the most challenging issues, given the absence of a final waste management route in most countries. Related to this was the issue of waste characterisation and clearance, so that for many programmes this challenge covered the wider issue of materials management. The Belgian experience from the decommissioning of the Eurochemic facility was that up to 80% of metals and concrete could be cleared.

The importance of maintaining a good safety culture was emphasised by a number of speakers. In this regard it was important to avoid the potential for over-regulation- a level of regulatory oversight that was out of balance with safety needs. Regulation should therefore be adapted to the actual level of risk, i.e. taking account of reduced nuclear safety risks though increased industrial safety risks. It was noted that there is therefore a need for a change in culture inside the regulatory authority, just as well as in the implementing organisation. In this regard the need for flexibility in regulation was very important.

It was noted that maintaining as many as possible of the local workforce during the decommissioning phase (rather than bringing in contractors from outside) helped to maintain continuity with the safety culture that applied during the operational phase of a nuclear power plant. This also had benefits in terms of the maintenance of knowledge about the plant.

RAPPORTEUR'S REPORT

Doug METCALFE
Natural Resources Canada

The OECD/NEA Working Party on Decommissioning and Dismantling (WPDD) held a one-day Topical Session on regulatory practices related to the decommissioning and dismantling of nuclear power plants (NPPs) on 24 October 2006 in Paris, France as part of its 7th Meeting. This was attended by 38 participants, representing 14 NEA member countries and 2 international organisations.

The Topical Session was chaired by Mr. Larry Camper of the US Nuclear Regulatory Commission, and included keynote addresses, facilitated discussions, and papers from both implementers and regulators. To provide a sound basis for the discussions, a brief questionnaire was circulated to Member Countries in June 2006 to collect information on regulatory approaches and practices. Nine countries responded to the questionnaire, the results of which were synthesized and summarized in a keynote address by Mr. Allan Duncan, United Kingdom. The Topical Session provided valuable insights and lessons learned on the regulation of the decommissioning and dismantling of NPPs, and identified ongoing issues that are being resolved as experience is gained.

Transition to Decommissioning

In all countries, the transition of NPPs from an operating state to decommissioning requires substantial documentation, rigorous regulatory review, and typically an environmental impact assessment before approval is granted. In some countries a new decommissioning licence is required, while in other countries the operating licence "evolves" through the addition of new conditions to address decommissioning activities and issues, and the elimination of conditions that are no longer applicable. Given the novel and diverse nature of decommissioning and dismantling, a number of new activities are involved which require regulatory review and analysis. The regulatory scrutiny of organizational and financial issues is often as rigorous as that for technical and safety issues. At least initially, regulatory requirements for decommissioning are largely the same as for operation, with increased emphasis in many areas, such as the control of new activities, radiation protection, and the management and clearance of waste. Areas of decreased emphasis identified during the transition phase included risk analysis, criticality and off-site emergency planning.

Reductions in Regulatory Requirements as Hazards and Risks are Reduced

It was common ground amongst the delegates that regulatory requirements can be reduced as decommissioning and dismantling progresses, and the associated hazards and risks are reduced. Regulators pointed out, however, that it is up to the implementer to make the case for reductions in regulatory requirements. It was suggested that there may be benefit in defining, on an internationally-agreed basis, the general phases and milestones in NPP decommissioning when regulatory requirements should be reviewed to ensure that they are in keeping with the residual risks associated with the facility and the decommissioning operations. Regulators recognized that the process of decommissioning and dismantling an NPP is dynamic, and want mechanisms in place to ensure the protection of health, safety and environment throughout the continuous change that is an inherent

characteristic of decommissioning. A rigorous implementer work permit system and a stepwise approach to decommissioning were noted as potential approaches for dealing with uncertainties and adapting regulatory effort to risks.

Coordination between National Authorities

The decommissioning and dismantling of NPPs brings new issues, such as conventional hazards associated with large-scale demolition projects and the handling and disposal of large quantities of non-radioactive waste. This typically requires new cooperative working relationships between national and regional authorities, some of which have limited experience with the nuclear industry. This requires early, frequent and open communications between the various authorities with an interest in the decommissioning project to determine roles and responsibilities and to develop a streamlined and coordinated decision-making process. It was noted that the challenges become more significant as the number of authorities involved in NPP decommissioning and dismantling increase. The implementer must comply with the requirements of all authorities, and thus from the standpoint of the implementer, it would be beneficial if a 'lead' authority were appointed to ensure consistency between the various requirements, and coordinate the review process to allow for timely decision-making.

Harmonization versus Flexibility

The discussion session on the potential for harmonization of international approaches to regulating the decommissioning and dismantling of NPPs suggested that there were both advantages and disadvantages in pursuing this. Implementers noted that harmonization of regulator requirements would increase understanding and predictability, particularly for matters with transboundary ramifications, such as the clearance of scrap metal for recycling. Harmonized regulations could also contribute to increased public confidence, especially regarding numerical criteria such as those used for the release of buildings and sites from regulatory control. On the other hand, flexibility in regulatory requirements can help facilitate local acceptance of decommissioning approaches through the accommodation of local issues and preferences. Further, a flexible approach allows authorities to take account of site-specific circumstances and tailor requirements to the planned future use of the site. Flexibility also allows implementers to be innovative in developing approaches and solutions to increase safety or efficiency, or reduce costs.

Although it was generally felt to be more important to harmonize on principles and approaches than on numerical criteria, it was also noted that, in situations where there are several adjacent nuclear countries (as in Europe), there is benefit in seeking to develop harmonised safety criteria. Ultimately, good communication is more important than common criteria. Regulators need to be able to explain how they arrived at specific numerical criteria in a clear and transparent fashion, and how meeting the criteria will assure safety. At present, internationally accepted criteria are more the exception than the rule; however the use of such criteria, where they are available, will promote general acceptance and confidence in them.

Stakeholder Involvement

Both implementers and regulators recognized the importance of stakeholder trust and confidence, and it is apparent that both are making significant efforts to understand and accommodate stakeholder views in nuclear decommissioning and dismantling projects. "Stakeholders" were generally seen as being synonymous with the general public; however it was noted that other types of stakeholders including government, industry, environmental interest groups and, in some cases, international stakeholders, may play important roles. Plant workers are a particularly important stakeholder group, as implementers generally are keen to retain staff on the decommissioning team who are

knowledgeable about the history and operations of the facility. Regarding the public, local views are often considered more important than national views in planning the overall approach and schedule for decommissioning. It was, however noted that interdependencies between sites undergoing decommissioning and associated impacts on communities hosting waste management facilities and along waste transportation routes can blur the distinction between local, regional and national stakeholders.

Experience with Regulating NPP Decommissioning and Dismantling

From the discussion it was clear that national experience with large decommissioning and dismantling projects varies considerably, and countries undertaking such projects for the first time recognize that there is a significant learning curve in developing and applying national regulatory requirements to permit the safe, efficient and cost-effective decommissioning of NPPs. Countries with significant large-scale decommissioning experience, such as the US and France, have, on the basis of the experience gained, refined their regulatory requirements and processes to ensure that they are proportionate to risk, and provide implementers the flexibility required to deal with the dynamics of decommissioning an NPP. Furthermore, some regulatory authorities have reorganized staff and responsibilities to address the "culture change" in transitioning from regulating an operating facility to decommissioning and dismantling operations. Clearly, continued sharing of lessons learned, by both regulators and implementers, will be beneficial as the international body of experience in regulating the decommissioning of NPPs grows in the coming years.

APPENDIX 1:

AGENDA OF THE TOPICAL SESSION ON EMERGING ISSUES AND TRENDS IN REGULATORY PRACTICES DURING THE DECOMMISSIONING AND DISMANTLING OF NUCLEAR POWER PLANTS

OCTOBER 24, 2006

24 OCTOBER 2006

Topical session

'Emerging issues and trends in regulatory practices during the decommissioning and dismantling of nuclear power plants'

Chair: Larry Camper, USNRC

09.00	**1**	**Welcome and introduction** *Larry Camper, USNRC*
09.10	**2**	**Keynote addresses**
	2a	**Overview of the regulatory approach and practice in NEA countries based on received inputs by WPDD and RWMC-RF.** *Allan Duncan, UK (20 min)*
	2b	**WENRA perspective on harmonisation of EU regulations to the IAEA standards regarding decommissioning** *Peter Lietava, State Office for Nuclear Safety, Czech Rep, (20 min)*
	2c	**Discussion** *(10 min)*
10.00	**3**	**Facilitated discussion on the balance between harmonization and flexibility.** *Moderator: Juliet Long, UK Environment Agency*
10.30		Break
11.00	**4**	**Facing up to the challenge of setting up a decommissioning regulatory regime** *Stig Wingefors SKI, Henrik Efraimsson SSI, Bertil Hansson BKAB* *(15 min)*
11.15	**5**	**National presentations on lessons learned and adaptation of regulatory practice:** *(15 min each)* • **US** *Nick Orlando, USNRC* • **Germany** *Karl-Heinz Kölschbach, Federal Ministry for Environment* • **Spain** *Jose Luis Revilla, Consejo de Seguridad Nuclear*
12.00	**6**	**Discussion on item 4 and 5 above**
12.30		**Lunch**
14.00	**7**	**Implementer's perspective on regulatory issues** *Bertil Hansson, WNA*
14.30	**8**	**Regulators – implementers interface:**

		Panel-led discussion on the theme – "What regulatory factors are seen as most critical to an effective and efficient decommissioning process?" *Regulators:* *Walter Blommaert, FANC, Belgium* *Dorothée Conte, DGSNR, France* *Implenmenters:* *TadamichiSato, JAPCO,Japan* *Guiseppe Bolla, SOGIN, Italy*
15.30		Coffee
16.00		**Continuation of the panel-led discussion**
17.00	**9**	**Summary of main points** *Rapporteur: Doug Metcalfe, Natural Resources Canada*
17.30		Adjourn

APPENDIX 2:

TOPICAL SESSION ON EMERGING ISSUES AND TRENDS IN REGULATORY PRACTICES DURING THE DECOMMISSIONING AND DISMANTLING OF NUCLEAR POWER PLANTS

CONTRIBUTED PAPERS

OVERVIEW OF REGULATORY APPROACHES AND PRACTICES IN NEA MEMBER COUNTRIES

Allan G. DUNCAN
United Kingdom

1. INTRODUCTION

In recent years, as the pace of decommissioning and dismantling (D&D) of nuclear plants has quickened, particularly in those countries with long-established nuclear power programmes, regulators have had to address the associated regulatory arrangements. It has long been clear that the nuclear licensing regime and related regulatory processes would need to reflect the changing nature of the hazards associated with a plant as it evolves from the operational phase, perhaps through some interim post-operational phase, and into the phase of D&D. The removal of fuel effectively eliminates the possibility of a major nuclear excursion, but there are still risks associated with residual radioactive and non-radioactive hazardous materials. Although the scale of the hazard is lower, the potential for their release and dispersion may be increased by the nature of D&D activities. Furthermore, the diversity and novelty of these activities change the pattern of work activities on the plant and introduce a range of issues concerned with human factors and behaviours, as well as with operational roles and responsibilities. Hence careful attention to regulatory requirements is still very important.

At a previous meeting of the WPDD, a number of important questions emerged in connection with these matters, and Member Countries were invited to share their experience of them. The questions were as follows:

- *New regulatory aspects relevant for D&D*

  What are the new questions that the regulator will consider and will flow into the conditions for a decommissioning and dismantling license?

  What to take out and what to add *vis-à-vis* the previous regulatory regime?

- *Balancing of risk and regulatory requirements*

  How are the regulatory requirements and practices adapted to a situation of decreasing safety concerns from a radiological view point, while staying proportionate with remaining risk and yet still providing for flexibility in operation?

  How are risk informed decisions made?

- *Stakeholder involvement*

  What is the role of the stakeholder in the decommissioning process?

  Are regulatory practice and oversight influenced by public views?

- *Interfaces between relevant decision-making authorities*

  Are regulatory practices and oversight influenced by the interfaces between multiple regulatory and decision-making authorities?

  How difficult to deal with?

  What is your experience?

Nine countries responded to these questions, i.e. Belgium, Canada, the Czech Republic, Finland, Germany, Italy, Sweden, Switzerland and USA, and a digest of their responses is given below.

2. NEW REGULATORY ASPECTS RELEVANT FOR D&D.

The regulatory arrangements in all respondent countries include specific recognition of the transition from the operational phase to D&D. In some cases, this is by way of the requirement for new license, as in Germany, Sweden, and Italy for example. In others, such as the USA, it appears that the existing operating license evolves continuously to accommodate the transition to and throughout D&D, as judged necessary for the maintenance of full regulatory control. In Finland, both options appear to be available. The operator may apply for a new operating license for D&D, or the regulator may take the initiative to modify the conditions of the existing operating license. In all cases, however, the arrangements for transition involve the formal addressing of issues arising from the new situation. Where a completely new license is required, these issues are presumably addressed in a formal license application. In Belgium and Switzerland, following the end of operation, the owner of a plant must prepare and submit for approval a decommissioning project document or note.

There is close agreement between respondents on the issues to be addressed for the D&D phase. In general, these include:

- Overall plan for each step of D&D, with associated timetable.
- Retention of information about site and past operations, incidents, etc.
- Potential effect of new situation on occupational health and safety, and on the environment (e.g. by creation of new types of waste and new release points for effluent streams.)
- Arrangements for care and maintenance during any non-operational standby phases.
- End-state foreseen for the site, whether for unconditional release or restricted reuse.
- How to minimise both the doses to personnel and the creation of waste.
- Management of large quantities of radioactive materials, whether by recycling, clearance or disposal as waste.
- Availability of facilities for interim storage and final disposal of waste.
- Potential effects of personnel changes, such as need for new training arrangements, loss of site-related knowledge, etc.
- Continuing requirements for emergency planning and for dealing with risks associated with terrorist attack.
- Cost estimation and arrangements for securing the necessary funds.
- Social factors and opportunity for stakeholder and public input.

As regards what may be taken out, or needs to be added, in converting from an operating license to one that covers D&D, the general response is that all of the above issues need to be examined and the existing conditions adjusted for the new situation, or new conditions added. With only a few exceptions, it appears that most of the operating license conditions will remain, even if in a modified form. The exceptions include the conditions relating to the nuclear fission process itself, and refer to removal of those conditions concerned with control of reactivity and control of coolant, for example. New conditions to be added include those concerned with environmental impact assessment and planning for the various stages of dismantling through to the final end-state. They also include those concerned with the construction and operation of any new facilities needed for the actual process of D&D, having particular regard to the interfaces between new and old parts of the plant. The basic impression is that most countries are approaching the task of revising or renewing licenses in much the same way as is being done in Germany. This is set out very clearly in Federal guidance to the 'Land'-based regulatory authorities, and shows which regulatory aspects of the operating license can be taken out, how the emphasis on others needs to be increased, decreased or maintained, and what needs to added. This is described in a following paper by Karl-Heinz Kölschbach of the German Federal Ministry for Environment.

3. BALANCING OF RISK AND REGULATORY REQUIREMENTS

It seems clear from the responses that the basic regulatory requirements, in terms of safety standards, do not change, even if the license conditions underpinning these basic requirements are adjusted or balanced against a new or modified set of risks.

The experience of the Swedish SSI seems typical of other responses in finding that intensive supervisory activities are needed during decommissioning, due to the emergence of new radiation protection issues connected with dose planning and minimisation, training of the work force, radiological characterization, management of large volumes of waste, clearance of materials and buildings, treatment of effluents and controlling and monitoring of releases. This finding reflects also the relative novelty of D&D regulation, and the need to pay close attention to it until a larger body of regulatory experience is built up.

As regards how the process of balancing license requirements against modified risks influences the drafting of conditions, the responses are quite consistent. As described above, some conditions concerned with the nuclear fission process may be removed, and others concerned with environmental protection and new plant construction and operation need to be added. Not surprisingly, in regard to modification of existing license conditions, increased emphasis is given to aspects concerned with dismantling operations, such as decontamination, work permits and record-keeping, and with waste management in particular. Reduced emphasis is given to risk analysis, security, staff cover (e.g. for manning control room), and off-site emergency preparedness. The emphasis on the remainder appears to stay unchanged.

A few examples of licence conditions, included specifically for D&D, are as follows:

- Obligation to prepare and maintain continuously a decommissioning safety report, which replaces the operational phase safety report and addresses the changes to security, monitoring, staffing, record-keeping, etc.
- Definition of hold points during the decommissioning process, reflecting safety-significant phases that must receive prior approval from the relevant authorities.
- Preparation of an Environmental Impact Assessment.

- Criteria for disposal, recycling or clearance of large quantities of radioactive materials.
- Obligation to perform a final radiological survey to confirm achievement of the planned end-state of the site.

To emphasise the main point, however, it appears that all respondents intend to keep the balance between licence requirements and the risks associated with D&D operations under continuous review and to modify conditions in the light of experience and changing circumstances.

An interesting point noted only in the Swiss response, but probably reflecting the situation in other countries, is that the regulator takes no part in the economic balance between decontamination of materials, presumably for re-use or recycling, and their direct disposal as waste.

Another interesting observation is that no respondent raised the question of whether there might come a point in the D&D process when the regulatory burden associated with the nuclear site licensing process is disproportionate to the much-reduced risks associated with what is no more than contaminated land and buildings, and whether other, more appropriate regulations might be applied.

4. STAKEHOLDER INVOLVEMENT

Most of the responses seem to assume that the involvement of the operator and the relevant authorities, as stakeholders, is obvious. In the context of the question, they concentrate on involvement of the public. No respondent defined the limits of public involvement in terms of the right to be heard (i.e. "*locus standi*" in legal terms.) However, it is noted that, in Belgium, the 'local communities' are asked to hold a public inquiry during the decommissioning licensing procedure. In this case, "local" appears to mean "within a radius of 5 km of the installation which is to be decommissioned". It is not clear from any response, whether non-local NGOs or pressure groups have any specific right to be heard. This point would seem to be relevant in those countries, like Switzerland, where the individual circumstances of a plant are likely to determine the arrangements for its D&D, rather than some national plan. (We know from Canadian experience reported at NEA meetings, for example, that local views and interests are not necessarily the same as those expressed at public hearings by pressure groups from outside the locality.)

In all countries there appear to be provisions for early involvement of the public in the regulatory arrangements for D&D. These are generally by way of written submissions to the relevant authority or by way of a public hearing. This seems to be the case regardless of whether or not there is a requirement for a formal Environmental Impact Assessment (EIA), which entails detailed assessment of a wide range of factors including impact on amenities, landscape, noise, and transport provisions, and the effects of accidents and waste management on the environment. All responses indicate that the results of public involvement are genuinely taken into account by the authorities in determining the conditions of the decommissioning license. In the case of Germany, it is noted specifically that the public input contributes to the formation of a regulatory opinion but that the actual licensing decision is entirely for the regulatory body. It is also noted that public involvement is limited to the first stage of D&D licensing. This is because the overall decommissioning concept is decided at this stage and is unlikely to change during the course of D&D.

No response mentions any provision for appeal by any stakeholder against the decision of the regulatory body.

As regards the influence of the public on 'regulatory practice and oversight', the German experience is that public interventions have been concerned mostly with issues such as "general procedural and legal questions", "residual operation and dismantling", "radiation protection", "clearance", "on-site interim storage and disposal of radioactive waste", "accidents" and the "performance of environmental impact assessment". Each of these interventions is explicitly addressed by the regulatory body in the justification of the license, which is documented and placed in the public domain with the license itself. The Italian experience suggests that the public is concerned with more strategic issues. They would prefer D&D to be completed in the shortest possible time, and radioactive material to be is transported off-site, leaving the area available for other industrial, civil or social initiatives. They also see the availability of, or at least a firm plan for, a national waste disposal facility as a pre-condition for accepting a decommissioning programme, Otherwise the programme would be seen as leading to perpetual waste storage on-site. These strategic issues seem also to be a feature in other countries.

The overall impression is that the various processes for involving the public result in the satisfaction of a sufficiently large majority of the people in the respondent countries.

5. INTERFACES BETWEEN RELEVANT DECISION-MAKING AUTHORITIES.

The number and nature of interfaces between decision-making authorities concerned with D&D depend, obviously, on the structure of national legislation and on whether the country concerned has a federal structure or not.

Belgium is probably fairly typical of countries with a single, central nuclear safety authority, the Federal Agency for Nuclear Control, responsible for granting the decommissioning license. The license application, however, must contain the advice of National Radioactive Waste Agency about the end-state of the site and the decommissioning waste that is produced. In addition, regulatory interfaces exist between the nuclear safety authority and regional environmental authorities in regard to the environmental impact of the decommissioning. If all of the relevant authorities were to exercise their authority independently, it seems clear that there would be a potential for placing conflicting requirements on the operator, and changing the nature of regulatory practice and oversight on the nuclear site. Hence, it is recognised that a new and broader cooperation agreement between these authorities needs to be established. As yet, they have no substantial experience of this. This seems to be similar to the situation in Sweden, as regards new arrangements between SKI and SSI.

In Italy, the general situation also seems similar, but implementation arrangements are somewhat more advanced. In 2003, all competent authorities committed to an institutional co-operation agreement that established a process for co-ordination of the regulatory elements for licensing the decommissioning of nuclear power plants, and for the related environmental impact assessments. This cooperation has proved to be difficult. Difficulties arise at the level of centralised, national authorities, and are increased when local authorities have to coordinate with the central authorities. This is because the interests and points of view of the different parties are sometimes very different.

In the USA and Germany, the situation is further complicated by the interfaces between the Federal and State, or Land, levels. In both cases, however, it seems that the interfaces between nuclear safety and environmental authorities at both Federal and State, or Land, level are well understood and that sensible arrangements for cooperation are in place. In Germany, the "Land" licensing authority is responsible for ensuring that all obligations under both federal and state law are fulfilled, clearly requiring them to lead in coordinating other regulatory bodies. The US experience is that it is critical for the lead regulatory authority to identify and engage other organizations with current or future regulatory oversight at a facility destined for D&D. This includes local State and Federal authorities.

Often, that lead authority must act as the facilitator between the various other authorities. However, it is the operator's responsibility to comply with the requirements of all regulatory authorities during the decommissioning. Their experience has shown that early, frequent and open communication between all authorities is the only way to ensure a successful project

Switzerland is something of an exception from the situations described above in having only one regulatory body responsible for regulation of nuclear power plants. This body, (HSK), is under the Federal Department of Environment, Transport, Energy and Communication (DETEC), and the Swiss Federal Office of Energy (SFOE), so it is already linked internally to the other relevant departments.

6. SUMMARY

Although the risks associated with a major nuclear excursion are eliminated by fuel removal, the transition from the operational phase of a nuclear power plant to D&D requires a site license, whether new or modified, which recognises a range of important factors that arise from the different nature of new activities on the site. These reflect the change from operational nuclear safety risks towards risks concerned more with the industrial nature of D&D operations and with the potential for increased environmental impacts.

In the situation where there is still relatively little experience of licensing the decommissioning of nuclear power plants, it appears that all Member Countries intend to keep the balance between nuclear site licence requirements and the risks associated with D&D operations under continuous review, and to modify conditions in the light of experience and changing circumstances. This may result in addition of new conditions, removal of redundant conditions, increased or decreased emphasis on some of the existing conditions and continuation of others.

An interesting observation is that no respondent raised the question of whether there might come a point in the D&D process when the regulatory burden associated with the nuclear site licensing process is disproportionate to the much-reduced risks associated with what is no more than contaminated land and buildings, and whether other, more appropriate regulations might be applied.

In all countries, there appear to be provisions for early involvement of the public in the regulatory arrangements for D&D, by way of written submissions or a public hearing. Factors to be addressed include impact on amenities, landscape, noise, and transport provisions, and the effects of accidents and waste management on the environment. All responses indicate that the results of public involvement are genuinely taken into account by the authorities in determining the conditions of the decommissioning license. No response, however, mentions any provision for appeal by any stakeholder against the decision of the regulatory body.

Public interventions have been concerned with a number issues ranging from "general procedural and legal questions", to the details of "radiation protection" and "performance of environmental impact assessment". There is also interest in more strategic issues concerned with timing of D&D, re-use of the site, and availability of waste disposal facilities. In Germany, for example, each of the interventions is explicitly addressed by the regulatory body in the justification of the license, which is documented and placed in the public domain with the license itself. The overall impression is that the various processes for involving the public result in the satisfaction of a sufficiently large majority of the people in the respondent countries.

The number and nature of interfaces between decision-making authorities concerned with D&D depend on the structure of national legislation and on whether the country concerned has a federal

structure or not. Experience of handling these interfaces is still limited, but the experience to date indicates that this is a difficult issue and that success depends on identification of a lead authority together with early, frequent and open communication between all authorities.

WENRA PERSPECTIVE ON HARMONISATION OF EU REGULATIONS WITH THE IAEA STANDARDS FOR DECOMMISSIONING

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Abstract

The activities of WENRA cover wide range of topics containing also the decommissioning of selected types of nuclear installations. The goal of this paper is to provide a short overview of WENRA work methodology with the emphasis on a development of decommissioning harmonisation reference levels and the interaction with EC.

1. INTRODUCTION

Western European Nuclear Regulators' Association (WENRA) was formally created in 1999 as an association of the heads of nuclear regulatory authorities of Switzerland and EU member states having at least one nuclear power plant on their territory. In March 2003, in view of the enlargement of the European Union, WENRA welcomed the delegates of the Candidate Countries owning nuclear power plants (Bulgaria, Hungary, Lithuania, Romania, Slovakia, Slovenia, and Czech Republic), who are now members of the Association.

WENRA's main objectives are:

- to develop an independent nuclear safety assessment capability, based on in-depth knowledge of the installations, and
- to develop common approaches to nuclear safety and regulations and to encourage the harmonisation of practices.

The first objective of WENRA was to produce a report on the status of nuclear safety in candidate Central- and Eastern-European countries. This report was used by the European Commission as a basis for the adhesion negotiations with these countries in the field of nuclear safety.

The work of the Association is performed in two Groups - Reactor Harmonisation Working Group (RHWG) and Working Group on Waste and Decommissioning (WGWD).

2. HARMONISATION OF PRACTICES

Harmonisation of practices is defined as no substantial differences between countries from the safety point of view in their formally issued national safety requirements, and in the resulting implementation on the Nuclear Power Plants. This definition has several implications for harmonisation work aiming at equal safety levels in the different countries as that both the legal and the implementation (technical)

aspects need to be considered, requirements need to be formally issued on a legal basis, requirements need to be public and transparent, etc.

In 2004 all WENRA member states agreed on following goals of harmonisation process:

- produce harmonised safety reference levels (SRLs) by 2006 in most areas, and
- implement these levels by 2010 in each country.

Therefore the objective is not to produce uniform European safety requirements, because the national regulatory systems are too different, but the goal is an effective harmonisation of practices. The objective is to produce harmonised SRLs against which the situation of each country is assessed. It is each country's responsibility to implement actions to ensure that these levels are reached. The SRLs are considered to be implemented if they are written down in:

- generic publicly available document from the regulatory authority (which may be regulation or guidance), or
- generic condition in individual license.

They are not considered implemented, in particular, if it is only a good practise of nuclear licensees, or if it is only written down in individual letters from the regulatory authority.

3. ACTIVITIES OF WGWD

In order to compare in a systematic manner, and conclude on the substantial differences and similarities between national requirements, it was necessary to define a reference against which to make the comparisons. The references were elaborated as reference levels related to each selected safety issue. These levels were chosen from the national requirements already existing in the WENRA countries. Hence, the reference levels have a real background and are not abstractions.

Identified priorities of second Working Group of Association, WGWD, are the reports containing SRLs on two topics:

- radioactive waste and spent fuel storage for separate, purpose built or adapted storage facilities used to store spent fuel or radioactive waste in solid form, and
- decommissioning of nuclear reactors (of any power), fuel reprocessing facilities, fuel manufacturing facilities, uranium concentration and conversion facilities, uranium enrichment facilities, research facilities involving nuclear material, waste storage facilities and other waste management facilities involving nuclear matter or HLW.

Starting points for the derivation of all reference levels were RHWG reference levels, corresponding IAEA documents and best practise in Europe.

4. DECOMMISSIONING SAFETY REFERENCE LEVELS

The term 'decommissioning' refers to administrative and technical actions taken to allow the removal of some or all of the regulatory controls from a nuclear facility that is not intended as a repository. These actions involve decontamination, dismantling and removal of radioactive materials, waste, components and structures. They are carried out to achieve a progressive and systematic reduction in radiological hazards. The decommissioning SRLs address mainly the radiological hazards resulting from the activities associated with the decommissioning of facilities, primarily with decommissioning

after a planned shutdown. Non-radiological hazards can also arise during decommissioning activities. These hazards should be given due consideration during the planning process and in the risk analyses.

The document assumes that the normal operational phase includes the removal of the bulk of fuel and radioactive materials from the facility in accordance with the safety case for normal operations. The decommissioning phase starts technically once further operations cannot be carried out using normal operational methods or within the bounds of the safety case for normal operation.

Regulatory requirements for Environmental Impact Assessment (required by EU directives), waste disposal, conventional occupational health and safety, physical protection and decommissioning funding, are important for decommissioning. However, WGWD members do not all regulate all these matters and in that case, these matters are addressed by other national regulatory organisations. As a result, at this stage, WGWD did not take into account in detail these topics and has therefore concentrated on the nuclear safety requirements.

The principles underlying the reference levels for nuclear reactors, developed by RHWG, will apply to any type of nuclear facility including during the decommissioning phase, taking into account the magnitude of the hazard in a graded approach. However the report on decommissioning SRLs refers mainly to the IAEA documents developed for decommissioning activities at different nuclear installations and contains reference levels developed by the group based on best practices in countries represented in the group (about 15 SRLs). As a result 83 reference levels grouped in following 5 safety areas were identified [4]:

- safety management;
- design;
- operation;
- safety verification;
- decommissioning strategy and planning.

The WGWD expects to finalise part I. and II, of the report in the first half of 2007 taking into account also comments from involved stakeholders (IAEA, ENISS, NEA/OECD,…). At the same time the benchmarking – compliance of both national legislation and implementation with SRLs, is going to be launched. The benchmarking methodology will be based on RHWG approach, but some changes are necessary, related to:

- the large variety of decommissioned facilities;
- the need to modify the scale system for the implementation;
- the organisation of benchmarking meetings.

The results of the benchmarking process will be included into the part III. of the decommissioning report at the end of 2008/early 2009 and used for the preparation of national action plans in order to implement the SRLs in national regulations till the end of the decade.

5. EC STANDPOINT

The standpoint of the EC was presented during the first WENRA seminar in Brussels in February 2006. The representative of the DG-TREN appreciated WENRA's objective to enhance nuclear safety in Europe and welcomed the extension of the WENRA activities to other stages of the fuel cycle than reactor safety. As first thoughts following proposals were presented:

- SRLs could be further developed to become EU Safety Standards.

- A dynamic process should be set for the definition of the SRLs: it should be proposed as a more evolving concept.
- Recent Eurobarometer on nuclear waste clearly indicated that EU citizens expect EC to play an important role in co-ordination of nuclear energy issues and to monitor activities in order to ensure that safety requirements are equally applied throughout the EU.
- Improvement of transparency needed. It would be useful to invite EU interested organizations as observers to participate at the WENRA meetings.

As a follow-up action the WENRA chairperson initiated meetings with Energy Commissioner Mr. A. Piebalgs and interaction with non-WENRA EU Member States and the EC, who were invited to a separate meetings with WENRA representatives.

6. CONCLUSIONS

As stated in the main text the objective of WENRA is not to produce another regional set of requirements. The objective of WENRA is to achieve effective harmonisation in identified fields of interest in Europe by 2010.

The outcomes of WENRA work will be used by the preparation of a report on achievements reached or foreseen with regard to harmonised safety approaches in Europe. This report will be submitted to the Council of the EU and will serve as basis for the consultation process with stakeholders before any instruments in the field of nuclear safety and radiation protection are developed in the framework of Euratom Treaty.

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FACING UP TO THE CHALLENGE OF SETTING UP A DECOMMISSIONING REGULATORY SYSTEM: SKI PERSPECTIVE

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BACKGROUND

Until now Sweden has had only limited experience from decommissioning of nuclear facilities. Thus, the completed decommissioning so far has mainly concerned research reactors and other small research facilities in the Stockholm area. Facilities currently under decommissioning are shown in the following Table.

Facilities under decommissioning 2006:

Facility	Type	Shut down	Present decommissioning phase
Ågesta	PHWR 80 MWth	1974	CM
Barsebäck 1	BWR 615 MWe	1999	CM
Barsebäck 2	BWR 615 MWe	2004	CM 2006
R2	MTR 50 MWth	2005	CM 2006
R2-0	MTR 1 MWth	2005	CM 2006
ACL	Radiochem. lab.	1997	Complete 2006

(CM = Care & Maintenance phase; MTR = Materials Testing Reactor)

A new era of decommissioning activities in Sweden began in 2005 with the final shutdown of the second NPP aggregate in Barsebäck and the research reactors in Studsvik.

The roles of SKI as a regulator of decommissioning are manifold. Apart from supervising nuclear safety in the sense that radioactive material shall be contained or confined in all steps of the nuclear fuel cycle, SKI has the task to review the research and development programme conducted by the utilities for waste management, disposal and decommissioning. New versions of the programme are presented each third year and are reviewed accordingly by SKI and commented by SSI and many other authorities, research institutions and other stakeholders. These reviews, with subsequent recommendations to the government on SKB's programme, have been performed since 1986.

Another important role of SKI in supervision of decommissioning is the annual review of the cost estimates handed in by the utilities. Based on its review SKI then calculates and recommends to the Government on the fee to be paid by the utilities for funding the disposal of nuclear waste and spent fuel as well as the decommissioning of nuclear power plants and other nuclear facilities. This has been a task of SKI since 1992 and it has also involved independent cost studies and complementary studies of decommissioning methods and amounts and properties of decommissioning waste.

Until recently SKI decommissioning activities have been focussed more on financing than safety issues. Nevertheless, general regulations covering also requirements on waste management including

wastes from decommissioning and planning of decommissioning were issued in 1998 and 2004, respectively. In addition, SKI has since long followed and participated in the international work on decommissioning, in particular that performed within IAEA and NEA.

NEW ACTIVITIES

With several facilities such as nuclear power plants and research reactors under decommissioning it was also necessary for SKI to organise an effective and focussed inspection. Partly to meet these requirements a new organisation of SKI has been implemented since beginning of 2006. Specially assigned tasks and programmes for supervision of decommissioning have been formulated. It has been more difficult than expected to provide the personal resources, however.

An important feature of the Swedish legislation must be kept in mind when discussing authority involvement in decommissioning: no separate licence from the Government is needed for decommissioning according to the Nuclear Activities Act. All activities from final shutdown to the release of the site of a facility are regarded as operation of the facility and, thus, decommissioning is covered by the original licence given by the Government. Nevertheless, for each new phase of decommissioning it must be determined what documentation must provided and handed in to the authorities with the application for start operation in this new phase. In particular, this is true for the dismantling phase, where SKI regulations stipulate that a new Safety Report of the facility must be approved by the SKI.

Apart from facility supervision SKI has the task of reviewing Decommissioning Plans for all nuclear facilities, and for facilities under decommissioning also the Safety Reports. The plans have never before been reviewed by SKI, which means that development of reviewing criteria is an urgent task.

From the supervision of facilities under decommissioning some experiences have already been gained:

The legal and financial issues turned out to be more difficult than foreseen and much more difficult than safety related issues. An example: When decontamination is performed after final shut-down, is the resulting waste decommissioning waste or operational waste? This might be of some importance in Sweden were a repository for operational waste is not allowed to accept decommissioning waste. Other issues where the legislative prerequisites are vague or ambiguous concern dismantling of non-nuclear parts of a facility and or whether dismantling and recycling of used parts is permissible during the Care and Maintenance phase.

Another experience, although not quite unexpected, has been the inconsistency between different legislations: nuclear safety, radiation protection, financing and environmental protection. Mostly, these inconsistencies have concerned differences in requirements for different phases of decommissioning.

The following are objectives for SKI's work on decommissioning in the near future:

- Definition phases and SKI involvement before start of a new phase.
- Development of more detailed requirements of Decommissioning Plans for different phases, e.g. with regard to termination of a licence, and an analysis of the applicability of regulatory requirement in different phases.
- A new set of specific regulatory requirements for decommissioning.
- Development of principles for licence termination and subsequent release/clearance of facilities and sites.

FACING UP TO THE CHALLENGE OF SETTING UP A DECOMMISSIONING REGULATORY SYSTEM: SSI PERSPECTIVE

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The SSI is the Swedish regulatory body for radiation protection issues. Among other tasks, the SSI has the mandate to issue regulations and licence conditions concerning nuclear activities and to supervise such activities from a radiation protection point of view.

EXPERIENCES

Historically, the SSI has supervised the few decommissioning projects that have been undertaken in Sweden. In some cases, project specific conditions have been issued. Since the 1980:ies, the major projects have been:

- Decommissioning of the experimental reactor R1 in Stockholm (1981-1983, Ref 1).
- Decommissioning of two steam generators from the Ågesta NPP (1992-1993);
- Cleanup and clearance of the cleaning facility at the Ågesta NPP (1995-1997).
- Cleanup, clearance and demolition of the Active Central Laboratory in Studsvik (1999-2006);

During the years, major refurbishment projects have also been performed at the Swedish nuclear power plants, which are considered as valuable experiences when it comes to decommissioning. Some examples are the replacement of steam generators at Ringhals NPP, replacement of internal parts at Oskarshamn NPP and replacement of turbines at Forsmark NPP.

RECENT ACTIVITIES WITHIN THE SSI

For several years, different aspects of decommissioning has been studied and discussed within the SSI and on seminars arranged by the SSI. Some issues were investigated in more detail, such as conditions for clearance of large amounts of materials (Ref 2).

However, in connection with the governmental decision to close one of the two NPP units in Barsebäck, more focus was put on preparing the regulations and the authority (organization, resources) to take care of issues in connection with decommissioning. A platform for SSI:s future work was elaborated and presented in the SSI-report Radiation Protection in Connection with the Decommissioning of Nuclear Plants (Ref 3).

In 1998 an internal project was performed with the purpose of identifying issues that should be regulated or investigated in more detail. The project included gathering of experiences from other countries, studying of international guidance, proposing new policies, investigating the need for competence and resources and giving proposals for future work. The project was reported in Ref 4.

In 1999, the project was continued in three different working groups with the following tasks:

1. Propose suitable definitions of terms in connection with decommissioning, to be used in communication with other parties and to be incorporated in regulation on decommissioning.

2. Propose a policy for the timing of decommissioning, i.e. within what period of time should a facility have been completely decommissioned. This included investigation of the factors that may be relevant for the decision to wait or to go on with decommissioning.

3. Propose requirements that should be put on planning before and during decommissioning.

The project was reported in internal documents. A policy for the timing of decommissioning was decided in November 1999 (Ref 5). It mainly states that it is suitable, from a radiation protection point of view, to perform decommissioning in close connection to the final shut down of a facility. It is clarified that this means that the decommissioning should be completed within 10 to 15 years.

In 2000, work was started to develop regulations on planning of decommissioning. A proposal was sent out for comments to the license holders and discussed on a seminar at the SSI in December 2000. The proposal was developed and sent out for national review in November 2001, together with a commentary report and an estimation of expected consequences. After having reworked the proposal, the regulations were adopted in October 2002 (Ref 6) and entered into force in January 2004. The proposal was presented at the IAEA decommissioning conference in Berlin 2002 (Ref 7).

During 2004 and 2005, the SSI performed inspections of the decommissioning planning activities at all Swedish nuclear facilities. All operators had established preliminary decommissioning plans. Procedures for documentation of information that could be valuable for planning and conducting decommissioning were in place or were being prepared. However, in some cases, additional documentation of radioactive material in the facility was required by the SSI.

Regarding analysis of radiological consequences, the results of the inspections was rather disappointing. Every inspection resulted in demands from the SSI on measures to fulfil the requirements on analysis of consequences from different options for decommissioning. The last complementary material was handed in to the SSI in spring 2006 and the result in now being evaluated within the SSI. Preliminary, the evaluation points at a need to revise the regulations.

CURRENT ACTIVITIES

In 2005, the decommissioning scene changed dramatically in Sweden. From mainly being a question of making plans for the future, it became an actual task for some of the operators to prepare their facilities for surveillance and/or dismantling (Barsebäck NPP and the Studsvik R2-facility). Also, preparations are being made in Studsvik to decommission some smaller facilities that have not been used for a long time. This has raised a number of questions which involve judgement and decisions by the SSI, e.g. organisational and technical changes for radiological protection, changes in emergency preparedness and changes in control of releases to the environment.

Besides following the activities of the operators and dealing with arising issues, the SSI reviews plans and investigations put forward by the operators, both according to the SSI regulations (requirements on information to the SSI), the SKI regulations (requirements on safety assessments), the Environmental code (environmental impact assessments) and the Law on nuclear activities (R&D programme presented by the NPP operators every third year). Thereby there are several ways in which

judgement and opinions by the SSI may have an impact on the plans and actions for decommissioning. If needed, the SSI can also put specific radiation protection conditions on the activities. Experiences from all these processes will be a valuable input for the revision of the regulation on planning of decommissioning and the development of other regulations, see below.

Other activities in the field of decommissioning are:

- International cooperation and benchmarking.
- Competence building, study visits.
- Information to concerned parties.
- Review of cost estimations (support to the SKI)

Current work on regulations and strategy is focused on

- Evaluation of the regulations on planning of decommissioning.
- Development of regulations for clearance of material and buildings (Ref 8).
- Development of the strategy for supervision during decommissioning.
- Coordination with the SKI;

Essentially all departments within the SSI are involved. Within the SSI, the department of waste management and environmental protection is responsible for coordination of SSI activities in the field of decommissioning. The work done yearly (2006) within the SSI corresponds to about 3 persons working full time.

PLANNED ACTIVITIES

The regulatory system is not yet fully developed to deal with all decommissioning issues in an effective way. Therefore, the following activities are planned:

1. Revision of the regulations on planning of decommissioning
2. Development of regulations on releases to the environment during decommissioning
3. Development of criteria and regulations for the release of sites

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FACING UP TO THE CHALLENGE OF SETTING UP A DECOMMISSIONING REGULATORY REGIME (LICENSEE PRESENTATION)

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The implementers position in the development of new regulations

Today, several activities are going on in Europe to develop harmonised regulations. The Western Europe Nuclear Regulators Associations (WENRA) is setting up a set of regulations for:

- Reactor safety
- Waste storage, and
- Decommissioning

WENRA's work is based on the IAEA Safety Standards and by some rewriting they create new Reference Level's (RL)

We, the implementers, are working through our organisation, European Nuclear Installations Safety Standard (ENISS) by reviewing and giving practical and constructive comments. Last week we had a meeting in Stockholm with WENRA working group for Waste Storage.

The World Nuclear Association (WNA) has made a Position Paper on Decommissioning, which I will later come back to.

IAEA is just now running a project for demonstration of safety during decommissioning (DeSa). Barsebäck is here the test case for a power plant. The objective with the project is to develop and test guidance on safety assessment of a plant under decommissioning.

Planning scenario for the Decommissioning of Barsebäck 1 and 2

Barsebäck NPP planning scenario is special due to that the political decision to close Barsebäck has kicked the plant out of the long term planning for the Swedish Waste system. The plant will stay in a long period of Service Operation waiting for the storage for dismantling waste will be ready, 2020.

Authorities' demands

In Sweden we have two regulators that regulates the nuclear and radiation part. Then we have the Environmental Court that reviews our Environmental Impact Assessment. To complete the picture, there are several other industrial regulations for the plant to cop with.

The Risk Profile is changing

Under the transition from an operating reactor to 'Green field' status, the dominant risk-focus is rapidly changing from reactor safety and radiological risks to normal Industrial safety risks!

The regulation and requirements from the regulators must follow and harmonise with the actual risk, to guide the operator through the transition

From old Operational Safety Systems to Barrier Protection Systems

When all the fuel has left the plant most of systems that we called our safety system has done their duty. We have no core anymore, so consequently there is no need for the core cooling system. Other systems like the reactor vessel and the main circulation lines are now containing water to cover some higher active components in the vessel.

The classification of SSCs can now be done more to normal industrial regulations.

Other old systems will now instead come more in focus as the fire protection system and protection against flooding. The classification will be done as before or to normal industrial standards. Systems containing radioactive water will as before be in a higher-class 4a.

A new risk profile and a new (licence) authorisation process

In Sweden we have a licence for construction, operation and decommissioning, but we need to go through a new authorisation process, were we now for moving to "Service Operation" have developed the following:

- Decommissioning plan
- A Safety Report – New SAR
- A new Technical Specification
- Environmental Impact Assessment to be submitted to the Environmental court
- Reorganisation – reduction of staff as well as developing new competence in different staff groups
- A new Management system(MS) and a new Quality Management System incl. in MS
- Modification or/and rewriting of procedures
- Modification of plant (New monitoring system, modified electrical power supply and others as i.e. new air compressors etc.)
- Full scope system decontamination

Continuous improvement of safety, still a valid statement….

During decommissioning as during operation there is always room for improvements of safety. We have therefore developed a policy for our work in preparing and performing the decommissioning:

'Simple'

- Put plant in lowest energy state (drain systems and components, clean and drain pools, remove filters and resins, Reduce ventilation requirements etc.
- Reduce needs of surveillance.

'Safe'

- Know and reduce risks (fire, flooding etc.)

'Cost optimized'

- Optimize costs for Service Operation and future demolition

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LESSONS LEARNT AND ADAPTATION OF REGULATORY PRACTICE IN THE USA

United States Nuclear Regulatory Commission

Emerging Trends and Issues during Decommissioning

WPDD 7 - October 24, 2006

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Areas for Discussion

- **Transition to Decommissioning**
- **Application of a Graded Approach**
- **Stakeholder Involvement**
- **Co-ordinaton between Authorities**

United States Nuclear Regulatory Commission

Transition to Decommissioning
"The Licensee's problem"

- **New, unevaluated, risk-significant activities**
- **Expertise of the licensee**
- **Adequacy of site information**
- **New waste streams**
- **Accuracy of cost re-estimates**
- **Inclusion of stakeholders**

United States Nuclear Regulatory Commission

Application of a Graded Approach
"The Regulator's Problem"

- **Ensuring that requirements remain commensurate with risk**
- **Justification for reduction in requirements**
- **Documentation**

United States Nuclear Regulatory Commission

Stakeholder Involvement

- **Greater stakeholder involvement in the decommissioning process**
- **Mandated public meetings and opportunities for review of decommissioning documentation**
- **Voluntary efforts by licensees**

LESSONS LEARNT AND ADAPTATION OF REGULATORY PRACTICE IN GERMANY
AUTHORITIES' PERSPECTIVE

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1. INTRODUCTION

This document provides information on lessons learned and adaptations of the regulatory practices on decommissioning and dismantling of nuclear power plants in Germany. It is a contribution to the topical session "Emerging issues and trends in regulatory practices during the decommissioning and dismantling of nuclear power plants" of the Working Party on Decommissioning and Dismantling (WPDD) of the RWMC, which is held in Paris on October 24th, 2006.

According to a request of the organizers of the topical session the document addresses the following questions:

- New regulatory aspects relevant for decommissioning & dismantling

  "What are the new questions that the regulator will consider and will flow into the conditions for a decommissioning and dismantling license?

  What to take out – what to add vis-à-vis the previous regulatory regime?"
- Balancing of risk and regulatory requirements

  "How are the regulatory requirements and practices adapted to a situation of decreasing safety concerns from a radiological view point, while staying proportionate with remaining risk and yet still providing for flexibility in operation?

  How are risk informed decisions made?"
- Stakeholder involvement

  "What is the role of the stakeholder in the decommissioning process?

  Are regulatory practice and oversight influenced by public views?"
- Licensing as a management process affecting different decision making authorities

  "Are regulatory practices and oversight influenced by the interface amongst multiple regulatory and decision-making authorities?

  How difficult to deal with?

  What is your experience?"

The answers on these questions are given in the following four chapters. The reported experiences are based on experiences of the federal government gained in two recent, still ongoing decommissioning and dismantling projects in Germany, namely in the decommissioning and dismantling of the nuclear power plants (NPP) at Stade (Lower Saxony) and the NPP in Mülheim-Kärlich (Rhineland-Palatinate).

Different to the system of authorization and regulatory supervision in the nuclear safety in most other countries the German system is basically influenced by the federal structure of the Federal Republic of Germany. Licenses are granted by the responsible authorities of the federal states ("Länder") on behalf of the federal government, which is supervising the "Länder". Thus, there is a continuous process of improving the regulatory practice concerning the authorization and regulatory supervision in the context of decommissioning and dismantling of nuclear facilities. The final chapter 6 gives a short overview on recent topics which are under discussion to improve the regulatory practice.

2. NEW REGULATORY ASPECTS RELEVANT FOR DECOMMISSIONING AND DISMANTLING

Decommissioning and / or dismantling are subject to a new, separate license which will terminate previous licenses on construction and operation partially or completely. The basic legal requirements relevant for application and granting a license hereby are the same for decommissioning or dismantling as for construction or operation of a NPP. Especially, the procedures for application are generally the same as they are based on the same ordinance ("Nuclear Licensing Procedure Ordinance (AtVfV)").

But the scope of the protection goals during decommissioning and dismantling has changed compared to those relevant to operation: if - as is recent practice in Germany - all spent (and new) fuel has been removed from a NPP before any measures for decommissioning and dismantling shall be started, nuclear safety measures to control reactivity and on heat removal are no more required. Thus, with respect to nuclear safety the required measures shall ensure that radioactive material effectively is contained and controlled in the NPP and that the exposure of the work forces, the public and the environment shall be limited and shall be as low as reasonably achievable.

As a consequence, some licensing aspects relevant for operation of a NPP are no more contained in a license for decommissioning or dismantling, for some aspects importance does increase while for others the importance does decrease. Finally, some regulatory aspects are new. The German decommissioning guide ("Guide to Decommissioning of Facilities as defined in § 7 of the Atomic Energy Act") provides guidance to the regulatory body, which in Germany is not the federal government but a ministry of a federal state ("Land"), same as to the applicant to focus on those aspects relevant for decommissioning and dismantling of a nuclear installation.

As an overview Table 1 gives an excerpt of those regulatory aspects that are taken into account in the authorization of decommissioning or dismantling projects for recent NPP in Germany. The regulatory aspects are gathered in thematic complexes. For each aspect an indicator is provided to illustrate the importance of the aspect for decommissioning and dismantling with respect to its importance for operation.

In the following the regulatory aspects are explained in more detail.

- Control of reactivity / control of coolant

  As mentioned previously, the control of reactivity and the control of coolant to ensure heat remove for spent fuel are no longer relevant for licensing as usually the spent fuel will be removed from the NPP before start of the decommissioning and dismantling. If decommissioning and / or dismantling will start while spent fuel still is at the NPP, for example in wet spent fuel ponds, measures to ensure both protection goals will be subject to the authorization of the proposed measures.

Table 1. **Excerpt of regulatory aspects in licenses for decommissioning and dismantling and their relative importance compared to operation licenses**

Thematic Comlex	Regulatory Aspect	Trend of Importance
Control of reactivity	Control of reactivity	×
Control of coolant	Control of coolant	×
Decommissioning / residual operation	Assessment of the nuclear operational phase / post-operational phase of NPP	new
	Residual operations	~
	Modifications for dismantling, esp. modification in the use of available space within the facility and of transportation paths for the later material flow	↗
	New components and systems for dismantling	↗
	Exposure of the environment and the public due to direct exposure or due to release of radioactive material (incl. Monitoring systems)	~
	Clearance of radioactive material	↗
	Radiation protection of the work forces	↗
	Qualification of personnel	~
	Reliability of the applicant / future licensee	~
Dismantling	Feasibility of the overall decommissioning and dismantling project to reach the proposed final end state	new
	Feasibility of dismantling phases subject to the current license	new
	Decontamination techniques	↗
	Dismantling techniques	↗
	Work permit procedure	↗
Financial security pursuant	Financial security pursuant	↘
Material management	Flow of material within the NPP (temporary storage, transport)	↗
	Clearance of radioactive material	↗
	Systems for treatment of radioactive waste	↗
	Handling of radioactive material - licensing aspects	~
New (external) facilities	Assessment of new facilities Construction Operation of the facilties	new
Off-site emergency preparedness	Off-site emergency preparedness	↘
Precaution for waste management	Precaution for waste management	↗
Relevant non-nuclear regulations	Building lease	~
	Laws pertaining to water and waterways	~
	Off-site emergency prepardness	↘
	Environmental laws on state level	~
Risk Analysis	Accident / incident analysis	↘
Security	Security	↘
Stakeholder involvement	Stakeholder involvement	~
	Assessment of objections in the context of stakeholder involvement	~
	EURATOM § 37	~

Explanations

new	aspect new
↗	aspect of increasing importance
~	aspect of unchanged importance
↘	aspect of decreasing importance
×	aspect not relevant

- Decommissioning and residual operation

  The thematic complex of decommissioning and residual operation is new in total to the regulatory authorization, although the regulatory aspects and the related systems and components mostly are known from the operational phase of a NPP:

  - Assessment of the operational and post-operational phase

    A new aspect in the authorization process is the assessment of the operational phase and the post-operational phase, i. e. the phase between shut down of the NPP and granting of the license for decommissioning and / or dismantling. The assessment addresses the question on, whether the real state of the NPP is compliant with the state proposed in the applicant documentation, esp. in the safety analysis, to start decommissioning and dismantling.

  - Residual operation

    The operation of all systems required during the decommissioning and dismantling phases are subject to the assessment of the residual operation. Details herein affect e. g. classification of safety relevant systems and components, organization, residual operations manual, radiation protection of the work forces or fire protection. As the safety goals are reduced the relevant safety functions are less in volume than during operation – nevertheless the degree of assessment is comparable to that of operation.

  - New and modified systems and components

    Special emphasis is given to the modification of existing systems and components and the construction of new systems and components needed to facilitate the stepwise dismantling. With respect to their importance and possible interdependencies with systems to be dismantled the importance of their assessment is as high as during operation, but as no fuel is anymore at the NPP the set of required safety functions will be adapted to the remaining risks.

  - Exposure of the environment and the public

    The assessment of the exposure of the environment and of the public takes into account the reduced risk as spent fuel is no more available at a NPP. Especially in the assessment of incidents and accidents this will result in more easy scenario so that the importance is decreasing the more the radioactive inventory is declining as the dismantling continues.

  - Clearance

    Clearance of radioactive material in Germany is regarded to be part of the residual operation. Clearance still is part of current practice during operation of German NPP, thus this regulatory aspect is not new. But due to the high amount and due to the greater variety of the relevant nuclide vectors and material characteristics of radioactive waste, that will be cleared, a much higher emphasis is laid on the assessment of the concepts and procedures for clearance during the authorization and supervision phases.

  - Radiation protection of the work forces

    A special emphasis is given to the radiation protection of the work forces to adequately take into account the rapidly changing state of a NPP during dismantling activities. As the proposed concepts (e.g. on work planning with regard to radiological

aspects) and equipment (e.g. personal protection equipment) in the NPP mostly are modifications and further developments of those, used during operational phase and, in addition, the same regulatory requirements hold for operational phase and decommissioning and / or dismantling (e. g. IWRS II regulation) the aspect is not new, but importance has further increased.

- Qualification of personnel

  Aspects of qualification of the responsible personnel same as of the other personnel are subject to the regulatory authorization. As compared to operation, as soon as nuclear fuel is no longer available at the NPP the requirements can be adapted, especially with progress in dismantling and thus with continuous reduction of the radiological inventory. Hereby the requirements on the qualification will be based on the regulations on qualified personnel, which are primarily intended for application during the operational phase. Nevertheless, independent from the adaptation of the requirements, the aspects of qualification of the personnel during decommissioning and dismantling are still of high importance for the regulatory body.

- Reliability of the applicant / future licensee

  Subject to each license is the assessment of the reliability of the applicant / future licensee. There is no difference between a license for decommissioning or dismantling and a license for operation concerning the assessment of the reliability of the applicant/future licensee.

- Dismantling

  A further thematic complex is related to the proposed dismantling activities. Emphasis is laid especially on the following aspects:

  - Feasibility of the proposed overall dismantling project

    Usually, the dismantling of a NPP in Germany is performed in several phases, which are executed in parallel or in sequence in time and which are subject to different licenses. gives an example for the Stade NPP. During the authorization of the first dismantling phase the feasibility of the overall decommissioning project will be assessed to ensure, that the proposed final end-state can be reached, and to ensure, that the detailed dismantling activities of the first phase are in line with the proposed overall decommissioning project. This assessment is completely new with respect to the assessments during the authorization of a license for operation.

  - Feasibility of the proposed dismantling phase

    A second important regulatory aspect is the assessment of the dismantling activities of the dismantling phase, which is subject to the current licensing. Several aspects will be evaluated in detail, among them the shut down and removal of systems and components no longer used, the decontamination and dismantling techniques and the work permit system, are explained below. It should be mentioned, that this regulatory aspect is new with respect to a operating license.

  - Decontamination techniques

    Due to the frequent need for decontamination the proposed techniques are subject to a more intensive assessment. As several techniques are used and proven during operation, too, this aspect is not a completely new one. Nevertheless, some techniques will be proposed, which are not applicable during operation. In this context it should be mentioned, that during the post-operational phase after the shut down of a NPP

large system decontamination programs were set up and executed under the conditions of the license for operation.

- Dismantling techniques

  Similar to the decontamination techniques during dismantling several dismantling techniques will be applied taking into account the conditions of the individual dismantling step. Although usually techniques are proposed, which are approved and are appropriate for purpose, special emphasis will be given to safety aspects during the licensing procedure. The assessment will result in a list of approved dismantling techniques. With respect to the complexity of dismantling activities and a high degree of flexibility for a detailed work planning, to allow optimizing safety aspects esp. concerning the radiation protection of the work forces, the license will not lay down the concrete techniques for individual dismantling steps. The selection of the techniques will be subject to the work permit procedure (see below), which is subject to the regulatory supervision, and is based on the approved list. For those cases, in which during a dismantling step a new technique, which is not laid down in the license, should be adopted, the licensee has to demonstrate to the regulatory body and related experts, that the technique will be fit for purpose.

- Work permit procedure

  As in the case of the dismantling techniques, detailed work plans for the individual dismantling steps can't be provided during the licensing period. Therefore, to ensure safety during execution of individual dismantling steps, the planning of the individual dismantling steps and the analysis of the related safety issues are subject to a more or less regulatory supervision, depending on the classification of the safety relevance, laid down in the license. The related procedures (so called "Work Permit Procedure") on the planning and participation of the regulatory body will be assessed during the licensing process and laid down in the license. Usually, these procedures are based on those, applied during operational phase and which are adapted for the specific needs of decommissioning and dismantling. Although during the operation the importance of the work permit procedure is high, the importance still increases for decommissioning and dismantling due to the high safety relevance.

- Financial security pursuant

  During the authorization process the appropriateness of the financial security pursuant will be checked. In regard to the liability (concerning accidents) as after removal of the spent fuel the relevant radiological inventory is reduced the new value for the decommissioning and dismantling phase usually will be lower than during operational phase.

- Material management

  Aspects of material management are subject to a license for operation. Due to the increasing volumes, the increasing numbers of types of materials and the related different disposal paths several aspects of the material management become more important during the authorization and are subject to licenses in Germany:

  - Flow of material within the NPP

    Especially during the first decommissioning phase provisions will be prepared to simplify storage, transportation or handling of the generated radioactive waste taking into account the expected disposal paths. Accordingly, during the authorization these aspects are subject to an assessment to ensure, that the provisions are appropriate for

purpose. The related dismantling measures are subject to the assessment of the adaptation of systems and components in the context of the residual operation.

- Treatment of radioactive material

  With respect to the disposal paths and the need to treat radioactive material after dismantling e. g. in a post-processing either to increase the volume of material to be subject to the clearance or to condition the remaining radioactive waste the availability of sufficient and appropriate systems and equipment are of high importance to the regulatory body which is – due to the high volumes to be handled – higher than during operation. Remark: The aspect of the required systems in practice often will be subject to the assessment of the thematic complex of "Decommissioning and residual operation".

- Handling of radioactive material - licensing aspects

  A license for operation contains the authorization to handle radioactive material originating from the operation of a NPP. Within the license for decommissioning the conditions for handling of radioactive material, esp. concerning the treatment and conditioning of radioactive waste on-site will be clarified as these practices are not automatically subject to the matter of fact of dismantling.

- Clearance of radioactive material

  Based on the requirements within the "Radiation Protection Ordinance (StrlSchV)", as far as possible, radioactive material will be cleared. The related concepts and procedures, to ensure, that only material is released from regulatory control with an activity or activity concentration below prescribed nuclide specific clearance levels, are subject to a detailed assessment during the authorization process. While the concept and procedure will be laid down in the license the application of them will be subject to an intensive regulatory supervision.

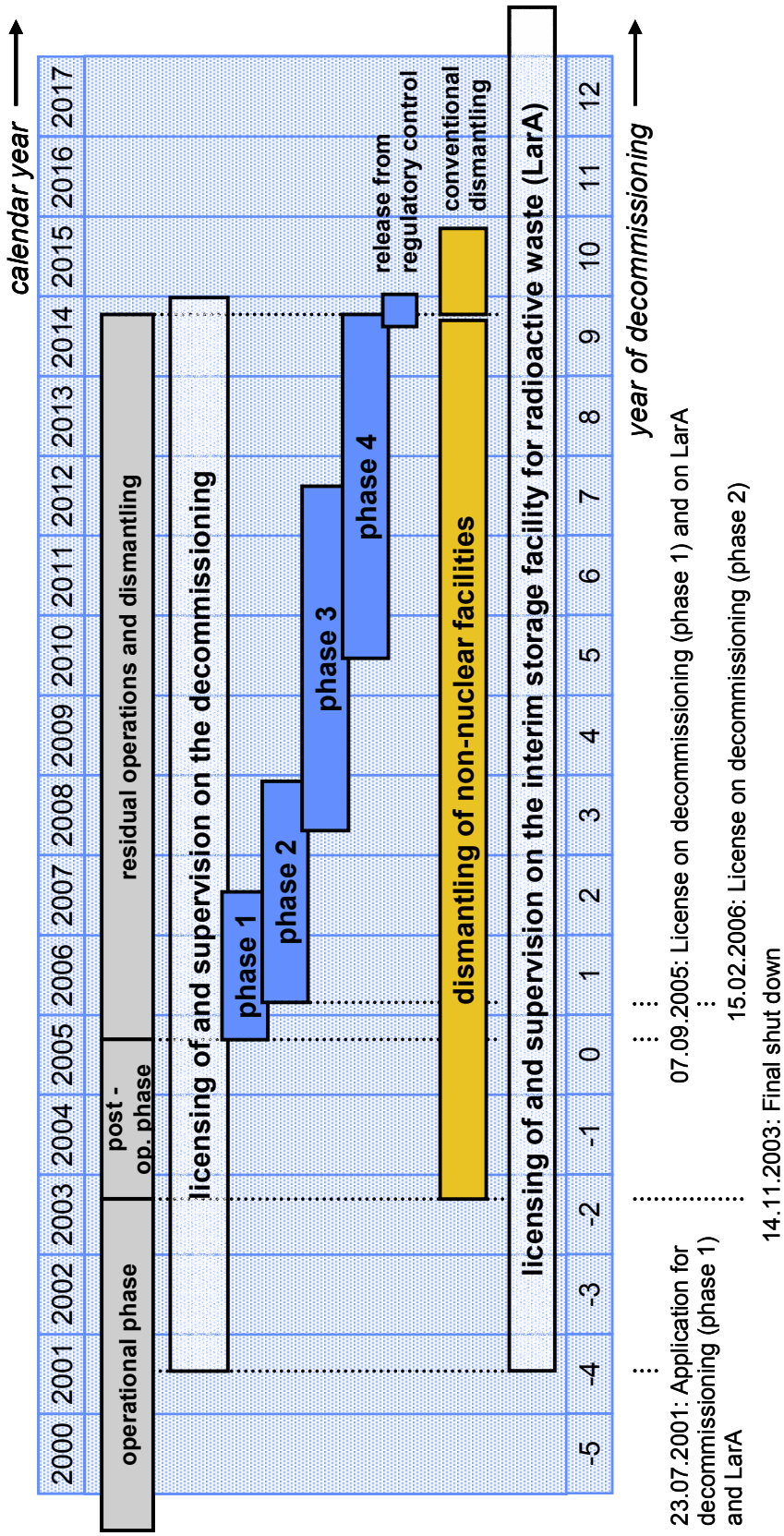
- New (external) facilities

  As far as new (external) facilities, e.g. to store radioactive waste or to treat radioactive waste, are needed to facilitate the dismantling of a NPP in Germany the facilities can be authorized within the license for decommissioning or dismantling (as is the case for Stade NPP) or within a separate license (as will be the case for Mülheim-Kärlich NPP). As these facilities will be new they have not been subject to an operating license. Nevertheless, the requirements and conditions for construction and operation of such a facility will be subject to an intensive assessment by the responsible regulatory body. With respect to the decommissioning and dismantling of a NPP potential dependencies of such facilities with the NPP will be assessed by the regulator during the authorization of the decommissioning or dismantling activities. Dependencies may not only effect safety aspects but may effect aspects of material flow, too, which may result in conditions in the license for decommissioning and / or dismantling (as is the case in the first license for Mülheim-Kärlich NPP).

- Off-site emergency preparedness

  Due to the reduced radiological inventory of a NPP under decommissioning and dismantling the requirements concerning off-site emergency preparedness will be reduced. For example, the planning of off-site emergency measures is no more needed.

Figure 1. **The Stade NPP decommissioning project as an example for a typical German multi-phase decommissioning project**



- Precaution for waste management

  As the volume of radioactive and conventional waste, generated during dismantling of the NPP, is high special emphasis will be laid on the foreseen off-site disposal paths. As during operation disposal of radioactive and conventional waste has been an issue, too, this regulatory aspect is not new, but has an increased importance. During authorization the applicant has to show, that the off-site disposal paths are available (e.g. on a contractual basis).

- Relevant non-nuclear regulations

  Subject to the authorization process is the assessment of the consideration of non-nuclear legal requirements. Of major concern are laws on the federal state ("Länder") level as building lease, laws pertaining to water and waterways, environmental laws and laws on disaster control. Except for the laws on disaster control, which are reflecting requirements to the emergency preparedness, there is no difference between the operation and decommissioning and dismantling phase of a NPP.

- Risk analysis

  Based on the radiological inventory of the NPP and based on the proposed dismantling phases a risk analysis will be performed by the applicant, which will be subject to a detailed assessment. According to the reduced nuclear and radiological risk the scenario will be adapted and the number of relevant scenarios will be reduced and in most cases limited to worst case analysis. Based on current experiences accident scenarios for impact from inside take into account leakage of systems containing radioactive material, load crashes, transportation accidents, fire, lost of residual operation systems or internal flooding. Scenarios for impact from outside are taken from a collection of earthquake, impact by storm, snow or lightning, flooding, external fire, external gases or air crash.

- Security

  With respect to the missing nuclear fuel and depending on the remaining but decreasing radioactive inventory the related possible radiological consequences for the public are decreasing with ongoing dismantling activities. Therefore the requirements for security will be lower with the decreasing radiological risk. Nevertheless, still a very high level on control will be established, and issues of security are still taken seriously by the responsible regulatory body and the applicant / future licensee.

- Stakeholder involvement

  Based on the requirements of the "Environmental Impact Assessment Act (UVPG)" an assessment on the impacts due to the proposed decommissioning and dismantling activities will be executed by the applicant. Based on the results and according to the requirements of the "Nuclear Licensing Procedure Ordinance (AtVfV)" the process of stakeholder involvement will be executed. The recommendations of the stakeholder will be taken into account by the regulatory body as far as relevant from the regulatory body's point of view. The procedure for stakeholder involvement is the same as for a license on the construction and operation of a NPP (but the interest of third parties and other persons in participation is much lower).

Summarizing, some of the regulatory aspects relevant for the authorization of decommissioning and / or dismantling are new but most of them are yet known from the authorization of the construction and operation of a NPP. New aspects are related to the assessment of the overall decommissioning project and to the assessment of the decommissioning phase, subject to the license under preparation and to new facilities, often interim storages for the radioactive waste generated during dismantling. For those,

which are known, often the importance has increased due to the rapidly changing state and conditions of the NPP caused by the dismantling activities. For some of them, the importance from the regulators point of view has remained or decreased. No longer relevant are regulatory aspects related to the control of reactivity and control of coolant, if the spent fuel is no more available at a NPP.

3. BALANCING OF RISK AND REGULATORY REQUIREMENTS

The authorization of the decommissioning and dismantling of a NPP as a risk informed decision making process is based in Germany on a system of two pillars. The pillars enable the regulatory body during authorization as well as during the execution of decommissioning and dismantling measures to adapt regulatory requirements and actions to the overall and to the individual radiological (and conventional) risk, represented by the NPP at the time.

The first pillar is represented by the fundamental concept of the multi-phase approach, in which the dismantling of a NPP is performed in several parallel or sequential dismantling phases which are subject to individual licenses (for an example, please consider Figure 1). Subject especially to the safety analysis and corresponding to the regulatory requirements are those measures proposed for the decommissioning and dismantling phase under discussion. Hereby, those radiological conditions are taken into account, which are valid during the proposed decommissioning and dismantling phase. Thus, as with progress in the dismantling of a NPP the radiological risk will decrease, the regulatory requirements will be adapted from license to license. It should be mentioned, that the applicant is not obliged to dismantle a NPP in the context of several decommissioning and dismantling phases, as described before, but is free to apply for one license only, which has to cover among other all safety relevant aspects at the same time. But, concerning NPP, large research reactors and complex nuclear fuel cycle facilities the multi-phase approach is good practice in Germany.

The second pillar is represented by the work permit system, which was mentioned in paragraph 0. While during authorization of a dismantling phase the frame will be defined and safety is assessed in detail, the detailed planning of individual dismantling steps is subject to the regulatory supervision. This allows a flexible work planning, taking into account individual conditions relevant for the individual dismantling step, without jeopardizing safety aspects as regulatory control is ensured. The work permit system covers among others the work planning, including the determination of protection measure against conventional and radiological hazards, the way of participation of the regulatory authorities in an approval step (depending on the safety classification of the system / component under discussion), the preparation of the work, its execution and the post processing.

Some examples for regulatory aspects, which are subject to a balancing of risk during licensing and regulatory supervision, are the following:

- *Qualification of the personnel*

  The requirements for the qualification of the responsible personnel and of the other personnel will be adapted according to the reduced radiological inventory, especially as spent fuel is no longer at the NPP under decommissioning and dismantling.

- *Off-site emergency preparedness*

  The preparation of off-site emergency plans is no more needed due to the reduced radiological inventory and the worst case scenarios, which have less severe consequences during decommissioning and dismantling than during operation.

- *On-site and off-site radiological monitoring systems*

  The systems for on-site and off-site monitoring will be adapted to the reduced inventory. For example, the monitoring of noble gases or Iodine in the chimney can be switched off and removed if no significant releases can be measured any more after the spent fuel has been removed, which is recent practice in Germany.

- *Security*

  If no spent fuel is in the NPP and the remaining radioactive inventory is appropriate the requirements concerning the security can be adapted accordingly. Nevertheless, still a very high level of control will be established, and issues of security are still taken seriously by the responsible regulatory body and the applicant / future licensee.

Summarizing, it can be stated that balancing of risk and regulatory requirements are good practice in Germany to facilitate an efficient and prompt decommissioning and dismantling of German NPP.

4. STAKEHOLDER INVOLVEMENT

In Germany, stakeholders are involved in the process of authorization of the decommissioning and / or dismantling of a NPP due to the regulations of the "Nuclear Licensing Procedure Ordinance (AtVfV)".

According to the AtVfV the decommissioning and dismantling project shall be announced to the public via official Publication Gazette and local newspapers once the application documents to be submitted to the authority are complete. The announcement shall include details of where and when an excerpt of the application documents will be available for public inspection of two months duration, a request to submit any objections in writing to the responsible authority of the "Land" within a specified period, and the date of the public hearing or reference to the fact, that this date will be announced in future. The excerpt of application documents shall consist of the safety report, a short description of the project, information on radioactive residues and other environmental impacts of the project. The objections shall be raised in writing or for recording at the responsible authority and will be subject to a public hearing, at which they will be discussed insofar as they may be important for an examination of the licensing requirements and at which any individuals, who have raised objections, are to be given the opportunity to explain them.

The objectives of the public hearing will be taken into account by the responsible authority when making its decision and will be addressed in the license findings. In this sense, the stakeholder involvement is part of the authority's formation of opinion, but does not directly influence the decision making, which is based on the regulatory framework, the authority's own assessment and judgement of the decommissioning project and its proposed decommissioning phases. To give an impression on recent experiences, it should be noted that for two recent licenses, related to the first dismantling phases of two NPP, between 30 to 50 objections relevant to the subject of the license were imposed addressing mostly the topics "general procedural and legal questions", "residual operation and dismantling", "radiation protection", "clearance", "radioactive waste/on-site interim storage/disposal", "accidents" and the "performed environmental impact assessment". Each of the objections was explicitly addressed in the justification of license, which are public as the licenses are public.

In addition to the stakeholder involvement according to the AtVfV, the European Commission is integrated into the process of stakeholder involvement based on the obligations of article 37 of the EURATOM treaty.

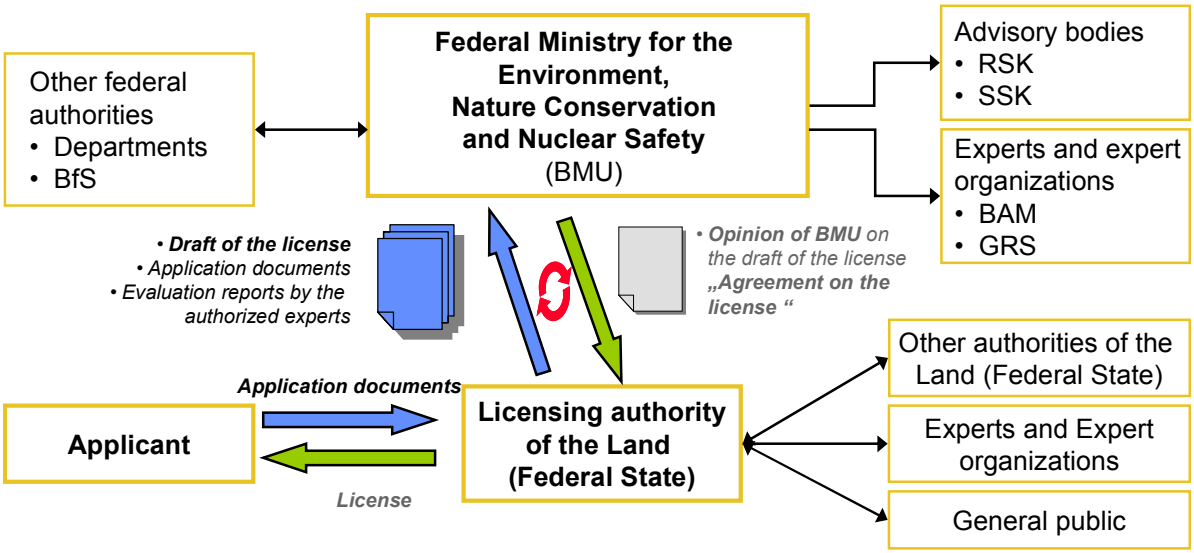
It should be noted, that, as far as the overall decommissioning concept, which will be part of the regulatory assessment of the first decommissioning and dismantling phase, will not be changed essentially during the following decommissioning phases, the stakeholder involvement will be limited to the authorization process of that first decommissioning phase.

5. LICENSING AS A MANAGEMENT PROCESS AFFECTING DIFFERENT DECISION MAKING AUTHORITIES

As mentioned in the introduction unlike the system of authorization and regulatory supervision of the nuclear safety in most other countries the German system is basically influenced by the federal structure of the Federal Republic of Germany. Licenses are granted by the responsible authorities of the federal states ("Länder") on behalf of the federal government, which is supervising the "Länder".

Figure 2 illustrates the granting of a license for decommissioning to show the interaction between the federal government, represented by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), between the responsible licensing federal state ("Land") and other ministries and parties, involved in the process of authorization.

Figure 2 **Example for the interaction between the parties involved in the authorization of a license for decommissioning**



The licensing authority of the "Land" is responsible for ensuring, that all obligations to the licensing process according to federal and state law are fulfilled. This includes the management of the participation of all authorities and organizations with competences affected by the decommissioning and dismantling project according to laws, ordinances and regulations of the "Länder" and of the Federal Republic of Germany. The obligations also include the management of the stakeholder involvement process. Usually, the licensing authority will be supported by experts and expert organizations. The number of authorities and organizations varies depending on the location of the NPP, for example, while for Stade NPP 55 authorities and organizations were contacted, for the Mülheim-Kärlich NPP the corresponding number was 26.

Before a license will be granted by the responsible authority, the BMU approves the final draft. This is due to the German nuclear regulatory system in which the responsible authority of the "Land" will grant the license on behalf of the federal government and in which the Land is supervised by the federal government, i.e. the BMU. Hereby BMU will assess the draft license and, as far as appropriate, the application documents to set up an own opinion on the permissions and the conditions within the draft license, on the safety during the proposed decommissioning and dismantling and on the fulfillment of all prerequisites related to the licensing process. BMU will be supported by external experts and by its advisory bodies.

Based on the experience from past decommissioning and dismantling projects the responsible authority will take into account the recommendation of the BMU in the finalization of the license under discussion, that is, BMU and the responsible authority will agree upon the final license.

Finally, it should be noted, that a license for decommissioning and dismantling will rule only those aspects that are directly related to the former operation of the NPP and which are based on the permissions of the previous licenses for construction and operation of the NPP. There may be other aspects relevant in the context of the decommissioning and dismantling, that will be subject to other regulatory regimes (esp. building lease) and which thus will be out of the scope of the license for decommissioning and dismantling.

6. RECENT DEVELOPMENTS IN REGULATORY PRACTICES IN GERMANY

New aspects in regulatory practice in Germany relevant to decommissioning and dismantling are developed not only in the context of a license to be granted, i. e. due the responsible authority's or the Federal Ministry's for the Environment, Nature Conservation and Nuclear Safety (BMU) reflection on safety aspects relevant, but they are also a result of the continuous process of experience exchange and of harmonization of the individual approaches of the "Länder" relevant to the regulatory authorization and control, which is embedded in the relevant working group of decommissioning of the "Länder" and the BMU.

The following examples shall be mentioned:

- *Safety management system*

  Following international recommendations and reflecting the high importance of managing safety especially under rapidly changing conditions safety management systems shall be operated in NPP, which are under decommissioning and dismantling. Depending on its availability, such a system can be an adaptation of the system operated in the operational phase of the NPP or shall be introduced during decommissioning and dismantling, as is the case in a recent decommissioning and dismantling project.

- *Work management planning*

  In 2004 the German regulation "Richtlinie für den Strahlenschutz des Personals bei Tätigkeiten der Instandhaltung, Änderung, Entsorgung und des Abbaus in kerntechnischen Anlagen und Einrichtungen: Teil 2: Die Strahlenschutzmaßnahmen während des Betriebs und der Stilllegung einer Anlage oder Einrichtung (IWRS II)" was updated and reissued again. The regulations rule how to take into account radiation protection aspects during the planning, preparation and execution of practices in nuclear facilities. In addition to the adaptation to the German "Radiation Protection Ordinance (StrlSchV)", which was reissued 2001, and to the improvements of the concepts contained, the regulations now shall be applied not only to NPP under operation, but also to NPP under decommissioning and dismantling. Thus, the regulation now is subject to recent decommissioning projects. It should be noted, that as the

regulation is not legally binding, but an instrument of harmonization between the "Länder" and the Federal Government on a voluntary base, and due to consensus between the "Länder" and the BMU the regulation will not be applied to those decommissioning and dismantling projects running for years and which have gained good progress up to now.

It should be mentioned, that currently under discussion are aspects on decay storage of large components in dedicated interim storages, on clearance of radioactive waste by service providers or on the adaptation of the German "Nuclear Safety Officer and Reporting Ordinance (AtSMV)", which is the base for reporting of events by the operator to the regulatory body. In addition, it should be mentioned that the decommissioning guide of 1996 ("Guide to Decommissioning of Facilities as defined in § 7 of the Atomic Energy Act"), which provides guidance to the regulatory body same as to the applicant to focus on those aspects relevant for decommissioning and dismantling of a nuclear installation, is under review.

Summarizing, it can be stated that in Germany recent developments exist and can be expected in the future, too, which might be of interest for the international scene.

7. SUMMARIZING

For many years license-granting and supervision of decommissioning and dismantling of nuclear power plants are common practice in Germany. With progress in past decommissioning and dismantling projects and with the related experiences today an appropriate regulatory approach does exist in Germany to ensure, that safety is taken into account by the operator in a serious and reliable manner.

Decommissioning and dismantling of German nuclear power plants are performed in several phases, which are subject to individual licenses. The regulator's authorization of the decommissioning and dismantling phases addresses new aspects, as assessment of the decommissioning and dismantling activities, same as existing one like precaution for waste management or security of the nuclear power plant. In those cases, in which no spent fuel is in the nuclear power plant, measures to control reactivity or the coolant are no longer required and thus are no longer subject to the authorization. Depending on the progress during dismantling of the nuclear power plant and the related remaining radioactive inventory the requirements will be adapted accordingly, but without jeopardizing safety of the work forces, of the public and of the environment.

Due to the structure of the Federal Republic of Germany several decision making parties may be involved in the process of authorization. Nevertheless, a clear overall responsibility is defined and up to now no deficiencies have been observed. Especially the regulatory structure of the responsible authority at the level of a federal state ("Land") and of the supervising Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) ensures a very high level of regulatory control which facilitates a high self-responsibility of the licensee for ensuring safety during decommissioning and dismantling.

LESSONS LEARNT AND ADAPTATION OF REGULATORY PRACTICE IN SPAIN AUTHORITIES' PERSPECTIVE

FROM VANDELLÓS 1 TO JOSÉ CABRERA NPP'S DECOMMISSIONING PROJECTS

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Lessons learned from the partial dismantling of Vandellós I NPP show some important considerations to have in mind when planning the regulation of the decommissioning process of other nuclear power plants.

Once the spent fuel had been fully removed from the site, as it was the case in Vandellós I Nuclear Power Plant, there are four main characteristics to define basic criteria and conditions to achieve a safe decommissioning of a particular facility:

- The progressive reduction of the existing radioactive inventory and its characteristics and the associated evolution and change on the remaining radiological risk.
- The inherent need to progressively remove from service safety systems and destroy confinement barriers that can increase temporarily the risk, especially for workers.
- The dynamism of the dismantling activities, in comparison with those implemented during the operational stage that are much more static and repetitive.
- The non-reversible nature of the activities that forces to focus regulatory control very much on quality assurance of dismantling tasks and the training of workers.

All these strategic considerations are being taken into account in some way by CSN when defining a specific regulatory strategy for the decommissioning of the José Cabrera NPP, the next challenging project for Spanish regulators. This old NPP just ended its operation in April this year and entered the so called transition phase from operation to decommissioning. The real decommissioning activities are expected to start in 2009 after all the spent fuel had been transferred to a temporary dry storage facility located on site.

A right strategy for the licensing and control of the decommissioning of nuclear facilities require acting from the very beginning of the project, including the design and planning activities, and a close coordination between all organisations involved. In this sense a CSN Task Group was established in September 2003 with the aim of proposing a specific strategy for the decommissioning of J. Cabrera NPP, having concluded the first part of its analysis, with respect to the transition phase from operation to decommissioning activities.

A deep review of safety regulations has been performed, in order to define a more systematic and predictable decommissioning process, that can lead to the development of a new regulatory framework for decommissioning activities, modifying in this respect the current Spanish regulation. The basis for this new regulatory framework will be the current national basic regulation, the WENRA

harmonization programme, the experience gained in Spanish decommissioning projects, and references from other countries like USA and France.

REGULATING A DECOMMISSIONING PROCESS

Up to now, the regulations and technical criteria applicable to decommissioning processes have been mostly developed case by case through the regulatory authorities' interpretation and application of standards and rules established to control the operating life of the facilities concerned. This has also been the case when regulating Vandellós 1 NPP Decommissioning Plan. Old regulations in force at the time of granting the Vandellós 1 dismantling licence included no specific references that might serve as a regulatory framework for licensing the decommissioning of the facility neither for controlling the decommissioning activities.

The types of safety, environmental and public policy issues that arise in decommissioning can be quite different form those during operation, and often public interest and concern can be quite high. The population living near a nuclear facility may have become accustomed to its normal operation, but they are naturally concerned that a new activity like decommissioning be done safely, and they may be even more concerned about plans for the long-term condition of the site. These new safety, environmental, organisation, human and social factors and public issues produce new challenges for the regulator.

Decommissioning on the basis of case-by-case regulatory decisions has the advantage of certain flexibility, which has, up to a point, been indispensable in the initial period of decommissioning processes carried out so far. But now that there is sufficient practical experience of these processes, there is also an increasingly need to establish specific regulations applicable across the board to all decommissioning processes, and to set guidelines and technical standards so as to systematise the regulatory process, making assessment results more predictable and thereby helping to optimise both financial costs and those arising from radiological risk.

The main problem to be solved in Spain and some other countries, before tackling the decommissioning issue as an "industrial" one is to establish a viable spent fuel management strategy. Other decommissioning aspects regulated up to now on a case-by-case basis and currently being subject also to a wide-ranging national and international debate are:

- Availability of qualified staff for the decommissioning process
- Provisions of adequate financial resources for the process
- Keeping records of information important to decommissioning
- Management of specific decommissioning radioactive waste
- Clearance and recycling of materials originating from facility dismantling
- Releasing sites of old facilities
- Safety systems technical specifications evolution during decommissioning

Developing the above-mentioned aspects has become a real challenge for all the competent regulatory authorities dealing with decommissioning. New emerging regulatory issues appear like those related with the removal of control for the clearance of materials and the release of sites. There are also others regulatory challenges worth mentioning here that are even more important than previous ones. These challenges imply a genuine change in the regulator's mind and are particularly related with a new approach that should be applied when regulating decommissioning processes. Regulatory bodies should modify in some way their old and almost familiar methods that are used for controlling and

supervising facilities' operations when they are dealing with the control of the last period of the life of these facilities.

LESSONS LEARNED

Most of the regulatory factors that are addressed to ensure the safety during the operational phase of a nuclear facility will continue to apply during its decommissioning, but decommissioning also raises to issues that are in some respect different from those prevailing during the operation of the installation.

Once the spent fuel had been fully removed from the site, as it was in the case of Vandellós 1 nuclear power plant, there are four main characteristics to define the basic criteria and conditions to achieve the safe decommissioning of a particular facility:

- The progressive reduction of the existing radioactive inventory and its characteristics and the associated evolution and change on the remaining radiological risk.
- The inherent need to progressively remove from service safety systems and destroy confinement barriers that can increase temporarily the risk, especially for workers.
- The dynamism of the dismantling activities, in comparison with those implemented during the operational stage that are much more static and repetitive.
- The non-reversible nature of the activities that forces to focus regulatory control very much on quality assurance of dismantling tasks and the training of workers.

A principle of proportionality and evolution between risk and the safety requirement should inform the level of control established during the full decommissioning process (risk informed regulations). This is not only due to the change in the level of risk but also to the different safety perception, focusing no longer on the potentially catastrophic events but much more on risks involving hazards that are less serious but much more likely. The concept of an "intensive" safety control measurement to prevent risk of criticality, heat generation, high radiation levels or spent fuel safety and security, should be substituted by an "extensive" approach.

On the other hand, the regulatory approach should also take into account aspects such as the lost of physical barriers, the proximity of radiation sources to workers and the existence of diffuse levels of radiation and contamination during long periods and in large zones within the facility being decommissioned.

Radiological protection of workers must be optimised on the basis of a detailed knowledge of the work environment and a valid estimate of the duration of project task. Staff training and monitoring of the work environment are key parameters for ensuring that the work is done in suitable radiological conditions.

A considerable number of dismantling tasks are performed in decommissioning projects by expert contractors or other types of outside personnel that are not used to nuclear industries methods of work and the responsibilities for safety could not be clearly allocated at all time. A clear and unequivocal allocation of responsibilities for safety shall be ensured by regulatory control in these cases. The regulatory body should also promote a safety culture in order to encourage a questioning and learning attitude to protection and safety.

An important lesson learnt is that regulatory scheme and regulatory oversight methods should be established according to the real decommissioning safety case. It has been said somewhere that it is

absolutely necessary to "decommissioning regulatory uncertainty" to obtain a more predictable regulation for decommissioning processes in order to facilitate future projects.

THE CURRENT SPANISH DECOMISSIONING REGULATORY SCHEME

The reference regulatory framework for the decommissioning of the Spanish nuclear facilities is established in the Royal Decree 1836/1999 adopting the current Regulation on Nuclear and Radioactive Installations that provides, for the first time, for the administrative process of licensing the decommissioning of nuclear and radioactive facilities, and regulates the whole administrative procedure, specifying the documentation that the licensees of such facilities must provide. Chapter VI of this Regulation on Nuclear and Radioactive Installations is dedicated fully to the system of administrative authorisations required for the decommissioning and dismantling of such installations.

In most cases, the contents of the Royal Legislative Decree 1302/1986 on the Assessment of the environmental impact and the Royal Decree 1131/1988 containing the Regulations for the enactment of the Royal Legislative Decree 1302/1986 on the Assessment of the environmental impact are also applicable.

The aforementioned regulations establish two basic ministerial authorisations for the decommissioning of a nuclear facility to begin: the dismantling permit to be granted once its operation and pre-dismantling operations has ended and the so-called decommissioning statement, which would release the old operator from its liability for the facility's safety.

Permanent cessation of the operating phase and pre-dismantling activities

Regulation provide that the Ministry of Economy must specify in the official permanent shutdown statement, whether due to a planned or unforeseen cessation of operations of the facility, for certain preliminary activities to be carried out by the holder prior to the request for and granting of the dismantling permit: the activities to be carried out at the facility until a dismantling licence is obtained and the period within which such a dismantling licence must be requested.

The holder of the facility operating permit must in any case carry out two activities before a dismantling licence is granted: unloading of fuel from the reactor and the storage pools and conditioning of waste generated during the facility's operation. The Regulations also envisage the possibility of authorising the dismantling of nuclear power plants with the fuel still located in the fuel pools, provided that the licensee has prepared a plan for the management of that spent fuel, previously approved by the Ministry of Economy.

Dismantling authorisation

The dismantling permit, awarded by the Ministry of Economy following a favourable report by the CSN on the dismantling plan proposed by the licensee, and positive evaluation of its environmental impact by the Ministry of the Environment, allows the licensee to implement the said plan and to initiate activities relating to the decontamination and disassembly of equipment, the demolition of structures and the removal of materials, ultimately to allow for the total or restricted release of the site.

The procedure for requesting a nuclear facility dismantling permit requires the submission of documentation quite similar to that required during the operating stage, but whose contents are to be in keeping with the new stage of the facility's life.

1. **Safety study**, giving a description of the facility's initial status and an outline of the main activities to be undertaken during the project, a safety analysis and an environmental radiological impact assessment.

2. **Operating regulation**, with a description of the organisation, functions and responsibilities of personnel.

3. **Technical specifications** applicable to operational equipment and systems during dismantling activities.

4. **Quality assurance manual**, with the scope of the quality programme for the dismantling process.

5. **Radiation protection manual**, with the radiological standards and protection criteria applicable while dismantling activities are carried out.

6. **Site emergency plan**, providing for the possibility of critical accidents where nuclear power plants are dismantled with spent fuel inside. The probability of occurrence of accidents with radiological impact such as fires, explosions, etc. may rise owing to the type of materials used and the activities carried out.

7. **Radioactive waste management plan**, which should set out the basic criteria for the management of all waste materials generated in the process, both radioactive waste and cleared materials.

8. **Site restoration plan**, a document characteristic of dismantling licences which should include plans for carrying out a final radiological analysis of the site to be released following the decommissioning statement.

9. **Financial study**, with financial forecasts for the dismantling project.

Decommission statement

The process of dismantling a facility ends with the so-called "Decommission statement", which frees the licensee from his responsibility as operator and defines, in those cases in which the release of the site is restricted by some kind of conditioning factor, the limitations on use that will be applicable in the future, while appointing the organisation responsible for their maintenance and for ensuring their compliance. The decommission statement is awarded by the Ministry of Economy on completion of the dismantling activities, once the Nuclear Safety Council has verified that the technical conditions established in the dismantling project, especially what is stated in the waste management and site restoration plans, have been fulfilled.

SPANISH STRATEGY AND DECOMMISSIONING POLICY

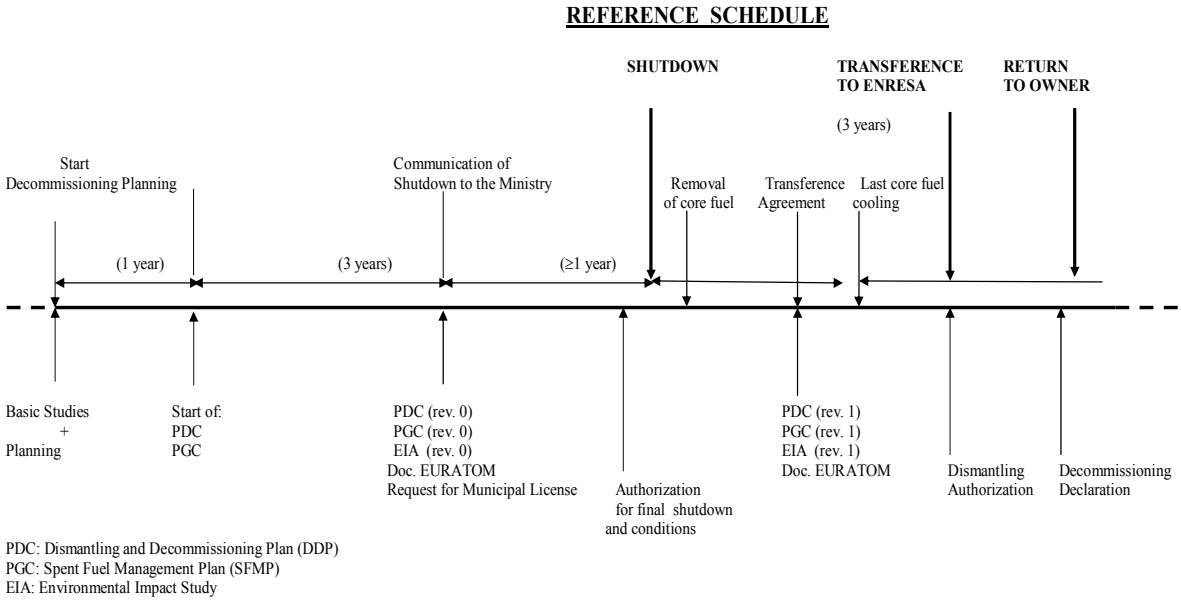
The Spanish framework for decommissioning commercial nuclear power plants implies the facility is temporarily transferred to ENRESA, the Spanish Radioactive Waste Management Agency, which will then become the licence holder of the facility in charge to perform the main decommissioning and dismantling activities. That means that a trusteeship of these facilities must be transferred from the operating licensee to ENRESA up to the moment of awarding of the decommission statement. At which moment the site of the facility, released of the regulatory control, is returned to its owner, the

former operating licensee. The transfer of trusteeship is authorised by the Ministry of Industry, Tourism and Trade at the same time as the dismantling authorisation.

The original licensee will retain however some responsibilities. The operating permit having expired, the responsibility for its decommissioning is initially to current licensee who, prior to awarding of the corresponding authorisation, undertakes what are known as the pre-dismantling activities.

The current licensee of the facility is responsible for conditioning the radioactive waste generated during operation of the installation. These radioactive wastes must be conditioned in such a way that they satisfy the acceptance criteria of the disposal facility to which they are to be transferred. The current licensee is also responsible for unloading the fuel from the reactor and from the irradiated fuel storage pools or, where the later does not exist, of preparing a spent fuel management plan approved by the Ministry.

The type contract between ENRESA and UNESA, "Unión Española de las Compañías Eléctricas" (Spanish Utility Lobby), the professional organization which represents the Spanish utilities interest, establishes in greater detail the responsibilities and the scope of work to be performed by the current licensee for planning the dismantling activities to be undertaken by ENRESA. The Appendix J of the mentioned contract defines the activities generic program, the way to coordinate those activities and the responsible entity in the process.



The basic milestones of the decommissioning schedule included in the contract are: the NPP cessation of operation, the facility transference to ENRESA for dismantling and the decommission statement issued at the end of the process that frees the site form the regulatory control. The site finally should be returned to its owner once the facility is decommissioned.

It is worth mentioning that the basic planning for the decommissioning should start five years before permanent cessation of operation (If a planned NPP shutdown). The following documentation has to be elaborated before the notification of permanent cessation of operation and the shutdown of the plant:

- A strategic basic study for its decommissioning (1st year)
- Licensing draft documentation for the dismantling period (2nd to 4th year)

- Licensing documentation for the pre-dismantling period (5th year)

After the permanent cessation of operation of the NPP the transference agreement between the utility and ENRESA should be signed. Before the licence transference occurs the fuel should be unloaded from reactor vessel to the spent fuel pool and managed accordingly with a Spent Fuel Management Plant previously approved by Ministry of Industry, Tourism and Trade. The operational waste should also be conditioned before the transference, and the first official licensing draft documentation for dismantling should have been proposed to regulatory authority.

DECOMMISSIONING OF JOSÉ CARBRERA NUCLEAR POWER PLANT

All these strategic and licensing consideration were taken into account by CSN in 2002 when defining a specific regulatory strategy for the decommissioning of José Cabrera NPP, when the Ministry of Economy decides to prematurely shutdown the plant.

José Cabrera NPP is the oldest Spanish PWR, one loop Westinghouse design, almost 40 years of commercial operation that just ended its operation in April this year. The plant entered the so called transition phase from operation to decommissioning. ENRESA decided to proceed with the prompt dismantlement alternative for its decommissioning. The spent fuel will be stored on-site dry storage facility until conditions for a future off site shipping.

The real dismantling activities are expected to start in 2009 after all the spent fuel had been transferred to a temporary dry storage facility located on site. In the meanwhile, after definitive shutdown of the plant and in this phase prior to dismantling, there are plans to carry out a series of preparatory activities: system decontamination, final unloading, radiological characterization of the facility, and other activities aimed at facilitating the subsequent dismantling activities.

Task group for the preparation of a specific regulatory strategy

A right strategy for the licensing of the decommissioning of a nuclear power plant requires acting from the very beginning of the project, including the design and planning activities, and a close coordination between all organisations involved.

Keeping in mind all the considerations previously mentioned, the CSN decided in 2003 to organise a working group with the basic objective of proposing a specific licensing strategy and a regulatory oversight scheme for all the José Cabrera decommissioning process. So that safety of all the foreseen operations during the dismantling could be guarantee and at the same time the national and international experience acquired until the moment is incorporated.

A deep review of safety regulations has been performed, in order to define a more systematic and predictable decommissioning process, that could lead in the future to the development of a new regulatory framework for decommissioning activities, modifying in this respect the current Spanish regulation. The basis for this new regulatory framework would be the current national basic regulation, the WENRA harmonization programme, the experience gained in Spanish decommissioning projects, and references from other countries like USA and France.

The group firstly focused the analysis in the transition period between operation and decommissioning of the plant, the immediate situation to deal with, and the period that has demonstrated to be a critical one in the process. Some peculiar regulatory concerns arise from this situation, especially with the record transfer and the loss of useful historic knowledge about the plant operation.

The group has also advanced in aspects related with licensing documentation for the dismantling activities. The objective of this analysis has been to make the official documentation flexible enough to allow a real adaptation to the dismantling dynamics and the constant evolution of the decommissioning safety case.

An important recommendation of the group was to structure or organize of all those dismantlement activities according with five facility modes (1 to 4, out of mode). These modes would be associated to situations with a gradually reduction of the radiological inventory and consequently a progressive decrease of the risk can be considered when performing the dismantling activities. Each operational mode would then be associated with different safety measures and radiation protection requirements. This progressive decrease of the risk has to be reflected in some way in the safety documentation of the project, specifically in the operational specifications.

LICENSING DOCUMENTATION FOR JOSÉ CARBRERA NPP DECOMMISSIONING

Design basis accidents

The fundamental milestone in the planned activities was the definition of the design basis accidents that are applicable to the defueled condition. The majority of the design basis accidents evaluated for an operating plant are not applicable for a defueled plant.

The first step was to delete the reactor-related accidents from the operational licensing basis. Fuel handling accidents inside containment have to be recalculated taking into account the radioactivity decay time since reactor shutdown. Once all the fuel elements had been translated to the dry storage facility, the fuel handling accident inside containment can be also deleted because such an accident is not longer possible at all.

The second step was to review the remaining accidents included in the Safety Analysis Report of the operating period. These comprise accidents that result in radiological releases from systems or components, mostly liquid and gaseous radwaste failures, etc.

The third step, specially focused in the dismantling phase, is to determine whether other accidents are credible due to dismantling activities. The following assumptions have been considered in the safety analysis made of the dismantling phase of José Cabrera NPP:

- The risks are sufficiently low for allowing the use of a deterministic hypothesis umbrella in the analysis, with a very high degree of conservatism in some cases. This conservatism includes the assumption of not taking credit for safety or mitigation systems operation in the accidents analysis for the action of any safety system or mitigation (i.e. HEPA filtration in HVAC system)
- Regarding the accidental risks the applicable annual effective doses limits to the public members, considering all radioactive pathways is 10 mSv/a.
- The above limit is consistent with the recommended one in ICRP 82 as generic reference level, below which intervention measures are not justified; an with the administrative limits of EPA for the early phase of an emergency below which, no protection measures are taken. The limit is also consistent with the intervention levels established in the nuclear emergency basic plan for urgent protection measures. Due to the above, the limit is a reference measure to accept the immediate consequences of the postulated accidents and also to justify that no need exists for an off-site emergency plan.

- The accident selection to be considered is based on the information of the Appendix I of NUREG - 0586, that lists the accidents considered in the PSDAR from a total of 20 U.S. NPP's being dismantled.

The radiological consequences of the postulated accidents are always below the applicable limits (10CFR10.11, CGD 19 section A of 10CFR50 and RG 1.195). There is no case where the limit of 10 mSv is exceeded in the design basis accidents analysis performed for dismantling phase in the José Cabrera NPP decommissioning.

Systems, Structures or Components (SSC) classification

Once the safety analysis is performed, the next step is the definition whether or not an SSC is important for safety or radiological protection and elaborate the safety licensing documentation consequently. The steps followed for classifying an SSC is here below indicated:

- Establishing the criteria to be followed to decide whether or not a structure, system or component (SSC) is safety related.
- Defining umbrella accidents for the dismantling activities according to NUREG – 0586 and developing the accident analysis required to determine which SSC are important to safety.
- Establishing the criteria to be followed to decide and determine whether or not a structure, system or component (SSC) is important for radiation protection.

Safety Related SSC

10CFR50.2 defines the structures, systems and components related to the safety as the ones that should remain operational during and after the design bases accidents to assure:

- The reactor coolant pressure boundary integrity.
- The capacity to shutdown the reactor and to maintain it under safe conditions.
- The capacity to prevent or mitigate the consequences of accidents that could produce potential off-site radioactive dose above the limits indicated in 10CFR50.34 and 10CFR100.11.

After the permanently cessation of the operation, the above number one and two requirements do not apply, and the applicability of the third one depends on the assumptions and results of the accidents analysis.

SSC Important to Radiological Protection

The SSC considered important for the radiation protection are those not credited in the accident analysis but which contribute to prevent any impact off-site, assuring an adequate confinement and risks reduction. This classification applies to the SSC that comply with some of the following criteria:

- The SSC is essential for the storage, control or maintenance of the spent fuel operation, waste treatment or radiological protection.
- The SSC is essential for preventing accidents or postulated incident relative to the control or maintenance of spent fuel or relative to the handling and treatment of the radioactive waste.

- The SSC is associated to a requirement beyond the regulations requirements that remains applicable to the storage, control or maintenance of spent fuel, radioactive waste treatment or radiological protection.
- The SSC satisfies a requirement based on the applicable regulation to the radioactive nuclear fuel management. This includes any SSC required for technical specifications.

The SSC considered important for Radiation Protection in the case of José Cabrera NPP:

- Fire Protection
- Radioactive Effluent Control Monitoring
- Ventilation
- Radioactive Waste Treatment.

Technical Specification during the decommissioning of José Cabrera NPP

Due to lack of Spanish specific regulations or guides to establish the content of technical specifications, it is established to follow the so called "reference licensing facility" and to use the standards applicable in the original country of the project. So that technical specifications are based mostly on U.S. references.

The content of the operation specifications has been established considering the NUREG - 1625 "Proposed Standard Technical Specifications for Permanently Defueled Westinghouse Plants (Draft 1998)" criteria, the experiences of the U.S. facilities under conditions similar to the ones on José Cabrera NPP and Spanish NPP's on dismantling and on the results of the corresponding accidents analysis.

Technical specifications are assigned to enforce conditions or limits to the reactor operation, needed to avoid an immediate threat to the public health and safety. Four criteria are fixed to determined which operation conditions and associated surveillances will be controlled by technical specifications, with the objective of relocating the remaining conditions and surveillances in other documents control by the licensee.

- Criterion 1. Install instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the spent fuel storage pool.
- Criterion 2. A process variable that is initial condition of an accident that either assume the failure of or presents a challenge to the integrity of the fission product barrier.
- Criterion 3. A structure, system or component that functions or actuates to mitigate a design basis accident or either assume the failure or presents a challenge to the integrity of the fission product barrier.
- Criterion 4. A structure, system or component which operating experience or probabilistic safety assessment has shown to be significant to public health and safety.

Permanently refuelled José Cabrera NPP Technical Specifications

The permanently defueled José Cabrera NPP Technical Specifications have been developed from the above mentioned accidents analysis. These specifications include the limiting conditions for operation and the surveillance requirements of those systems and components of which the accident analysis takes credit.

The only SSC related to the safety while the fuel is in the pit are the spent fuel pit, the storage racks and the piping runs of coolant system from the pit to the devices that prevent the pit emptying by siphon effect. So while the pit has fuel in, the requirements related to the meteorological instrumentation and radiation surveillance and the system related to the spent fuel and the pit, and the sealed sources contamination system, seismic surveillance and liquids effluents storage tank remain in Technical Specifications.

When the pit has fuel in, the following Technical Specification for instrumentation remain applicable:

- 3/4.3.3.1, Radiation Surveillance Instrumentation (R-038)
- 3/4.3.3.3, Meteorological Instrumentation

When the pit has fuel in, the following Technical Specification for systems remain applicable:

- 3/4.7.7, Sealed Sources Contamination
- 3/4.7.13, Seismic Surveillance System
- 3/4.12.1.1, Water level in Fuel Pit without Fuel movements being performed
- 3/4.12.1.2, Water level in Fuel Pit while Fuel is being moved (New)
- 3/4.12.2, Pit Water Temperature.
- 3/4.12.4, Loads Movement.
- 3/4.12.6, Boron Concentration.
- 3/4.12.7, Fuel Element Burnt in Pit.
- 3/4.12.8, Fuel Movement (New)

Whenever all fuel elements have been translated to a dry storage facility, it is foreseen that the need to keep sections concerning safety limits and limiting conditions for operation will not exist any more.

The rest of requirements have been relocated in some other official documents like Radiological Effluent Monitoring and Off-Dose Calculation Manual, Technical Requirements Manual (control of changes as required in 10 CFR 50.59), Quality Assurance Program, Fire Protection Program.

Also new programs including the operative conditions, actions, and surveillance criteria have been developed for those systems which, although no credit to them is given in the accident analysis, they are considered important for Radiation Protection during permanently defueled shutdown. Those programs are here below indicated:

- 6.8.1, Fire Protection (New)
- 6.8.2, Spent Fuel Pit Coolant.
- 6.8.3, Chemistry Control and Water Activity of the Fuel Pit (New)
- 6.8.4, Radioactive Effluents Control Program.
- 6.8.5, Environmental Radiological Monitoring Program.
- 6.8.6, Containment Isolation (New).
- 6.8.7, Full System Decontamination (New).
- 6.8.8, Ventilation (New)

Preliminary proposal for Technical Specifications for the dismantling phase of José Cabrera NPP

On the contrary that Permanently Defueled Technical Specifications, that already are in force, the preliminary proposal of the Technical Specifications for the dismantling phase of the decommissioning program of José Cabrera NPP is being now under technical revision by CSN experts.

The proposal has been prepared starting from the last applicable specifications (Technical Specifications for Permanently Defueled Condition) and considering the specific condition of the facility, eliminating directly those systems and instrumentation specifications related to the fuel and fuel pit, as well as the non applicable surveillance programs to those conditions.

According to Accident Analysis results, there are not safety related SSC during dismantling. Consequently the safety limits and limiting condition for operation, in section 2 and 3/4 of Technical Specifications of an operating NPP, do not apply.

In addition, other systems requirements not related directly to fuel but still remaining in the Technical Specifications of Permanently Defueled Conditions have been proposed to relocate in the following documents:

Radiation Protection Manual

- 3/4.7.7, Sealed Sources Contamination

Off-site Dose Calculation Manual

- 3/4.11.1, Liquid Effluents. Distillate Storage Tank FH 20

New programs including the operative conditions, actions, and surveillance criteria have been developed for those systems which, although no credit for them is given in the accident analysis, they are considered important for Radiation Protection during dismantling and to assure an adequate confinement of contamination. The content of these programs is proposed to be quite similar to those presented for the transition phase and also the control of the possible changes on them should follow similar administrative procedure. The changes which reduce o relax the commitments have to receive a positive evaluation prior to its implementation.

These programs are here below indicated:

- Fire Protection Program
- Radioactive Effluents Control Program
- Environmental Radiological Monitoring Program
- Ventilation Surveillance Program
- Radioactive Waste Treatment Program

Technical specification evolution along the decommissioning

The contents of the Technical Specifications for permanently refuelled condition and for the dismantling phase are summarized in the following tables. The qualitative changes to the previous phase are indicated in parenthesis.

SECTION NAME IN THE TRANSITION PHASE (REGARDING TO OPERATION)	SECTION NAME IN THE DISMANTLING PHASE (REGARDING TO TRANSITION)
1.0 Definitions (reduced)	1.0 Definitions (reduced)
2.0 Safety Limits and Limiting Set-points of safety systems (removed)	2.0 Installation (Facility) Modes (new)
3/4 Limiting Condition for Operation and Surveillance Requirements (removals, relocations and new ones)	This section has been deleted in the new revision (relocations and removals)
3/4 Bases for Limiting Condition for Operation and Surveillance Requirements of sections 3.0 and 4.0 (removals, relocations and new ones)	This section has been deleted in the new revision (relocations and removals)
5.0 Project Bases (reduced)	3.0 Project Bases
6.0 Administrative Regulations (reduced and new ones)	4.0 Administrative Regulations (reduced and new ones)

In summary:

- The licensing documentation for dismantling phase is adjusted to the new activities and risks associated to dismantling.
- A methodology has been established to define whether an SSC is important for safety or for radiological protection.
- A methodology has been established to define the content of Technical Specifications.
- As well as in the transition phase, documentation is complemented with the Surveillance Programs.
- The prepared documentation is preliminary and it has been presented for comments to the Regulatory Authority.
- The final official documentation will be presented for approval in the first quarter of 2008.

IMPLEMENTER'S PERSPECTIVE ON REGULATORY ISSUES

Bertil HANSSON
Barsebäck NPP, Sweden

My name is Bertil Hansson and I am the Manager of unit 1 and also decommissioning of the Barsebäck site. I have a long background in the nuclear field, now close to 40 years in the nuclear business.

As a Implementer of the regulations, I will here express some of my and my colleagues thoughts about what is just now happening.

WORLD-WIDE FACTS & FIGURES

Already now about 100 power reactors are stop by one or another reason. In Europe, the reason is more frequently based on political discussions, than in USA, where so far economical factors has been the basis for the closure. However, in USA, several of the reactors that where planned for shutting down, now still are in operation and several have also extended the lifetime.

If we look into the future, there will be about 400 power reactors stopped in 2020 to 2035 if we still consider a lifetime of 40 years. With this I will also add that several of the closed reactors are waiting for another plant at the same site to be closed or only put into deferred dismantling or Safe-store as referring to the country policy. This means that we are in the beginning of a new period of dismantling reactors and therefore we have to try to give the right messages through balanced regulations so the Licensee can make an effective and safe dismantling.

THE IMPLEMENTERS POSITION IN THE DEVELOPMENT OF NEW REGULATIONS

Today, several activities are going on in Europe to develop harmonised regulations. Western Europe

Nuclear Regulators Associations (WENRA) is setting up a set of regulations for:

- Reactor safety
- Waste storage, and
- Decommissioning

WENRA's work is based on the IAEA Safety Standards and by some rewriting they create new Reference Level's (RL)

We, the implementers, are working through our organisation, European Nuclear Installations Safety Standard (ENISS) by reviewing and giving practical and constructive comments. Last week we had a meeting in Stockholm with WENRA working group for Waste Storage

World Nuclear Association (WNA) has made a Position Paper on Decommissioning, which I will later come back to.

IAEA is just now running a project for demonstration of safety during decommissioning (DeSa). Barsebäck is here the test case for a power plant. The objective with the project is to develop and test guidance on safety assessment of a plant under decommissioning.

Planning scenario for the Decommissioning of Barsebäck 1 and 2

Barsebäck NPP planning scenario is special due to that the political decision to close Barsebäck has kicked the plant out of the long term planning for the Swedish Waste system. The plant will stay in a long period of Service Operation waiting for the storage for dismantling waste will be ready, 2020.

Authorities' demands

In Sweden we have two regulators that regulates the nuclear and radiation part. Then we have the Environmental Court that reviews our Environmental Impact Assessment. To complete the picture, there are several other industrial regulations for the plant to coop with.

The Risk Profile is changing

Under the transition from an operating reactor to the "Green field" the dominant risk-focus is rapidly changing from reactor safety and radiological risks to normal Industrial safety risks!

The regulation and requirements from the regulators must follow and harmonise with the actual risk, to guide the operator through the transition

From old Operational Safety Systems to Barrier Protection Systems

When all the fuel has left the plant most of systems that we called our safety system has done their duty. We have no core anymore, so consequently there is no need for the core cooling system. Other systems like the reactor vessel and the main circulation lines are now containing water to cover some higher active components in the vessel.

The classification of SSC's can now be done more to normal industrial regulations.

Other old systems will now instead come more in focus as the fire protection system and protection against flooding. The classification will be done as before or to normal industrial standards. Systems containing radioactive water will as before be in a higher-class 4a.

A new risk profile and a new (licence) authorisation process

In Sweden we have a licence for construction, operation and decommissioning, but we need to go through a new authorisation process, were we now for moving to "Service Operation" and have developed the following:

- Decommissioning plan
- A Safety Report – New SAR
- A new Technical Specification
- Environmental Impact Assessment to be submitted to the Environmental court

- Reorganisation – reduction of staff as well as developing new competence in different staff groups
- A new Management system(MS) and a new Quality Management System incl. in MS Modification or/and rewriting of procedures
- Modification of plant (New monitoring system, modified electrical power supply and others as i.e. new air compressors, etc.)
- Full scope system decontamination

Continuous improvement of safety, still a valid statement….

During decommissioning as during operation there is always room for improvements of safety. We have therefore developed a policy for our work in preparing and performing the decommissioning:

"Simple"

Put plant in lowest energy state (drain systems and components, clean and drain pools, remove filters and resins, Reduce ventilation requirements etc.

Reduce needs of surveillance

"Safe"

Know and reduce risks (fire, flooding etc.)

"Cost optimized"

Optimize costs for Service Operation and future demolition

Adapting to the new (different) situation……

Some questions were asked to be answered during the presentation:

- **Security** – Still a nuclear plant, but without fuel and risk for urgent actions outside plant for radiological accidents, some changes in monitoring etc.
- **Monitoring of staff/visitors/contractors** - decreased requirements but increased requirements due to 9-11
- **Emergency plans** - reduced needs as no risk for urgent actions outside plant for radiological accidents, etc.
- **Monitoring of plant** - of course air and water born releases as well as other parameters to control the new operational situation.
- **Degradation of the plant** – Monitoring of equipment and general housekeeping. Preventive maintenance according to new needs.
- **Inspection and reporting** - adopted to the new situation, weekly reports. Plant inspections adopted to new situation and needs.
- **Records and their maintenance** - important as before. Need of up-dating documentation before staff are leaving, as well as a good system for controlling and registration of produced waste.

- **Stakeholders involvement** - results in confidence and trust for our way to managing the decommissioning.

WNA - SAFE DECOMMISSIONING OF CIVIL NUCLEAR INDUSTRY SITES - AN INDUSTRY VIEW

World Nuclear Association Working group Radiation Protection and Working group Waste management and decommissioning have produced a position statement called *'Safe Decommissioning of Civil Nuclear Industry Sites'*. This Position statement presents the nuclear industry's perspective and policy on the important subject of decommissioning of civil nuclear industry sites. The scope does not include legacies, which is a complicated matter dealt with by governments and operators in a more extensive way now

Overall goal of decommissioning and its key role in sustainability

The nuclear industry is committed to the twin objectives of decommissioning: safety and restoration. These characteristics underscore the industry's intrinsic sustainability. Re-use can apply to various parts of the site, including land, water bodies, buildings, equipment, materials and even wastes. The nuclear industry and regulators share a responsibility to develop and implement strategies for safe and effective decommissioning, restoration and re-use of these valuable resources.

Protecting people and the environment

Throughout a site's decommissioning, public authorities monitor the owner/operator's compliance with health, safety and environmental protection requirements. Once decommissioning is completed, acceptance must be obtained from key stakeholders – including local authorities and the general public – that these requirements have been fully met. This acceptance is a prerequisite to gaining official agreement that control over the site can be safely reduced or ended.

Environmental and socio-economic impact and stakeholder involvement

In many countries, before the formal application for a decommissioning licence, a preliminary process occurs aimed at assessing the environmental and socio-economic impact. The result is called an Environmental Impact Statement (EIS). Generally, this process includes public hearings where stakeholders have ample opportunity to influence the conduct of a decommissioning project. In anticipation of this formal process, the owner/operator often takes the initiative by seeking stakeholder input from the outset of planning. This is efficient from the owner/operator's perspective, and also serves to enhance public trust, confidence, and acceptance.

Site re-use is fundamental to the sustainable use of resources

Public expectations attach high value to site re-use because of the potential for workforce re-deployment and local redevelopment. Commercially, the best re-use of a successfully decommissioned site may well be the construction of a new nuclear facility in its place; and this option may also be congruent with national needs and local aspirations. From a national perspective in many countries, nuclear power is gaining increasing policy support as a reliable source of affordable, cleanly generated electricity. And from a local perspective, the replacement option draws upon skilled labour already available and is also likely to enjoy the public acceptance that is common to communities familiar with nuclear power.

Uniformity in regulatory standards facilitates predictability, planning, and efficiency in all areas of nuclear industry practice, including the decommissioning process. There is thus an increasing effort internationally to develop agreed universal standards that will lend consistency and coherence to national regulatory regimes. Recently the IAEA adopted international standards on the removal from regulatory control of materials containing trace levels of radioactivity; these standards were particularly designed to govern the use or disposal of bulk quantities of such materials as may occur during decommissioning. These standards – and similar IAEA standards for land and water bodies at decommissioned sites – are milestones in regularizing the process of achieving safe and efficient re-use of decommissioned nuclear facilities.

Most decommissioning wastes are uncontaminated or of a very low radioactive level

The concept of decommissioning suggests an enormous task of decontamination, requiring the dismantling or destruction of many buildings and much equipment and requiring the disposal of a correspondingly large volume of radioactive waste. In fact, over 90% of the total volume of waste generated during decommissioning is non-radioactive and uncontaminated, and most of the remainder has only a very low radioactive level. Thus, only a small percentage of the overall wastes generated during decommissioning require treatment, conditioning and disposal due to radioactivity. Because some wastes will be generated, decommissioning requires a sound infrastructure and system for waste management.

This area will benefit from the development and adoption of international standards.

A comprehensive regulatory framework

In all countries, decommissioning is subject to a comprehensive regulatory framework. The initial step – the owner/operator's submission for a license – usually triggers a sequence of evaluations and peer reviews to establish clearly what steps will be necessary to comply with the standards and requirements of relevant authorities. In this process, it is standard practice for the owner/operator to prepare a well-documented decommissioning plan to facilitate the presentation of all stakeholders. This interaction will sometimes produce an amendment in the decommissioning plan and the license application.

Once a licence has been issued, regulatory oversight continues until the decommissioning process has reached the stage of long-term monitoring and institutional control. At this final stage, authorities can decide to discharge the owner/operator, fully or partially, from further responsibility and liability for the decommissioned site.

SETTLEMENT OF ENISS WITHIN FORATOM BY EUROPEAN NUCLEAR INDUSTRY ON MAY 2005

Harmonisation – a tool for safety improvement

WENRA's understanding of harmonisation: no substantial differences between countries from the safety point of view in generic, formally issued, national safety requirements and in their resulting implementation on NPPs.

European NPP licensees support WENRAs harmonisation approach for existing plants because

- Diversity of national regulations could seriously distort competition in the deregulated EU electricity market

- Harmonising regulations is the best way of ensuring that industry can evolve in a stable legal framework
- Efforts in harmonisation processes increase transparency and public acceptance of nuclear energy

ENISS – European Nuclear Installations Safety Standards

Safety Standards Initiative Objectives

- To establish a common licensee view with respect to the "WENRA RLs" between the different countries
- As the major stakeholder, present the industry position in discussions with WENRA about the RLs
- To support an exchange of information about the interaction of license holders with their national regulators, in order to achieve a harmonised set of new regulations.
- To create an information platform for the European nuclear license holders with respect to new national and international regulatory activities

General Comments – Decommissioning SRLs

- Methodology used: to adapt Reactor Safety RLs leads to inadequate burden of decommissioning activities.
- Decommissioning strategy is the responsibility of the licensee taking into account national waste policy.
- Decommissioning phase starts once "the bulk of fuel and radioactive materials" has been removed: Scope, number and details of SRLs should taken into account this matter.
- Benchmarking Exercise: similar to the one in the Reactor Safety Report completed before the release of the final report.

STRUCTURE OF IAEA DESA PROJECT FOR ASSESSMENT OF SAFETY DURING DECOMMISSIONING

The project aims to draw on the international experience in order to develop a harmonized approach for evaluating the safety of decommissioning activities and reviewing safety assessments for these activities.

All types of nuclear facilities (e.g. nuclear power plants, research reactors, nuclear fuel cycle facilities, research laboratories, industrial plants) will be included. The project will consider the three main decommissioning options, i.e. immediate dismantling, deferred.

Performance of safety assessments for the decommissioning of various types of facilities through selected number of test cases, where Barsebäck NPP represent a NPP.

Three safety reports will be developed and published at the end of the DeSa project describing:

- The elements of the methodology for performing safety assessment

- The guidance for application of the methodology in performing safety assessment of different types of facilities
- The procedure for review of regulatory safety assessments for decommissioning.

CONCLUSIONS

Growing interest for decommissioning. Several organisations involved in writing requirements and guiding documents, make it practical and use test cases!

To have in mind

- The risk profile is changing
- Still a need of continuous improvement of safety and a good safety culture
- The industrial safety aspects dominant
- New actors, demolition companies etc.
- The safety systems have done their duty, now it is important to protect the outer barrier.

Overall it is important to gain trust and confidence from stakeholder that we will end the plant's life in a professional way.

APPENDIX 3:

LIST OF PARTICIPANTS

Topical Session on Stakeholder Involvement in Decommissioning Projects

November 14, 2005

Country	Delegate
Belgium/Belgique	Mr. Walter BLOMMAERT Federal Agency for Nuclear Control (FANC)
Belgium/Belgique	Mr. Jacques CANTARELLA ONDRAF/NIRAS
Canada/Canada	Mr. Doug METCALFE Natural Resources Canada
Czech Republic/République Tchèque	Mr. Peter LIETAVA Nuclear Regulatory Authority
Finland/Finlande	Mr. Jari TUUNANEN Teollisuuden Voima Oy
France/France	Mrs. Dorothée CONTE DGSNR
France/France	Mr. Cédric MESSIER DGSNR
France/France	Mr. Jean-Guy NOKHAMZON CEA Saclay
Germany/Allemagne	Dr. Rudolf GOERTZ Bundesamt fuer Strahlenschutz
Germany/Allemagne	Dr. Karl-Heinz KÖLSCHBACH Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)
Germany/Allemagne	Mr. Luis VALENCIA Forschungszentrum Karlsruhe GmbH
Italy/Italie	Dr. Luciano BOLOGNA APAT
Italy/Italie	Mr. Ivo TRIPPUTI SOGIN
Japan/Japon	Mr. Hiroshi RINDO JAPAN ATOMIC ENERGY AGENCY (JAEA)
Japan/Japon	Mr. Tadamichi SATO The Japan Atomic Power Company
Japan/Japon	Mr. Takeshi YAMANAKA Japan Nuclear Energy Safety Organization (JNES)
Slovak Republic/République slovaque	Mr. Miroslav DRAHOS Nuclear Regulatory Authority
Spain/Espagne	M. Jose Luis REVILLA GONZALES Consejo de Seguridad Nuclear (CSN)
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Switzerland/Suisse	Dr. Harald MAXEINER NAGRA
United Kingdom/Royaume-Uni	Dr. Juliet LONG Environmetn Agency
United Kingdom/Royaume-Uni	Mr. Alan NEAL UKAEA
United States/Etats-Unis	Mr. Larry W. CAMPER US Nuclear Regulatory Commission
United States/Etats-Unis	Dominick ORLANDO US Nuclear Regulatory Commission
EC/CE	Mr. Richard CLARKE
International Atomic Energy Agency (IAEA)/Agence internationale de l'énergie atomique (AIEA)	Mr. Michele LARAIA
OECD/OCDE	Mr. Sam EMMERECHTS Consultant to OECD
OECD/OCDE	Mr. Torsten ENG
OECD/OCDE	Mr. Keng-Ming LIN
OECD/OCDE	Mr. Claudio PESCATORE
OECD/OCDE	Mr. Hans RIOTTE
OECD/OCDE	Mr. Allan DUNCAN Consultant to OECD