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NUCLEAR ENERGY AGENCY
RADIOACTIVE WASTE MANAGEMENT COMMITTEE

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Topical Session on "Liabilities identification and long-term management at national level"

Topical Session held during the 36th Meeting of the RWMC

13 March 2003
Paris, France

These proceedings cover a topical session that was held at the March 2003 meeting of the Radioactive Waste Management Committee. The topical session focused on liability assessment and management for decommissioning of all types of nuclear installations, including decontamination of historic sites and waste management, as applicable. The presentations covered the current, national situations. Each oral presentation was followed by a brief period of Q & As for clarification only. A plenary discussion took place on the ensemble of presentations and a rapporteur provided a report on points made and lessons learnt.

Included in the proceedings are the papers from the oral sessions, the rapporteurs report, as well as written contributions provided by RWMC delegates from several other countries.

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FOREWORD

These proceedings cover a topical session that was held at the March 2003 meeting of the Radioactive Waste Management Committee. The topical session focused on liability assessment and management for decommissioning of all types of nuclear installations, including decontamination of historic sites and waste management, as applicable.

The presentations covered the current, national situations. The first oral presentation, from Switzerland, set the scene by providing a broad coverage of the relevant issues. The subsequent presentations – five from Member countries and one from the EC – described additional national positions and the evolving EC proposed directives. Each oral presentation was followed by a brief period of Q & As for clarification only. A plenary discussion took place on the ensemble of presentations and a rapporteur provided a report on points made and lessons learnt.

Additionally, written contributions were provided by RWMC delegates from several other countries. These are included in the proceedings as are the papers from the oral sessions, and the rapporteur's report. These papers are not intended to be exhaustive, but to give an informed glimpse of NEA countries' approaches to liability identification and management in the context of nuclear facilities decommissioning and dismantling.

For additional information dealing with national decommissioning policy ands its implementation, the reader may want to consult: http://www.nea.fr/html/rwm/welcome.html

Acknowledgements

The RWMC wishes to express its gratitude to Mr. José-Luis González for chairing the topical session, and to Mr. Peter Brown, for acting as rapporteur.

INTRODUCTION

The short- and long-term, safe management of all radioactive material is an important consideration in the OECD countries. In accordance with the ethical principle of intergenerational fairness these management costs should be borne, in the first place, by the generations which created those wastes (and benefited from the primary, producing activity). It is important then to set aside sufficient funds so that, when the moment comes, the financial resources needed to decommission nuclear facilities, remediate sites, and manage the attending wastes are available. A *liability* on future generations would exist if these funds were to prove to be insufficient. A liability can have several originating causes, e.g., underestimation of the actual costs by the operator or the owner of the nuclear installation or by the holder or the owner of the radioactive materials; negligence; transfer of ownership of the nuclear installation or the nuclear site without transfer of the corresponding provisions; a reduction in the operating time; bankruptcy; ignorance; etc. The word *liability* can also be used to indicate a *responsibility*, both financial and non-financial, that an entity, such as a government, may have.

"*Liabilities identification and management*", which is the title of the present topical session, is about correctly identifying and addressing the financial and non-financial responsibilities that need to be fulfilled today in order to provide for the safe, final management of radioactive materials when the time arises for this to take place. If these tasks are discharged correctly, a "real" liability should not exist in the end.

Liabilities identification is about the identification of all facts that would enable governments or institutions to verify whether every operator or owner of a nuclear installation, and every holder or owner of radioactive materials have provided - or are providing - the requisite financial resources in time to cover the future costs of decommissioning, remediation, and waste management. Iterative evaluations enable the government to estimate the potential liabilities and take the necessary corrective measures in time. *Liabilities management* is about making sure that appropriate frameworks exist for funds to accrue, to be managed, and to be disbursed at the appropriate time. To this effect, it is important to note that the longer the time period is between the closure of the nuclear power plant (the sale of electricity from the plant is the source of the funds that are set aside for decommissioning) and the commencement of a waste management program, the greater the potential is for a significant discordance between the money that is available in the fund to implement waste management programs and the money that is required to carry out this task. The timing of the implementation of waste management and/or disposal programmes is, however, clearly within the purview of society and governments. The waste management community needs to highlight the potential consequences of inaction.

The existence of adequate funds is linked, ultimately, to the safety of the public. Hence the linking together of both financial and non-financial liabilities. This link is recognised in the Joint Convention of the *International Atomic Energy Agency* of 5 September 1997 concerning the safety of the management of irradiated nuclear fuel and radioactive waste, which states in article 22 that *"Each Contracting Party shall take the appropriate steps to ensure that [...] adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning."* This link is also made by the European Commission, and it is at the basis of a recent proposed directive on establishing decommissioning funds (see these proceedings).

These proceedings collect the papers that were made available by the speakers in the topical session, plus additional national papers made available by the other participants and observers. These papers are not intended to be exhaustive, but to give an informed glimpse of NEA countries' approaches to liability identification and management in the context of nuclear facilities decommissioning and dismantling.

KEY FINDING AND MESSAGES (RAPPORTEUR'S REPORT)

Peter Brown

Underlying Principles

1. Principle of "User Pays" Applies

It is clear that the fundamental environmental principle of *User Pays* is being applied to waste management. This is very important, as the principle is one of the basic tenets of the environmental movement. For Radioactive waste management to be in accord with the principle is a powerful and positive statement.

2. Legal Requirements for Funds

It is clear that there are Acts of Parliament, Decrees, or Directives, which provide the authority for the funds to be established and preserved. This is important as it demonstrates, at the highest possible level, that there will be funds available to deal with the issue of waste management, including disposal, in the future.

This is a powerful message that makes clear that the issue is important and that it will be addressed. Some countries establish decommissioning and waste management funds together. In other cases the two funds are separate.

3. IAEA Convention on Safety or Spent Fuel & Radioactive Waste Management (1997)

The convention lays down that:

> "Each contracting party shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning."

Thus, in addition to a moral requirement based in the principle of User *Pays*, and a legal requirement to establish funds for decommissioning and/or disposal there is a clear statement in an international convention that adequate financial resources be available for long-term management and disposal.

These three fundamental requirements clearly signal that this is an important financial issue, and that the nuclear community takes it seriously.

Implementation

1. A Responsible body to Implement Waste management/disposal options

There is a need for a responsible implementing body to discharge the liabilities. In the event that no such body exists there is a need to create one.

2. An Inventory of Liabilities

If the liabilities are not identified, it is not possible to develop a plan to adequately deal with them. Further, if you do not know precisely what you have to deal with then you can only approximate the cost. The greater the precision the greater the certainty.

3. Definition of Waste management Strategy

This appears to be an absolutely crucial step. On the basis of a detailed and comprehensive understanding of the inventory of liabilities it is necessary to marry the science of "what is required" with the financial analysis of "what is available" to derive a workable waste management strategy to deal with the issue. The UK example of the Nuclear Decommissioning Authority clearly demonstrates that this cannot, and should not, be done in isolation. Rather, the strategy should provide for a comprehensive, cost effective and integrated solution.

4. Cost Estimation (including past practices)

This is where the variables really start to create uncertainty. The underlying assumptions used to estimate the cost should be well determined and well understood. For example, the nuclear power plants may operate from 25 to 40 years. The length of the operating period will effect the volume of waste produced and, more importantly, the length of time that contributions will be made to the fund from the sale of the electricity.

Furthermore the fund may be used to cover a wide variety of waste management activities such as: central storage; transportation system; laboratory work; research and development costs; encapsulation of the fuel; construction of the repository; dismantling of the nuclear power plants; expenses for regulatory control.

Benchmarking will be difficult as a result of these differences. The cost will be dependent on what is included and the specific program for long-term management and/or disposal. The amount of money in the funds may be very large and there was an expressed need to ring fence these monies to preserve them for use for which they were intended.

Potential problems with the Funds

1. The growth of the fund is at the whim of financial markets, management / mis-management, and inflation rates

The growth of the fund is dependent on the investment strategy i.e., how aggressively, or conservatively the funds are invested. It is reasonable that the owners of the power plants, who are depositing monies into the funds, will want to see the greatest possible return on the investment such that they will, in the long run, have to deposit less money into the fund. On the other hand, governments tend to have a more conservative approach and want to protect the capital in the fund. To achieve this they are willing to accept a lower rate of return. A balance is required between these two perspectives for optimal performance of the fund.

2. Mismatch between Allocations & Implementation

The longer the time period is between the closure of the nuclear power plant (which is the source of monies deposited into the fund as a result of the sale of the electricity) and the commencement of a waste management program, the greater the potential is for a significant discordance between the money that is available in the fund to implement waste management programs and the money that is required to carry out this task.

This was considered a major concern. However, it was recognised that the timing of implementation of waste management and/or disposal programs is clearly within the purview of society and governments. The waste management community needs highlight this potential consequence of inaction.

Conclusion

1. The programs discussed are well grounded

We clearly pay homage to the principle of *User Pays* and have identified the requirement to establish funds not only in state legislation but also as a requirement in an international convention.

2. Capability for Cost/Liability estimation

Clearly there is a capability to determine the dimension and magnitude of all of the potential waste liabilities and to develop a waste management strategy to deal with these liabilities.

However, the cost estimation of these liabilities contain considerable uncertainties as they are projected over many years into the future.

3. Uncertainties regarding timing of future implementation

There are considerable uncertainties related to the growth of the funds as a result of the chosen investment strategy, the management/mismanagement of the fund, and the inflation

rate. These suggest that a balance is required between the rate of return and the preservation of the fund value in order to preserve the fund value for future implementation of waste management and/or disposal programs.

Sooner is better than later in order to reduce these liabilities. However, the decisions related to implementation are clearly within the purview of society and governments.

SESSION PAPERS

SWITZERLAND –PAPER #1

SECURING THE LONG-TERM FINANCING OF DECOMMISSIONING AND RADIOACTIVE WASTE MANAGEMENT - FROM COST ESTIMATES TO A COMPREHENSIVE FINANCING SYSTEM

Michael Aebersold
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Executive Summary

Disposal costs

In accordance with the principle of user pays, producers of radioactive waste in Switzerland are responsible for ensuring its safe disposal at their own cost. The various ongoing costs (e.g. for reprocessing, studies carried out by NAGRA, construction of interim storage sites) have to be paid as they arise. Decommissioning costs and expenditure associated with the management (including disposal) of radioactive waste after a nuclear power plant has been closed down, are secured through contributions paid into two independent funds by the operator:

- Decommissioning fund for nuclear facilities
- Disposal fund for nuclear power plants

The Federal Ordinance on the Decommissioning Nuclear Facilities (5 December 1983) and the Federal Ordinance on the Waste Management Fund for Nuclear Power Plants (6 March 2000) form the legal basis for these two funds.

Decommissioning fund for nuclear facilities

The decommissioning fund was established on 1 January 1984 as a public law entity with domicile in Berne. Its purpose is to secure the necessary financial resources for the decommissioning and dismantling of nuclear facilities and for the disposal of the resulting waste material. Contributions are mandatory for proprietors of nuclear power plants as well as for owners of interim storage facilities for spent fuel elements and radioactive waste. At present this concerns the Beznau I and II, Mühleberg, Gösgen and Leibstadt nuclear power plants, and the Würenlingen interim storage facility.

The calculation of the contributions to the fund is based on:

- estimated decommissioning and dismantling costs, taking account of cost development and the anticipated amount available in the fund by the time the necessary tasks have to be carried out;

- estimated costs of permanent and safe disposal of waste arising from decommissioning and dismantling, taking account of the costs trend and the evolution of the fund's assets up to the time of disposal;

- administration costs of the decommissioning fund.

The calculation of annual contributions is based on the assumption that the overall service life of a nuclear power plant is 40 years. Annual contributions are regularly calculated so as to ensure that the costs arising upon decommissioning of a facility are fully covered.

According to the latest studies, the estimated decommissioning costs for the five nuclear power plants in operation in Switzerland and the interim storage facility amount to almost 1.9 billion Swiss francs (pricing basis, 1 January 2001). As of the end of 2001, the total assets of the decommissioning fund amounted to 908 million Swiss francs.

Waste management fund for nuclear power plants

The waste management fund was established in 2000. Its purpose is to cover the costs associated with the management of operational waste material and spent fuel elements following the decommissioning of a nuclear power plant. The first contributions were paid in during 2001. Contributions are mandatory for proprietors of nuclear power plants.

The disposal costs encompass all activities that are required in order to safely dispose of spent fuel elements and radioactive waste from nuclear power plants. The main cost-relevant components are transport and storage containers, transport, reprocessing and/or direct disposal of spent fuel elements, conditioning and interim storage, and deep geological disposal of low and intermediate level waste and for high level and long-lived intermediate waste.

Operators of nuclear power plants base their estimates of waste management costs on the following assumptions and factors:

- 40-year service life for the five existing nuclear power plants. The volume of fuel to be disposed of amounts to approximately 3,000 tonnes of heavy metals. Roughly 1,100 tonnes of this material will be reprocessed.

- High level waste and fuel elements, which are not reprocessed, will have to be cooled for approximately 40 years before they may be taken to a deep geological repository.

- A deep geological repository for low and intermediate level waste is to be constructed, operated, monitored and sealed during the period from 2016 to 2068. This timetable will need to be revised, however, following the rejection of the Wellenberg project by the electorate of the Canton of Nidwalden on 22 September 2002.

- A deep geological repository for spent fuel elements, high level and long-lived intermediate level waste is to be constructed, operated, monitored and sealed during the period from 2046 to 2093.

According to the latest estimates by operators of nuclear power plants and organisations responsible for waste management, the total costs will amount to approximately 12 billion Swiss

francs. A total of around 3.4 billion Swiss francs of this amount had been spent as of the end of 2000. The fund's assets amounted to 1.44 billion Swiss francs at the end of 2001.

Investment of the funds' assets

Investing the assets of these two funds is the responsibility of the Administrative Commission set up by the Federal Department of Environment, Transport, Energy and Communications (DETEC). Assets must be invested in such a manner as to ensure an optimal balance between risk and return. Investments in companies associated with the legally obliged contributors to the funds, and in companies that have invested the majority of their assets in nuclear facilities, are prohibited. The Administrative Commission has defined investment strategies and guidelines on the basis of these principles.

The Administrative Commission has entrusted a variety of custodian banks and asset managers with the task of investing the funds' assets. On its behalf a special investment committee and external experts monitor the investment policies of these custodian banks and asset managers, as well as their compliance with the specified guidelines, and they submit reports on a regular basis.

Introduction

One of the most important issues in the area of waste disposal concerns the long-term securing of the necessary financing. Large amounts of money will have to be invested, managed and subsequently spent at the appropriate time, over an extended period of 100 years or more. In an electricity market that is opening up across Europe and is characterised by complicated legal structures, a focus on a handful of major groups and cost pressure due to increased competition, it will be necessary to create the corresponding background conditions.

The anticipated costs for decommissioning and disposal will have to be calculated or estimated on the basis of available know-how and criteria. The required funds will then have to be collected and invested on the domestic and international money markets, which given the current situation on the stock markets will by no means be an easy task. But the assurance that enough money will be available is essential for public confidence.

Using Switzerland as an example, I would like to demonstrate which steps are necessary in order to calculate the potential decommissioning and waste disposal costs based on a defined disposal concept and programme, determine the annual contributions to be paid in by operators, and establish a suitable system for securing the necessary funding.

This paper deals with the following issues:

1. Political background and legislative framework in Switzerland.
2. Swiss radioactive waste management policy and programmes.
3. Calculating the decommissioning and waste management costs.
4. Calculating the contributions to the Funds.
5. Financing system.

Political background and legislative framework in Switzerland

In accordance with the principle of user pays, producers of radioactive waste in Switzerland are responsible for ensuring its safe disposal at their own cost. Today there exist two funds:

The Decommissioning Fund was established in 1984. The Waste Management Fund in 2001. Previously, the operators of nuclear power plants formed reserves for the purpose of financing waste management costs. On behalf of the competent parliamentary commission in summer 1997 the Swiss Federal Office of Energy entrusted experts with the task of preparing a report on securing the costs associated with the management of radioactive waste. These experts came to the conclusion that, while the existing method of establishing reserves for waste management was in compliance with the relevant legal provisions, it nonetheless left a variety of questions unanswered, such as assumed operation life, the collection period, securing provisions in the event of bankruptcy or an accident, and the prosecutability of shareholders and other operating companies in the event of missing funds. The report outlined a variety of forms and models for securing the financing of disposal costs.

- One of the possibilities for securing the necessary financing over the long-term is to deposit the revenue into special funds or a joint fund owned by the utilities, with or without supervision by the federal authorities.

- Producers of radioactive waste can be obliged to become members of a public-law institution and pay appropriate contributions.

- Another option would be to use models similar to those aimed at securing life insurance claims. Together with an insurance company we examined the model of blended cover, which involves finite risk cover for disposal costs.

- Finally, government responsibility for disposal and/or its financing would be another potential solution.

Alongside the legal form, various models exist with respect to covering the associated costs.

- In the model all waste management costs would be covered after the facility has been decommissioned. Here, operators of nuclear power plants cover the associated costs *prior to decommissioning* by paying ongoing contributions.

- A model involving a *fund for covering all waste management costs*, the overall costs would be secured by the fund, including those that arise during the operation of a nuclear power plant.

- Another option would be to only secure the *costs associated with final disposal* via a fund, and to cover the remaining costs by establishing reserves.

All models share a common problem, namely that in the event of premature decommissioning of a nuclear power plant, bankruptcy of an operating company or its take-over by another company, financial resources would be lacking unless an obligation to pay additional contributions is imposed on the other operators in the sense of joint liability, as is the case in Switzerland with respect to the Decommissioning Fund.

Swiss radioactive waste management policy and programmes

In addition to selecting a suitable fond-model, it is also necessary to define both a waste disposal policy and related programmes. For example, do we want to pursue a single-repository or multiple-repository concept? Should radioactive waste be deposited in a geological repository as soon as possible, or should it be retained in interim storage for a period of 200 years? And what happens afterwards? So it is important to define a fundamental concept.

Switzerland pursues two disposal programmes:

Short-lived low- and intermediate-level waste (L/ILW)

Following a lengthy evaluation procedure, in 1993 NAGRA proposed Wellenberg as the site for an L/ILW repository. In 1994, the application for the federal general licence for an L/ILW repository at the Wellenberg site was submitted and a request for an exploration licence for the repository was made to the Canton of Nidwalden where the site for the proposed Wellenberg L/ILW repository is located. At a cantonal public referendum in June 1995 the application for the exploration licence was rejected.

After a lengthy process, it became possible to submit an application for a concession for the exploratory shaft at the end of January 2001. Public concerns (mainly monitoring / retrievability and public involvement in decision-making) were taken into account, the strategy for repository implementation was adapted and a step-by-step approach was foreseen. However on 22 September 2002, voters in the canton of Nidwalden rejected the construction of an underground test gallery (with 57.5% voting against the proposal).

High-level and long-lived intermediate-level waste (HLW/TRU)

As part of the "Kristallin" project, NAGRA investigated disposal options in the crystalline basement of Northern Switzerland.

In 1988, the Federal Council requested that the investigation programme be extended to include sedimentary rocks. Investigations in sediments in the northern part of the Canton of Zurich began in 1994.

Since 1997, NAGRA has been carrying out studies in the area known as the Zürcher Weinland.

The next milestone of the HLW programme is to demonstrate that a safe repository can be implemented and that a possible site does exist ("siting feasibility"). The corresponding documentation was submitted to the authorities at the end of last year for review which eventually will lead to a decision by the Federal Council on how to proceed. The crystalline option is considered today to be a reserve solution.

Calculating the decommissioning and waste management costs

Auguste Zurkinden will talk about this part in detail. But let me show you two slides.

Before calculating the costs one has to decide what kind of costs arise and should be covered for the future.

The overall costs for radioactive waste management are estimated 12 billion CHF. One part is already spent, one part will be spend until the end of operation of the nuclear power plants and the third part will be spend afterwards and therefore has to be secured by payments to a fund in Switzerland.

Switzerland chose a model, which covers all waste management costs resulting from the operation of the Swiss nuclear power plants for the period after the end of their service life. Waste management costs arising before the end of their service life are borne directly by the nuclear power plants.

Calculating the contributions to the Funds

Estimating the contributions to be paid into the respective funds is a crucial step. Calculations are based on the estimated decommissioning and waste management costs on the one hand, and on various assumptions with the respect to time at which the costs arise, inflation, and the anticipated interest rate on the accumulated capital on the other hand.

For the decommissioning fund, the contributions required up to the assumed decommissioning date are converted into real, constant annual amounts. Decommissioning costs are projected up to decommissioning date on the basis of an assumed inflation rate of 3%, while the available capital is projected up to the same date on the basis of an interest rate of 5%, and subsequently deducted. Annual contributions are reviewed every five years. They are also examined and adapted as necessary if a new operator enters the equation, a given facility is definitely decommissioned or if a significant modification of costs is to be expected due to unforeseen circumstances.

The calculation of contributions to the disposal fund is also based on the cost trend and the assets available in the fund up to completion of the waste management activities. Contributions are calculated as constantly as possible and are reviewed every five years.

As with the decommissioning fund, the are examined and adapted in the event of any significant changes in costs. If as a result of developments on the financial markets the accumulated capital deviates from the target level within a certain bandwidth, then the annual contributions remain unchanged.

The applicable bandwidth is –15% to +20%. In addition to basic contributions, operators of nuclear power plants are also required to retroactively pay the respective contributions the would have had to pay if the fund had been in existence at the time the facility commenced operation. The deadline for this is 2005 (Leibstadt 2009).

Financing system

Fund organisation

The two funds each have two executive bodies: a Management Committee and a Secretariat. The Federal Department of Environment, Transport, Energy and Communications nominates the Management Committees, which comprise a maximum of 11 members. Owners of nuclear power plants are entitled to a maximum of 5 seats.

In order to deal with the various tasks, the Management Committee sets up Investment Committees and Cost Committees, the duties of which are defined in internal regulations.

The Management Committee takes all important decisions and is responsible for carrying out the following tasks in particular:

1. Periodical determination of estimated decommissioning, dismantling and waste management costs;

2. Assessment of owners contributions;

3. Decisions concerning payments;

4. Investment of the fund's capital, i.e. stipulation of investment policy.

The Investment Committee comprises six members. It acts as the steering, co-ordination and supervisory body for the management of investments. It's main tasks are:

1. To formulate an investment strategy and guidelines for the attention of the Management Committee;

2. To implement the investment strategy and guidelines;

3. Selection procedures for global custody, asset managers, auditors, etc.;

4. Supervision of payment transactions;

5. Supervision of the Secretariat with respect to tasks associated with the investment strategy and guidelines.

The Cost Committee compromises six persons. It acts as the steering, co-ordination and supervisory body for cost calculations and payments. It's main tasks are:

1. To calculate and allocate decommissioning and waste management costs, verify them and specify annual contributions;

2. To draw up a budget and five-year plan for payments after the end of operation of the nuclear power plants;

3. To deal with non-budgeted expenses;

4. Supervision of the Secretariat with respect to tasks associated with cost calculations and payments.

Until 2001 the Swiss Federal Office of Energy ran the Secretariat, but this duty has now been outsourced to an external company. It's main tasks are:

1. Responsibility for administration and provision of infrastructure for all committees;
2. Implementation of resolutions passed by the committees;
3. Preparation of annual accounts and annual reports, together with the necessary reporting and controlling documentation;
4. Collection of annual fees;
5. Planning and execution of payment transactions

Investment concept

Assets must be invested in such a manner as to ensure an optimal balance between risk and return. Implications for the investment concept are a long-term saving process with a lengthy investment horizon, a sustainable nature of investment income and, in the case of the Waste Management Fund, individual goals for each nuclear power plant.

The Investment Committee has defined investment strategies and guidelines on the basis of these principles. For the Decommissioning Fund, mixed asset management mandates have been given to four banks with identical start-up investments and guidelines. For the Waste Management Fund, a combination of indexed mandates and active mandates is implemented. Eleven banks have been chosen to invest the money in CHF bonds, non-CHF bonds (both active), Swiss equities and non-Swiss equities (indexed and active): In addition, a portion of the capital is invested in real estate.

On it's behalf, the investment committee and external experts monitor the investment policies of these custodian banks and asset managers, as well as their compliance with the specified guidelines, and they submit reports on a regular basis to the Management Committee.

SWITZERLAND –PAPER #2

DECOMMISSIONING AND DISPOSAL COSTS IN SWITZERLAND

Auguste Zurkinden
Swiss Federal Nuclear Safety Inspectorate, Villigen

Introduction

Goal: Secure sufficient financial resources.

Question: How much money is needed?

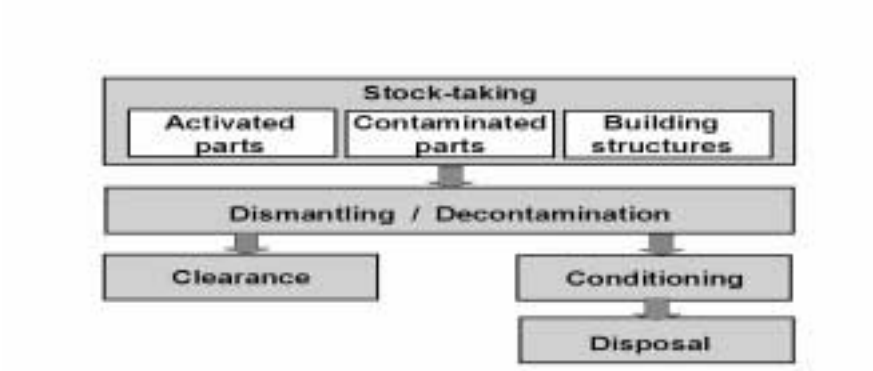
Mean: Concrete plans for decommissioning and waste disposal.

- It is the task of the operators to elaborate these plans and to evaluate the corresponding costs
- Plans and costs are to be reviewed by the authorities

Decommissioning Plans and Costs

- Comprise decommissioning, dismantling and management (including disposal) of the waste.
- New studies 2001 for each Swiss nuclear power plant (KKB 2 x 380 MWe, KKM 370 MWe, KKG 1020 MWe, KKL 1180 MWe).
- Studies perfomed by NIS (D).
- Last developments taken into account (Niederaichbach, Gundremmingen, Kahl).

Main Decommissioning Steps



Decommissioning: Results and Review

Results: Total cost estimates decreasing (billion CHF)

1994	1998	2001
13.7	13.1	11.8

Lower costs for spent fuel conditioning and BE/HAA/LMA repository (Opalinus Clay)

Split in 2025: 5.6 bil. CHF paid by NPP 6.2 billion CHF in Fund

Review: Concentrates on disposal, ongoing.

BELGIUM

INVENTORY OF NUCLEAR LIABILITIES – THE BELGIAN PERSPECTIVE

Jean-Paul Minon
ONDRAF/NIRAS, Bruxelles

Introduction

Like all countries that use radioactive materials for producing electricity or for other peaceful purposes, Belgium is faced with an important challenge: the safe management of all these materials, in both the short and long term. Of course there is a price to pay for this management, which in accordance with the ethical principle of intergenerational fairness should be borne mainly by the generations which benefit from the activities which these materials have produced, in other words by current generations. However, it is possible – as has been the case for a number of 'historic' dossiers – that when the moment has come, the financial resources to cover the costs of decommissioning and remediation of these installations, so that they no longer need to be subject to institutional control, prove to be insufficient or even completely non-existent: this then results in a *nuclear liability*. This kind of situation can have several causes, such as an underestimation of the actual costs by the operator or the owner of the nuclear installation or by the holder or the owner of the radioactive materials, negligence, transfer of ownership of the nuclear installation or the nuclear site without transfer of the corresponding provisions, a reduction in the operating time, a bankruptcy as well as ignorance.

Because it wishes to avoid the occurrence of new nuclear liabilities, the Belgian legislator, by virtue of article 9 of the programme law of 12.12.97, charged the 'Nationale instelling voor radioactieve afval and verrijkte splijtstoffen' (ONDRAF/NIRAS) [Belgian Agency for Radioactive Waste and Enriched Fissile Materials] with collecting all the elements that are necessary in order to examine to which degree the decommissioning and remediation costs can be actually covered when the time comes. ONDRAF/NIRAS was specifically charged with ascertaining all facts of a technical and financial nature which should enable the government – in this case its competent minister (the minister who is responsible for energy) – to verify whether every operator or owner of a nuclear installation and every holder or owner of radioactive materials have provided in time for the requisite financial resources to cover the future costs of decommissioning and remediation. This evaluation of course also serves to enable the government to take the necessary corrective measures in time in order to deal with any shortcomings and thus avoid the occurrence of new nuclear liabilities.

This new assignment, *the inventory of the nuclear liabilities*, its official legal name, consists of locating and inventorying the installations and sites where radioactive materials are present, and evaluating the situation in order to develop a policy that offers the requisite financial guarantees for safety in the long term. More specifically, the legislator asks ONDRAF/NIRAS to:

- establish a register of the localisation and the state of all nuclear installations and all sites that contain radioactive materials;
- estimate the costs of their decommissioning and remediation;
- to evaluate the existence and adequacy of the provisions for financing these future or current operations;
- to update this register on a five-yearly basis.

The programme law of 12.12.97 anticipated the approval by Belgium, in August 2002 (Belgian Statute Book of 25.12.2002), of the Joint convention of the *International Atomic Energy Agency* of 5 September 1997 concerning the safety of the management of irradiated nuclear fuel and radioactive waste, which states in article 22 that *"Each Contracting Party shall take the appropriate steps to ensure that [...] adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning."*

The inventory is not a purpose in itself but a means that will benefit every citizen. It concerns a task of public importance that makes better management in the long term possible. The monitoring by ONDRAF/NIRAS of Belgian territory fits in with an active prevention policy, an essential part of sustainable management. It can thus be prevented that society would have to bear in future the financial burden of potential nuclear financial liabilities.

To carry out this assignment, ONDRAF/NIRAS has developed a goal-oriented, functional and flexible operational model. The technical register of the present radioactive materials and the installations and sites that contain radioactive materials is intended as input for a cost calculation model that is based on a number of management scenarios which generate the costs on the output side for the management of the present radioactive materials and for decommissioning and remediation of installations and sites that contain radioactive materials. This is subsequently compared with an expert evaluation of the availability and adequacy of the financial resources to cover the costs in question.

Lessons learned

In addition to the costs that are not currently covered, the inventory exercise has highlighted a number of weak points that may threaten the availability and sufficiency of the financial means built up. To fill these gaps, the following corrective measures are required for which the initiative should be taken by the minister in charge:

Determination of the financial responsible(s) of some sites In most cases the legal situation is simple, because the operator and owner of the installations are the same. For some sites the legal situation is more complicated however. Is the financial manager the operator of the site, the owner of the installations, the owner of the site on which the installations are present, the lessee of the installations or the manager stipulated in a contract concluded between the parties? The division of the obligations amongst the owners and the operators must be defined in accessible agreements.

Determination of the presence or absence of provisions by organisation not subject to the accounting obligations (Belgian state, universities…) and difficulty in assessing any provisions built up The analysis of the balance sheets that are submitted to the National Bank by companies that are subject to this obligations, may prove difficult.

Availability of the financial means built up The financial means hidden behind accounting provisions recorded in the annual accounts of the companies, are generally rebuilt up in the operation of these companies. This may threaten their availability in the long term taking the uncertainties of economic life into account.

Sufficiency of the financial means Covering the nuclear costs using a financing mechanism presupposes that this mechanism is maintained for the entire, originally planned duration of operations of the installations concerned. The risks of an early shutdown of the installations or an insufficiency of the mechanisms raise the issue of the solidarity between the actors in the nuclear sector and the solidarity with the Belgian State.

Uncertainty regarding real costs The calculation of the real costs is linked to a number of uncertainties that relate to the work hypotheses used, specifically in relation to the planned management scenarios, and with the development of the laws, standards and techniques. These uncertainties are partially covered by a margin that is included in the calculation of the provisions. Once this reserve is depleted, the State is the sole guarantee for long-term financing for making the radioactive substances safe.

Fiscal deductibility of the provisions The non-fiscal deductibility of the nuclear provisions, with the exception of the provisions built up by the nuclear power states, is a disincentive for many financial managers to invest provisions.

Conclusions and outlook

After five years collaboration between ONDRAF/NIRAS and the operators of nuclear installations and holders of radioactive substances, the government today has at its disposal a first general overview available of the financing mechanisms intended to cover the future costs of the decommissioning and remediation in Belgium, including the costs of long-term management of radioactive waste. The report on the inventory of the nuclear liabilities contains all useful elements that should make it possible for the government to take a number of necessary measures to consolidate the means acquired and to fill those gaps identified. In this way it will guarantee the Belgian citizen that the necessary financial means will be available to manage the radioactive substances present in Belgium safely, both in the short and long term.

During the inventory exercise of 2003–2007 the knowledge and experience acquired will be broadened and the case of the sites that are not currently subject to a license but do contain radioactive substances and which will have to be registered to the Federal nuclear inspection agency from 01.09.2003 will be specifically investigated. Some of these sites will probably be included in the existing register by means of a decision taken by the agency.

SWEDEN

THE SWEDISH SYSTEM FOR FUNDING OF NUCLEAR WASTE MANAGEMENT

Tommy Hedman
SKB, Stockholm
Magnus Westerlind
SKI, Stockholm

Abstract

Nuclear activities in Sweden goes back to early 1950's when the first research reactor was commissioned in a rock cavern in central Stockholm. Small amounts of uranium were mined in Ranstad from the early 1960's until late in the 1970's. A treatment facility for low and intermediate level waste was built in the beginning of 1960's at Studsvik where are also two research reactors have been in operation. The Ågesta reactor, outside of Stockholm, was Sweden's first energy producing reactor, and it was in operation between 1964 and 1974. During the period 1972 to 1985 twelve nuclear power reactors were commissioned.

Research and development on spent fuel disposal in Sweden started in earnest with the report of the AKA-commission 1976, which outlined a complete system for the management of spent fuel and associated waste, including how to handle the costs. Components of the system, mentioned in the AKA-report, such as a sea transportation (MS Sigyn), a central spent fuel storage facility (CLAB) and a final repository for operational waste (SFR) have since been constructed and taken in operation. The research and planning for the additional facilities needed for a complete system is in an advanced stage. A nuclear waste fund has also been created, based on a special fee on nuclear power production.

During the 1970's the nuclear power utilities established their own internal funds for future waste management expenses. These funds were transferred to the government-run financing system established in 1981 when the Swedish parliament passed the Act on the Financing of Future Expenses for Spent Nuclear Fuel etc.

The fees to be paid into the Fund are to be based on the assumption that each reactor generates electricity for 25 years. These fees, plus the interest on the money already deposited in the Fund, must meet all expenses for handling spent fuel, dismantling facilities and for dealing with radioactive decommissioning waste. A guarantee shall compensate for the eventuality of a nuclear power plant being closed before the end of the 25-year earning period. The type of guarantee must be available until all nuclear waste has been placed in a repository and must cover contingencies for the waste programme. This guarantee will be used if expenses for future nuclear waste management become higher than expected, if these expenses have to be met earlier than expected, or if the actual amount in the Fund is lower than was estimated.

The process of yearly cost calculations, review and determination of fees and guarantees is well defined. SKB makes annual estimates for all nuclear power utilities that form the basis for the regulatory authorities' review as well as the basis for calculating the fee.

SKI is the regulatory authority that reviews the nuclear power utilities' cost estimates. Furthermore, SKI reviews the guarantee that the nuclear power utilities must make available. After its review, SKI submits a proposal for the size of the fees, and of the guarantees required, to the Government. Based on this proposal, the Government sets the fee and guarantees.

Furthermore, SKI decides on the reimbursements from the Nuclear Waste Fund. This means in practice that SKI approves SKB's annual budget and decides on reimbursements to SKB. It also means that SKI carries out annual audits of SKB's financial reports.

The estimated total future cost, from 2003 onwards, is SEK 50 billion, if all reactors are operated for 25 years. If they are used for 40 years, the costs will be SEK 48 billion (all estimates are January 2003 price level). The sum of the future expenses and of those already accrued on various nuclear waste projects, are approximately SEK 65 billion.

To date, the Nuclear Waste Fund has covered the expenses for:

- CLAB;
- the transport system, i.e., the ship Sigyn, containers, special trucks, etc;
- the Canister Laboratory and the Äspö Hard Rock Laboratory;
- SKB's research and development costs, including siting activities.

The Nuclear Waste Fund will eventually cover expenses for:

- the encapsulation of spent nuclear fuel;
- the repositories for spent nuclear fuel and long-lived low and intermediate level waste;
- the dismantling of nuclear power plants and the disposal of decommissioning waste;
- continuing research and development work;
- the expenses for regulatory control and supervision after closure of the reactors.

The repository for radioactive operational waste (SFR-1) has been paid for by the nuclear power utilities and not by the Fund. Costs for management of operational waste is paid for directly by the nuclear power utilities.

There is also a special Act for covering the costs for waste for past practices. As of 1989, a special fee has been levied on the nuclear power utilities according to the so-called Studsvik Act (1988:1597). This fee is intended to cover expenses for the management of nuclear waste from older experimental facilities, in particular the facilities at Studsvik, the Ågesta reactor and the uranium mine in Ranstad, and for dismantling these facilities. According to estimates, SEK 1.2 billion will be needed up to the year 2030 to meet these expenses. The special fee is the same for all four nuclear power

utilities, currently SEK 0.015 per kilowatt-hour, which is reassessed each year based on a proposal by SKI. These assets are administered together with the Nuclear Waste Fund.

The confidence in the system is basically very good from the parties who are involved in the process. There are some areas were there are discussions between SKB and SKI about how the financing act should be practised. Mainly it concerns the time scenario for the future decommissioning and dismantling of the nuclear power plants. The public in general and in the municipalities Forsmark and Oskarshamn seems to have a confidence in the system for funding and pleased with the fact that today the assets in the Fund is nearly 29 billion SEK (3,2 billion Euro).

From our experience it is has been vital to the Swedish disposal programme to have a solid financing scheme. The public's confidence is enhanced by the fact that substantial funds have been built up and that they are subject to regulatory supervision.

UNITED KINGDOM

MANAGING THE NUCLEAR LEGACY IN THE UK – PROGRESS TOWARDS THE ESTABLISHMENT OF THE NUCLEAR DECOMMISSIONING AUTHORITY

Robin M. Sellers
Department of Trade & Industry London

Background

In November 2001, the British Government announced its intention to undertake a radical change in the arrangements for managing public sector civil nuclear liabilities in the UK. The UK Government's proposals for this transformation were published in a White Paper *Managing the Nuclear Legacy – A Strategy for Actions* published on 4 July 2002. This envisages the establishment of a new organisation, the Nuclear Decommissioning Authority (NDA), responsible to Government and with a remit to ensure that the UK's nuclear legacy is cleaned up safely, securely, cost effectively and in ways which protect the environment.

The NDA will be responsible for some twenty UK nuclear sites comprising about 85% of the UK's civil nuclear liabilities. These sites are those currently operated by the United Kingdom Atomic Energy Authority (UKAEA) and British Nuclear Fuels plc (BNFL), and amongst other things include many facilities from the early years of nuclear power *etc* in the UK, liabilities associated with the Joint European Torus (JET) fusion research project at UKAEA's Culham site, the Magnox nuclear power stations, and the associated facilities at Sellafield for reprocessing. The challenge is to decommission and demolish these facilities, package the radioactive wastes ready for disposal and remediate the sites, taking into account the uncertainties associated with many of the older facilities and the potential technical novelty of the processes that will have to be deployed to achieve this.

The Liabilities Management Unit and its remit

To prepare the way for the NDA, a special team has been established within the UK Department of Trade & Industry. This team, known as the Liabilities Management Unit (LMU), includes staff from both private and public sectors, and is supported by a partner contractor (Bechtel Management Company Ltd) who bring high quality, experienced project management skills to the team. The following sections describe the LMU's principal tasks.

Acquiring a detailed knowledge of BNFL and UKAEA liabilities

Acquiring a detailed knowledge of BNFL and UKAEA liabilities has been an early priority for the LMU, since it provides the foundation for all the NDA's activities. In particular it will be used to build the first National Lifecycle Baseline, the overall plan for discharging the UK's public sector civil nuclear liabilities. This Baseline will, in time, provide the basis for planning short term work

programmes at each site and thereby provide the NDA with the means to drive forward and focus available resources on priority tasks.

The baselining process consists of the following basic stages:

1) Site assessments: Each site is being subject to an assessment, carried out with the assistance of the existing site management to:

   - Understand the nature of the liabilities on the sites.
   - Learn about the existing systems and processes to help develop best practices for the NDA.
   - Develop working relationships with the existing site management.
   - Help develop Lifecycle Baselines and Key Performance Indicators (KPIs)
   - Help develop methods to monitor site performance against future contracts with the NDA.

2) National Lifecycles Baselines: Each site will develop a site Lifecycle Baseline, covering the scope, schedule and cost to carry out the decommissioning plans.

   – These site specific baselines will be aggregated to form the National Lifecycle Baseline.
   – They will link in to all national requirements, such as funding, the supply chain, legislation, research and development activities and resource availability.
   – The intention is that each site will update its baseline annually until all its liabilities have been discharged.

Near Term Work Plan: This is similar to the Lifecycle Baseline except that it focuses on the next three to five years.

Key Performance Indicators: These will be developed annually based on the Near Term Work Plan and will be used to monitor performance. KPIs may include such things as numbers of waste packages produced, attainment of key milestones ahead of schedule, reductions in dose, enhancements in safety, reduced costs and so on.

Data collected during the Site Assessments is being used to provide a reference point for the future. In particular the LMU has established a ‘Catalogue of Nuclear Liabilities’ which provides in one place basic information about the 500 or so liabilities for which the NDA will be responsible. It is also setting up a Key Technical Issues Register to ensure that these are resolved in a timely and cost effective manner.

Establishing common methodologies

In the past each management team, and often each site, has developed its own tools and methodologies for reporting, estimating and planning activities associated with liabilities management.

The establishment of a single body to oversee public sector civil nuclear liabilities provides a unique opportunity to establish common standards for such things and to this end the LMU has begun to draft a "Requirements" document. Over and above the points dealt with in the previous section this will cover such thing as:

- Charging practice
- Change control
- Budget submission & authorisation
- Trending
- Funds tracking
- Estimating
- Contingency & management reserve
- Schedule hierarchy & use
- Performance monitoring
- Site and programme reporting
- Site and programme reviews
- Communication Developing the contracting strategy

The White Paper emphasises the Government's intent to improve value for the taxpayer in the decommissioning of civil nuclear sites. The Government has elected to do this by introducing competition into the contract award process. This will increase innovation and allow international experience, new technology and best practice to be introduced to the industry. The LMU has begun the preparatory work to enable the NDA to award bid contracts competitively soon after its creation. This involves consultation with the Regulators and other key parties such as the Trade Unions about contract structures, to ensure that site knowledge is retained whilst providing an ability to change contractor if required. The probable contract structure is one in which the NDA retains ownership of the sites whilst the licensees operate them under contract for a fixed but renewable period. The management contractors will be incentivised to achieve prescribed targets of efficiency against a fixed requirement for safety. The contract remuneration scheme will generally provide for the contractor to recover his costs, but his profit will depend on performance. Performance will be judged against the Key Performance Indicators and will cover all aspects of the contractor's activities. The direct link between performance and profit allows the contractor and his staff to focus on those areas that meet the NDA's requirements.

The LMU plans to encourage contractors to join the decommissioning industry to increase the bid pool for contracts. To achieve this the LMU is planning to publicise the Government's new strategy both in the UK and internationally, establish pre-qualification criteria for contractors and publish a communications package which will include a *pro forma* contract. Furthermore, in April 2003 it will host an event to inform the supply chain of the activities it is proposing to promote competition and explain its approach to contracting.

Establishing close working arrangements with the nuclear regulators

Regulation will remain an integral part of the liability discharge process, and the NDA will maintain a close working relationship with the regulators, so that it can fulfil its oversight role. Amongst other things the LMU is seeking to involve the regulators in the development of the national and site specific baseline programmes and strategies. The LMU has also begun the task of developing a comprehensive understanding of the strategic regulatory issues that could affect a site management team's ability to deliver its programme. From this it will be looking for potential synergies that might deliver cost savings or other benefits, by integration of clean up programmes and better allocation of national resources. A prioritisation methodology is being developed for this purpose, and the regulators will be invited to participate in this.

Timetable for formation of the Nuclear Decommissioning Authority

The formation of the NDA is dependent on primary legislation. The Government intends to publish a draft bill in Spring 2003 and to bring forward the necessary legislation as soon as the parliamentary timetable allows. According to current plans the NDA will become fully operational from 1st April 2005. The sequence of activities leading to the fully operational NDA is:

- Design a model NDA.
- Build the organisation and systems.
- Complete asset transfers and implement new contractual arrangements.

These tasks will be completed in parallel with the mobilisation of the NDA in terms of staff and facilities. Key dates are as follows:

- May 2003: Draft Bill & Charter published.
- December 2003: Bill receives its second reading; shadow NDA begins to be formed, staffing up progressively over ensuing 18 months or so.
- September 2004: NDA formally established; staffing *etc* continues.
- April 2005: NDA becomes fully operational.

ITALY

FINANCING LONG TERM LIABILITIES

Luigi Noviello
SOGIN, Rome

Abstract

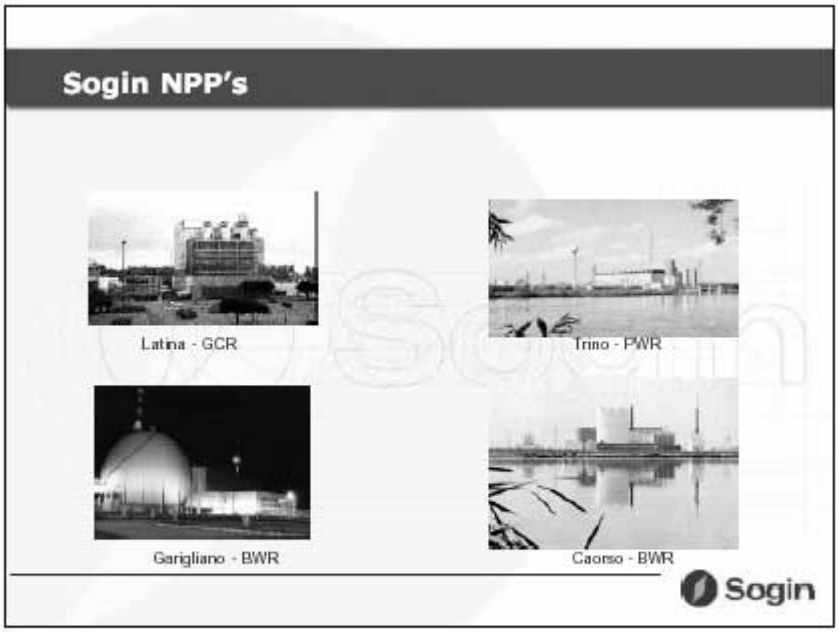
In the '80 even if there were no precise law disposition in this specific matter, Enel has created a fund for the plants decommissioning and a fund for the irradiated fuel management. A setting aside pluriannual plan has been defined. Cumulated funds transferred to the Sogin at the date of its constitution amount to about 1500 MLD ITL (750 MEuro). This amount was adequate to complete decommissioning activities within the Safe Store strategy.

Following the separation of Sogin from Enel, a funding mechanism has been defined to provide resources for additional costs deriving from the different economic conditions (new discount rate and taxes), from the management costs for the new company, and from the change in strategy (from Safe Store to DECON).

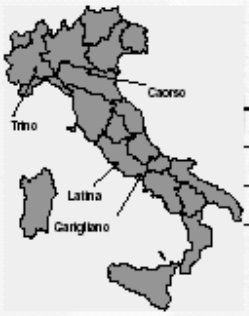
A Decree of the Ministry of the Industry, issued on 26th January 2000, states that the above mentioned extra costs for Sogin shall be financed on a levy on the price of the sold kWh. Every year Sogin shall present the program of future activities, with associated costs: on this basis, the national Authority for Electric energy and Gas (the national body which defines tariff policy) shall re-evaluate the global amount to be granted to Sogin and the levy on the price of the kWh due to Sogin for next three years. The re-evaluation will take into account economic efficiency criteria. For the period 2002-2004 the Authority has defined a global amount of about 362 M€ to be granted to Sogin, corresponding to ~0,04 cents of Euro per kWh.

The same procedure is foreseen by the Decree in order to finance Sogin for additional costs related to the dismantling of nuclear installations now property of ENEA. In this context, a Consortium between ENEA and Sogin has been established. The Authority for the period 2002-2004 has defined a global amount of about 106 M€ to be granted to the Consortium, corresponding to ~0,015 cents of Euro per kWh


SOGIN
Programs and liabilities management
L. Noviello
(Decommissioning Director)
March 13th 2003
Sogin


Sogin NPP's
Latina - GCR
Trino - PWR
Garigliano - BWR
Caorso - BWR
Sogin

Location of Sogin NPP's



	Type	Designer	MW_e	Commercial Operation	Plant Shutdown
Latina	Gas Graphite	TNPG	200	1963	1986
Garigliano	BWR Dual Cycle	General Electric	150	1964	1978
Trino	PWR	Westinghouse	260	1964	1987
Caorso	BWR	AMN - GETSCO	860	1978	1986

Sogin

A flexible D&D program

(a) 2000 – 2005

(b) 2005 - 2008

(c) 2009 – 2020

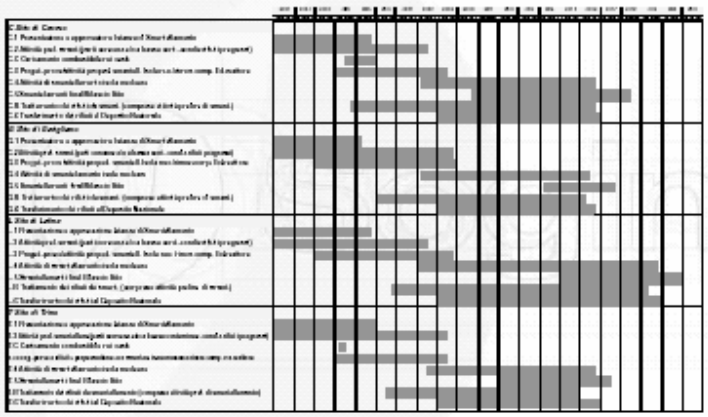
(a) Dismantling of BOP and Conventional Building. (Activities compatible with both SAFESTOR and DECON strategy).

(b) Preparatory activities for final dismantling. Waste produced can be managed on site

(c) Nuclear island dismantling. Significant delays or a change in the strategy will imply a significant problem of waste management

Sogin

The integrated schedule



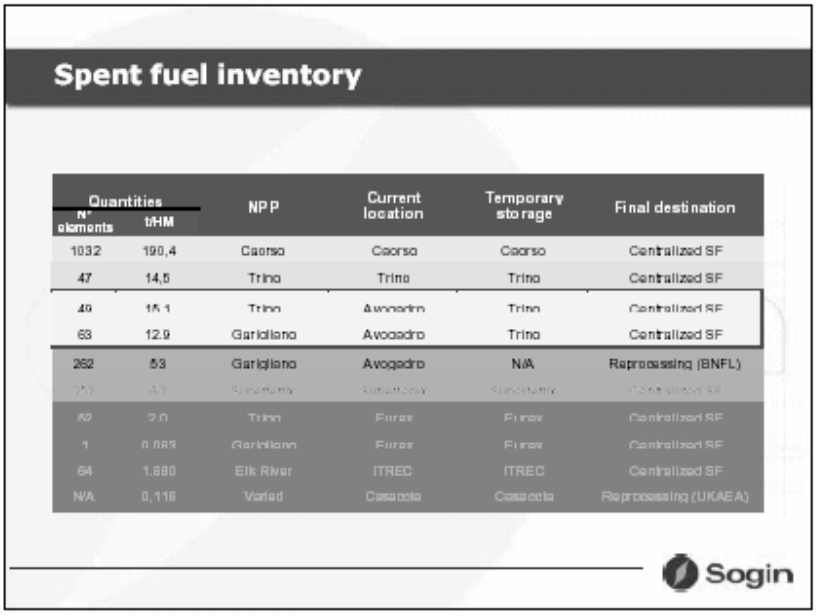
Sogin

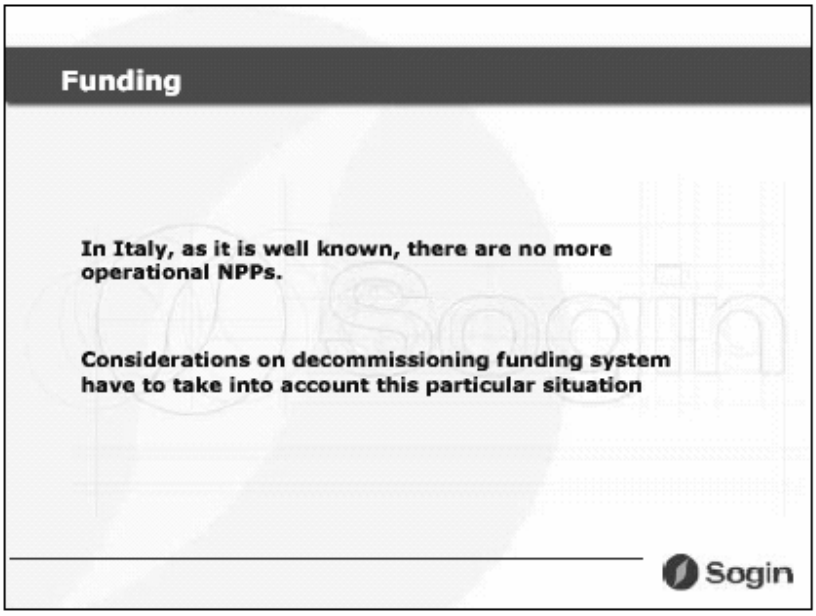
Waste to be disposed off

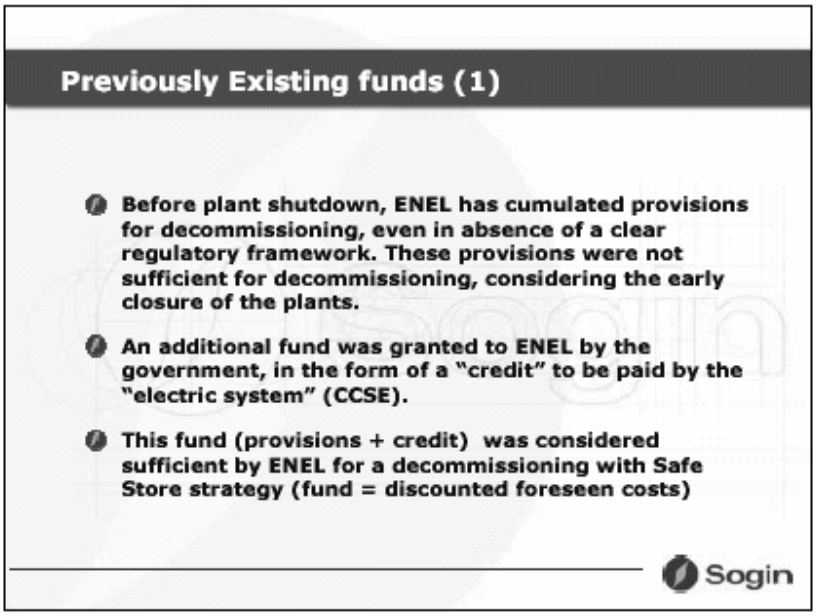
	2ª Category [m³]	3ª Category [m³]	Total [m³]	Activity (mar 2007) [TBq]
Waste from Sogin NPPs				
Caorso	4.900	150	4.250	3.233
Decommissioning waste (from dismantling activities)	2.300	140	3.440	3.230
Existing operational waste	300	10	310	3
Garigliano	4.600	30	4.620	1.150
Decommissioning waste (from dismantling activities)	2.700	20	2.720	640
Existing operational waste	1.900		1.900	510
Latina	13.400	4.100	17.500	3.700
Decommissioning waste (from dismantling activities)	12.500	4.100	16.600	3.750
Existing operational waste	900		900	20
Trino	3.700	120	3.820	2.840
Decommissioning waste (from dismantling activities)	2.100	40	2.140	2.800
Existing operational waste	1.600	80	1.680	60
Uncertainty 15%	4.200	600	4.800	
Total	34.000	4.900	34.990	11.885

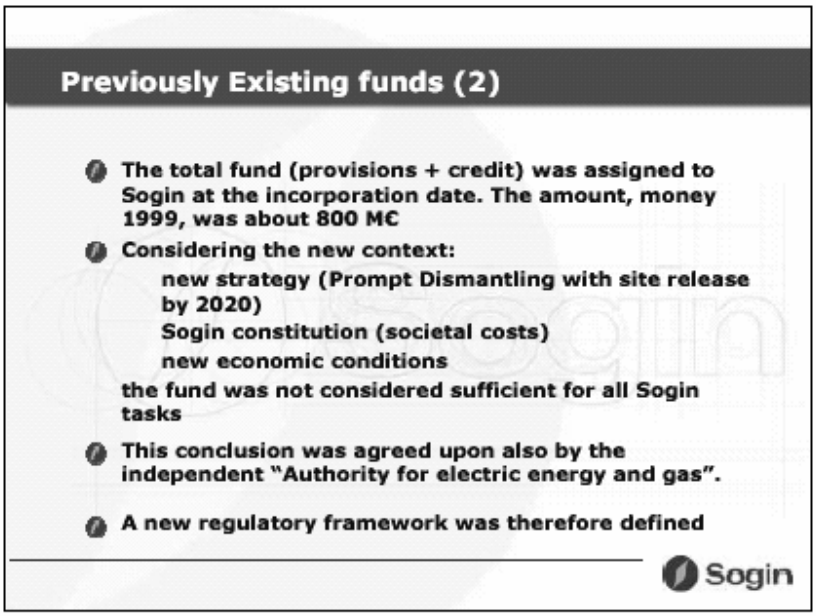
	2ª Category [m³]	3ª Category [m³]	Total [m³]
Waste from ENEA - FN (Consortium SICN)			
Trisaia - Itrec	4.200	300	4.500
Casaccia - Calle calde, Plutonio, Nucleco	9.000	2.100	11.100
Saluggia - Eurex	3.500	500	4.000
Bosco Marengo - FN	450		450
Total	17.050	2.900	20.050
Grand Total	48.050	7.880	55.940

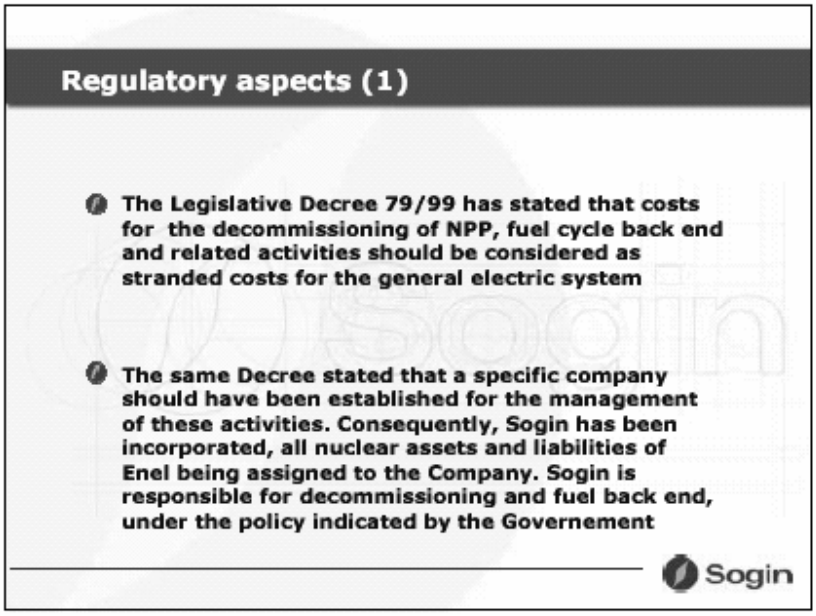
Sogin

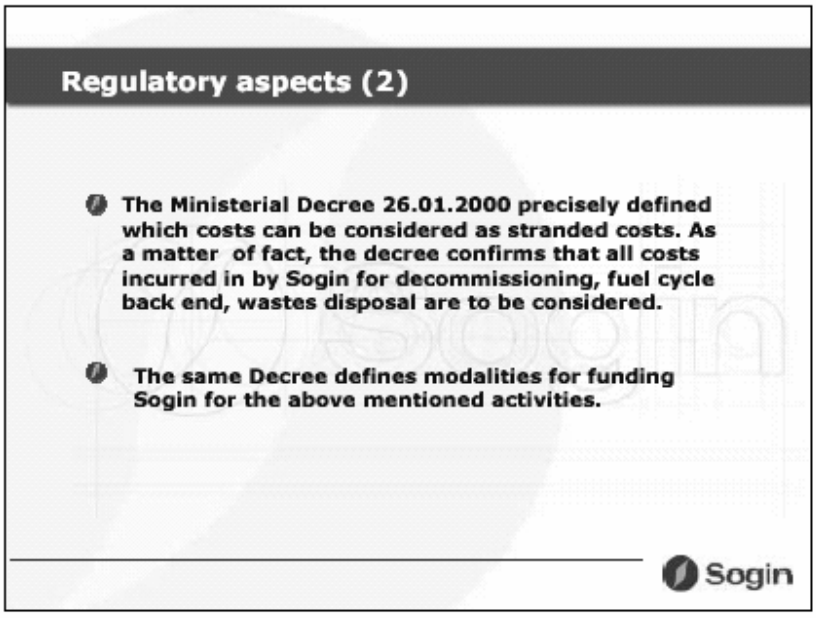

Spent fuel inventory
Quantities
N° elements
t/HM
NPP
Current location
Temporary storage
Final destination
1032 190,4 Caorso Caorso Caorso Centralized SF
47 14,5 Trino Trino Trino Centralized SF
49 15,1 Trino Avogadro Trino Centralized SF
63 12,9 Garigliano Avogadro Trino Centralized SF
252 53 Garigliano Avogadro N/A Reprocessing (BNFL)
52 9,0 Trino Eurex Eurex Centralized SF
1 0,083 Garigliano Eurex Eurex Centralized SF
64 1,680 Elk River ITREC ITREC Centralized SF
N/A 0,116 Varied Casaccia Casaccia Reprocessing (UKAEA)
Sogin

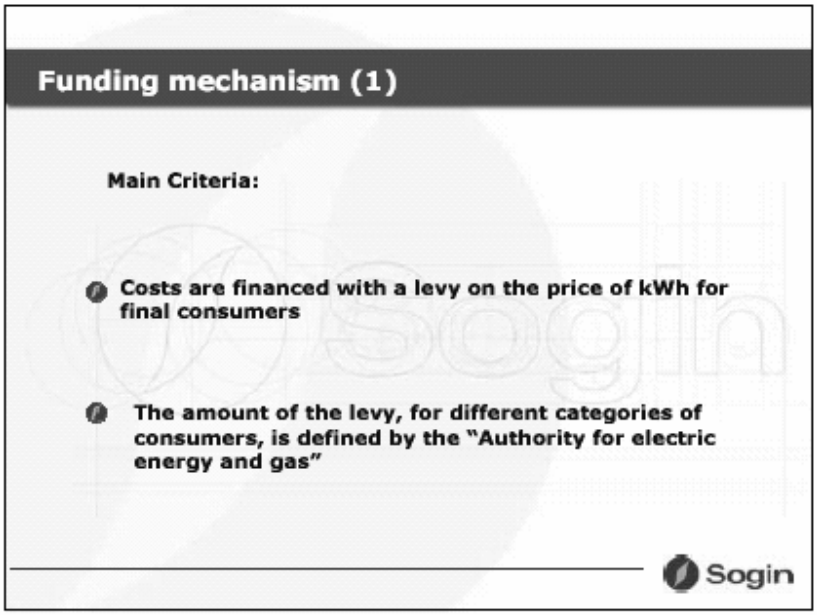

Funding
In Italy, as it is well known, there are no more operational NPPs.
Considerations on decommissioning funding system have to take into account this particular situation
Sogin

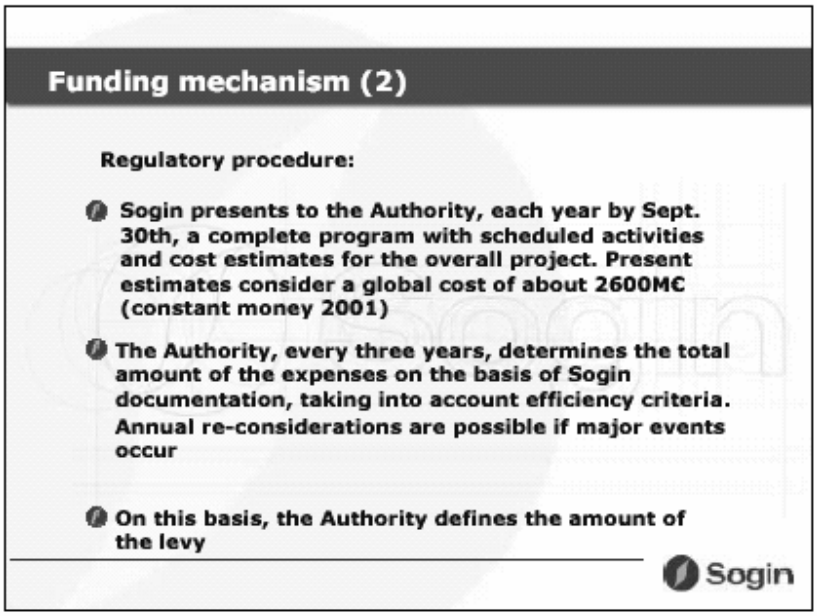

Previously Existing funds (1)
Before plant shutdown, ENEL has cumulated provisions for decommissioning, even in absence of a clear regulatory framework. These provisions were not sufficient for decommissioning, considering the early closure of the plants.
An additional fund was granted to ENEL by the government, in the form of a "credit" to be paid by the "electric system" (CCSE).
This fund (provisions + credit) was considered sufficient by ENEL for a decommissioning with Safe Store strategy (fund = discounted foreseen costs)
Sogin


Previously Existing funds (2)
The total fund (provisions + credit) was assigned to Sogin at the incorporation date. The amount, money 1999, was about 800 M€
Considering the new context:
new strategy (Prompt Dismantling with site release by 2020)
Sogin constitution (societal costs)
new economic conditions
the fund was not considered sufficient for all Sogin tasks
This conclusion was agreed upon also by the independent "Authority for electric energy and gas".
A new regulatory framework was therefore defined
Sogin


Regulatory aspects (1)
The Legislative Decree 79/99 has stated that costs for the decommissioning of NPP, fuel cycle back end and related activities should be considered as stranded costs for the general electric system
The same Decree stated that a specific company should have been established for the management of these activities. Consequently, Sogin has been incorporated, all nuclear assets and liabilities of Enel being assigned to the Company. Sogin is responsible for decommissioning and fuel back end, under the policy indicated by the Governement
Sogin


Regulatory aspects (2)
The Ministerial Decree 26.01.2000 precisely defined which costs can be considered as stranded costs. As a matter of fact, the decree confirms that all costs incurred in by Sogin for decommissioning, fuel cycle back end, wastes disposal are to be considered.
The same Decree defines modalities for funding Sogin for the above mentioned activities.
Sogin


Funding mechanism (1)
Main Criteria:
Costs are financed with a levy on the price of kWh for final consumers
The amount of the levy, for different categories of consumers, is defined by the "Authority for electric energy and gas"
Sogin


Funding mechanism (2)
Regulatory procedure:
Sogin presents to the Authority, each year by Sept. 30th, a complete program with scheduled activities and cost estimates for the overall project. Present estimates consider a global cost of about 2600M€ (constant money 2001)
The Authority, every three years, determines the total amount of the expenses on the basis of Sogin documentation, taking into account efficiency criteria. Annual re-considerations are possible if major events occur
On this basis, the Authority defines the amount of the levy
Sogin

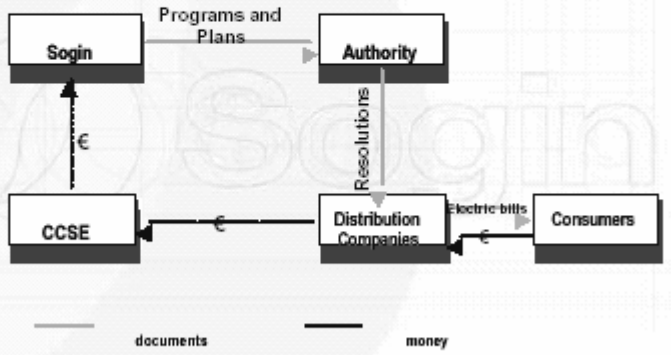
Funding mechanism (3)

Monetary flow:

- **Distribution companies pay the related amount to a central Body (CCSE)**
- **CCSE pays, every two months, the due amount to Sogin.**

Sogin

Funding mechanism (4)



Sogin

Present situation (1)

- In early 2002, the Authority issued the first resolution for the determination of decommissioning costs
- Specific reference was made to costs foreseen for 2002-2004, in the general context of the pluriannual program. The Authority endorsed the cost estimates of Sogin
- A levy of about 0,04 eurocents/kWh was established; the annual income for Sogin is about 110 M€

Sogin

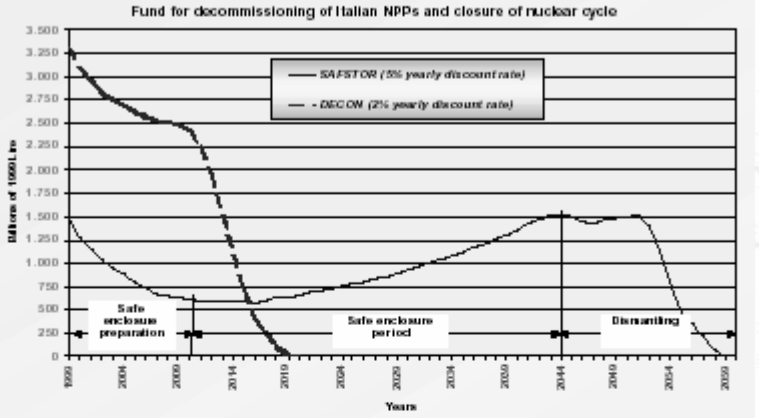
Present situation (2)

- In summary, Sogin has today a decommissioning fund that is built by two parts:
  - the provision (cash) assigned from Enel (about 400 M€)
  - a credit towards the "electric system", corresponding to the expenses foreseen in next three years period (about 350 M€).

  This credit shall be re-determined every three year
- It is expected that in the medium term decommissioning costs shall be covered by re-determined credits for successive three year periods
- The cash part of the fund shall be used in the long term
- The "cash" part of the fund is managed by Sogin according to guidelines issued by the Ministry of Economy. At the moment only low risk investment are allowed.

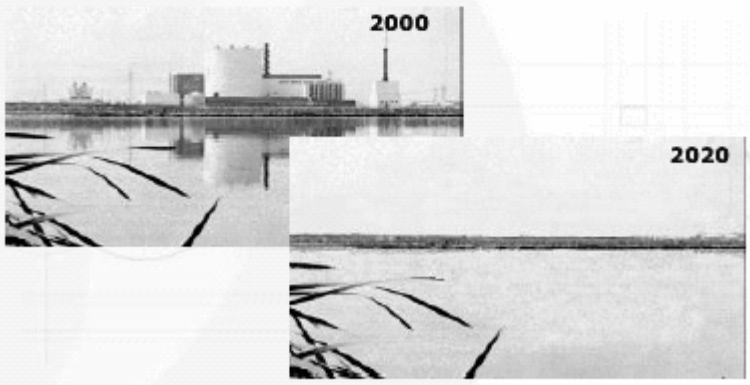
Sogin

Funds accumulation



Sogin

The final target



Sogin

HUNGARY

IDENTIFICATION OF LIABILITIES AND LONG-TERM MANAGEMENT OF THE FUNDIN HUNGARY

Ildikó Czoch
Hungarian Atomic Energy Authority, Budapest

Executive summary

According to the basic rules, laid down in the Act on Atomic Energy CXVI. of 1996, radioactive waste management shall not impose undue burden on future generations. To satisfy this requirement, the long-term costs of waste disposal and of decommissioning of the plant shall be paid by the generation that enjoys the benefits of nuclear energy production and applications of isotopes. Accordingly, by the Act and its executive orders, a Central Nuclear Financial Fund was established on 1st of January 1998 to finance radioactive waste disposal, interim storage and disposal of spent fuel as well as decommissioning of nuclear facilities.

The Minister, supervising the Hungarian Atomic Energy Authority is disposing of the Central Nuclear Financial Fund, while the Hungarian Atomic Energy Authority is responsible for its management. The Fund is a separate state fund pursuant to Act XXXVIII of 1992 on Public Finance, exclusively earmarked for financing the construction and operation of disposal facilities for the final disposal of radioactive waste, as well as for the interim storage and final disposal of spent fuel, and the decommissioning of nuclear facilities.

A long-term plan (up to the decommissioning of the nuclear facilities), a medium term plan (for five years) and an annual work schedule are to be prepared on the use of the Fund. The preparation of these plans/schedules is within the responsibilities of the Public Agency for Radioactive Waste Management. The long and medium term plans shall be annually reviewed and revised as required. The long and medium term plans and the annual work schedule shall be approved by the Minister supervising the Hungarian Atomic Energy Authority.

The payments into the Fund are defined in accordance with these plans. The liabilities of the Paks Nuclear Power Plant for annual payments into the Fund are included in the law on the central budget on the proposal of the Minister supervising the Hungarian Atomic Energy Authority. It is based upon submittals prepared by the Public Agency for Radioactive Waste Management and approved by the Hungarian Atomic Energy Authority and by the Hungarian Energy Office. The payments of the Paks Nuclear Power Plant should be taken into account when determining the price of electric energy.

The institutes disposing radioactive waste in the Radioactive Waste Treatment and Disposal Facility are also liable to contribute to the Fund according to a price list contained in a Ministerial Decree.

For nuclear installations financed from the central budget (research reactor and training reactor), the sources required to cover the payment into the Fund are provided by the central budget, when they arise.

The rate of payments into the Fund shall be specified in a way to provide appropriate sources for all costs of radioactive waste and spent fuel management and the decommissioning of nuclear facilities. These sources provide also coverage for the public control and information activities, as well as for the operational expenses of the existing repository. In order to ensure that the Fund maintains its value, the Government contributes to the Fund with a sum, calculated on the average assets of the Fund in the previous year using the average base interest rate of the central bank in the previous year. This practice was interrupted for 2001-2002, but now it is restored again as of 2003. By the end of 2002 there was 32.7 Mrd HUF in the Central Nuclear Financial Fund.

The table below demonstrates the development of the financial situation of the Fund between 1998 and 2002.

Table 1. Yearly income and expenditure of the Fund
(in M HUF – million Hungarian Forint[1])

	1998	**1999**	**2000**	**2001**	**2002**
Payment by Paks NPP	7428.7	9164.9	9311.3	14877.1	17199.3
Payment by other	3.6	6.2	5.6	9.8	6.5
Contribution from the central budget (maintaining value)		227.9	1132.1	0	0
Expenditure from the Fund	3941.1	3630.9	2094.1	6084.0	11239.4
Accumulation in the Fund	3832.7[2]	5768.1	8354.9	8802.9	5966.4

Notes: [1] in December 2002: 1 Euro = 233 HUF
[2] due to tax refund there was an additional income in this year

EUROPEAN COMMISSION – PAPER #1

NEW NUCLEAR LEGISLATION PROPOSALS FROM THE EUROPEAN COMMISSION FUNDS TO COVER NUCLEAR LIABILITIES

Derek M. Taylor
European Commission, Brussels

Present situation

On 30 January 2003, the European Commission adopted two proposals for new Directives in the area of nuclear safety:

- a proposal for a Council Directive defining the basic obligations and the general principles on the safety of nuclear installations;
- a proposal for a Council Directive on the management of spent nuclear fuel and radioactive waste.

The first of these includes a requirement for the setting up of "decommissioning funds". However, this is a "short-hand" title as the funds must cover all nuclear liabilities that remain after the end of operation of a nuclear installation, not just its closure and dismantling.

The liabilities that remain following the closure of a nuclear installation need to be managed safely. They also need to be managed over a period that ranges from decades to centuries. It is vitally important that the financial resources for the safe management of these liabilities can be guaranteed over the full period.

In the Commission's view, this can be best achieved by establishing a ***segregated fund*** that is built up over the operating life of the facility and by placing clear limitations on how the fund may be used.

Ideally the segregated fund should be ***"external" to the company*** and managed in such a way to ensure that it retains its value. The funds should not be spent on anything other than their identified purpose.

The fund should be sufficient to cover ***all liabilities*** that remain once a facility stops generating revenue. These liabilities would include long-term management of spent nuclear fuel and all radioactive waste (including its disposal), not already paid for during operation, and the full dismantling of the facility.

The Directive should cover ***all nuclear installations***, not just nuclear power plants. It would not be logical to require a fund to cover reactor decommissioning, but not for a reprocessing plant. Special provisions will have to be made for those installations, such as some research reactors, that do not generate important revenue streams.

The Commission realises that for companies that do not have segregated funds, ***a transition period*** will be required. We believe that allowing three years after the coming into force of the Directive should allow sufficient time for this to be done without disturbing the market.

The text in the Directive

The relevant parts of the Directive are its Article 9 and the Annex. These are reproduced below:

Article 9: Financial resources

1. Member States shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of nuclear installations.

2. Member States shall ensure that financial resources sufficient to cover decommissioning costs of each nuclear installation, taking into account the length of time required, are available as decommissioning funds at the time envisaged. These funds must meet the minimum criteria set out in the annex.

3. In the case of nuclear installations whose main purpose is other than the sale of products or services, in particular research reactors, Member States determine the means of meeting the specific decommissioning resource requirements.

ANNEX

The following minimum criteria shall apply to the decommissioning funds referred to in Article 9 of this Directive:

1. The funds shall be created from contributions by operators of nuclear installations during their operation, in order to reach a level of resources, at the time of the final shutdown, sufficient to cover all expenses related to decommissioning as defined in paragraph 2.

2. Contributions shall be made to the fund in line with the estimated service life of the installation and with the decommissioning strategy chosen, in such a manner as to cover, in particular, decommissioning of the installation; safe, long-term management of the conventional and radioactive wastes from decommissioning of the installation; and safe, long-term management of the spent fuel from nuclear power stations and of the wastes from reprocessing operations not already fully covered as an operational cost.

3. The assets of the funds shall be managed in a manner ensuring liquidity compatible with the timetable for the decommissioning obligations and the costs set out in paragraph 2.

4. The assets of the funds are to be used only to cover the costs set out in paragraph 2 in line with the decommissioning strategy and may not be used for other purposes. To this end the decommissioning funds shall be duly established with their own legal personality, separate from the operator of the installation. If exceptional and duly justified reasons make such legal separation impossible, the fund could continue to be

managed by the operator, provided that the availability of assets to meet the costs set out in paragraph 2 is guaranteed.

5. In the case of a nuclear installation whose operation will cease before the entry into force of the legislative, regulatory and administrative provisions set out in article 17 of this Directive; or within… [period to be decided] of the entry into force of these provisions, approaches other than the creation of decommissioning funds as required by this Directive may be taken.

6. Member states shall define the method by which the necessary resources for decommissioning, already accumulated by the operator before the entry into force of measures taken to implement this Directive, shall be transferred. These transfers must take place within at least 3 years from the date envisaged in Article 15.

Future

The two proposed Directives are now being examined by the Economic and Social Committee and their report will be adopted before the end of this month (March).

The proposals will then be formally presented to the European Council for adoption.

The Commissions expects the Directives to be adopted by the Council before the end of 2003.

EUROPEAN COMMISSION – PAPER #2

RADIOACTIVE WASTE MANAGEMENT IN THE EUROPEAN UNION: INITIATIVES FOR NEW LEGISLATION

Derek M. Taylor
European Commission, Brussels[1]

Abstract

Improving the management of radioactive waste in the European Union is a major theme of the "nuclear package" recently adopted by the European Commission. Included in the package are proposals for new legislation that would bring about the development of common safety standards in Europe covering the full nuclear sector, segregated funds to cover all nuclear liabilities that remain after the operating lifetime of an installation and clearly defined waste programmes for radioactive waste management in each of the Member States of the Union. Included in these programmes must be firm dates for a number decision points leading to disposal of all forms of radioactive waste. The package also puts significant emphasis on more, and better co-ordinated, research on radioactive waste management as the present levels are thought to be inadequate.

Introduction

On 6 November 2002, the European Commission adopted what is known as the "nuclear package". This is a series of documents centred on maintaining a high level of nuclear safety in a soon to be enlarged European Union (EU) included in this package where two proposals for new "EURATOM Directives" – pieces of legislation. Both of these have very important implications for the future of radioactive waste management in the EU.

The Nuclear Package

The nuclear package contained five sets of documents. The Commission formally adopted three of these:

- A Communication from the Commission to the Council and to the European Parliament on nuclear safety in the European Union
- A Communication to the Commission « Trade in nuclear materials with Russia » and a proposal for a Council decision instructing the Commission to negotiate a co-operation agreement between the European Atomic Energy Community and the Russian Federation in the area of trade in nuclear materials

1. The views expressed here are those of the author and may not represent those of the European Commission

- A proposal for a Council Decision to raise the ceiling for Euratom loans for nuclear installations from 4 billion euros to 6 billion euros

The two other sets of documents were draft proposals for new legislation that were to be submitted to a group of experts from the Member States for its opinion. These texts were approved by the Commission. They were:

- A draft proposal for a Council Euratom Directive « Defining the basic obligations and general principles for the safety of nuclear installations »

- A draft proposal for a Council Euratom Directive «The management of spent nuclear fuel and radioactive waste»

This paper focuses on the first Communication on nuclear safety in the EU and the two draft proposals for legislation as far as they relate to radioactive waste management.

It was expected that the two draft proposals will be formally adopted by the Commission in January 2003.

Security of Energy Supply

In November 2000, the European Commission adopted a Green Paper on security of supply or – to give it its full title – "Towards a European strategy for the security of energy supply". Since that date it has been the subject of an intensive debate around a number of essential questions which "shed light on the energy choices to be made".

The Green Paper pointed out that the future of nuclear energy is uncertain, particularly in Europe and depends on several factors including:

- a solution to the problems of managing and stocking nuclear waste,

- the economic viability of the new generation of power stations,

- the safety of reactors in Eastern Europe, in particular applicant countries,

- policies to combat global warming.

It then went on to conclude:

> "Nuclear cannot develop without a consensus that gives it a long enough period of stability, bearing in mind the economic and technological constraints of the industry. This will only be the case when the waste issue finds a satisfactory solution with maximum transparency. Research in this area should be oriented towards waste management".

This view is clearly shared by the Public in Europe. The European Commission regularly conducts EU-wide public opinion surveys during which 16 000 people are interviewed on a variety of topics. During a recent "Eurobarometer" survey, people were given a list of eight possible priority topics for government action from which they could select three. The majority of people identified food safety (52%), but this was closely followed by nuclear safety (50%) and then by management and

disposal of radioactive waste (47%). Rather surprisingly (at least to the author) was the fact that road accidents – that result in thousands of deaths across the EU each year – was only identified as a priority by 19%. Safety of oil and gas transport was identified by 16%.

European Legislation and Nuclear Safety

The Euratom Treaty, which defines the framework for the European Union's activities in the nuclear sector, did not explicitly establish a Community responsibility for nuclear safety.

The Treaty did require the establishment of "uniform safety standards" to protect workers and the general public. This has enabled the preparation and implementation of important legislation in the fields of radiation protection under Chapter III of the Treaty. There is also extensive legislation on the safeguarding of nuclear materials.

However, legislation in the field of the safety of nuclear facilities and management of radioactive waste has not developed in parallel.

On the other hand, this is a well-developed "European safety perspective" as a result voluntary co-operation between the main nuclear actors at EU level since the 1970s. It is built on fundamental common principles that form the basis of all the EU national nuclear safety regulations and stated in various internationally accepted documents.

This, albeit slow, route to harmonisation of regulations and practices appeared acceptable to most players until it was realised that the next proposed enlargement of the European Union – to include countries such as Lithuania, the Czech Republic, Hungary and Slovakia - could result in a number of Soviet-designed nuclear reactors being located within the Community. This brought calls for these "Candidate Countries" to meet Western safety standards.

For the first time in its history, the European Union started the process of carrying out the overall evaluation of nuclear safety in an independent State, in this case in all the candidate countries. Towards the end of 2000, a Working Party on Nuclear Safety (WPNS) was set up by the European Council's Atomic Questions Group to undertake this assessment for those countries with civilian nuclear power plants.

The main negotiations regarding nuclear safety with the countries that are now expected to join the Union in May 2004 have now been concluded. However, the debate on nuclear safety in the context of enlargement raised questions about what are Western standards for nuclear safety. These questions proved very difficult to answer – at least in a clear ***and transparent*** way to the non-expert.

As the energy commissioner, Vice-President Loyola de Palacio explained to the European Parliament, the current situation is unsatisfactory because:

- there are no equivalent standards and criteria for comparable situations across the EU;
- the strict requirements currently being imposed on the applicant countries as part of the accession negotiations cannot, paradoxically, be imposed on Member States;
- the public need to be reassured that the highest levels of nuclear safety are being achieved across the Union and that when the current applicant countries become Member States a high level of safety can continue to be enforced in these countries.

In recognition of the importance of immediate and effective action, the Laeken European Council in December 2001 committed itself to maintaining a high level of nuclear safety in the Union and stressed the need to monitor the safety of nuclear installations in general. It also called for regular reports from Member States on nuclear safety.

Most recently, on 10 December 2002, there was a very important ruling of the European Court of Justice, in the context of the Nuclear Safety Convention. This ruled that there is Community competence in the following areas:

- the establishment of a legislative and regulatory framework to govern the safety of nuclear installations;
- measures relating to the assessment and verification of safety;
- emergency preparedness;
- the siting of a nuclear installation; and
- the design, construction and operation of nuclear installations.

This clearly opened to path to greater harmonisation in the area of nuclear safety at the level of the European Union.

The new proposals of the Commission, outlining a new EU approach to nuclear safety and radioactive waste management, should be viewed in this context.

A Community Approach to Nuclear Safety

The future approach to nuclear safety at a Community level is set out in a new Directive "Defining the basic obligations and general principles for the safety of nuclear installations ". The interest from the specific point of view of radioactive waste management is twofold. Firstly, the Directive covers all nuclear installations, not just nuclear power plants. As such it covers all the facilities for the management on spent nuclear fuel and radioactive waste – including for their disposal. Secondly, there is an important part dealing specifically with "decommissioning funds". Decommissioning wastes form an ever more important part of the radioactive waste stream – and the management of spent nuclear fuel and radioactive waste is responsible for a major part of the costs following closure of a nuclear facility.

The future approach will be based on common European standards. Even though these will not necessarily be of a detailed technical nature, they will take time to develop. The starting point, as set out already in the framework Directive, is the Nuclear Safety Convention and the Directive takes over many of the Convention's basic requirements. This Directive, like the Convention, does not contain detailed technical rules. However, it lays down a precise legal framework constituting the basis for a nuclear safety system. Clearly, such a Community approach to safety cannot, ultimately, be restricted simply to taking over the relevant provisions of the Convention on Nuclear Safety. However, it does provide a starting point on which there should be agreement since all the Member States have to implement them already, supplemented by other elements.

Initially, the Community system will be based on this "corpus of minimum standards". This will also establish a legal framework comprising a mechanism allowing the standards to evolve and

develop. In practical terms, States the further development of European safety standards will be done in close co-operation with experts from the Member States. It will take fully into account the results of the work of the International Atomic Energy Agency (IAEA) in the field of nuclear safety an area in which the Agency has been working for many years. It will also take into account the results of the work of the Commission's expert working group on nuclear safety over the past 25 years and other relevant bodies. The proposals will also need to be reviewed by other committees before being formally adopted by the Member States themselves.

Member States will be required to produce regular reports on all aspects of nuclear safety in their country and these will be the subject of "peer reviews" and compiled into a regular report on nuclear safety in the EU. This reporting will be backed up by a system of verification that will rely mainly on the technical experts from national safety authorities. The focus of this verification system will be on checking the ways in which national safety authorities carry out their tasks in order to assure the Community that there is an equivalent level of nuclear safety regulation and control throughout the EU.

Decommissioning Funds

Maintaining a high level of safety in nuclear installations requires that adequate resources are available. This is also true for the decommissioning phase of a nuclear installation. However, here there is the added complication that the facility is no longer generating income.

Decommissioning of nuclear installations is inseparable from the issue of radioactive waste management. Decommissioning is the process that provides an ever increasing part of the radioactive waste stream. Also, the management of the wastes following closure of an installation are a very important element of the total liabilities. In some instances, especially in those countries with small or relatively limited nuclear programmes, the cost of managing the wastes may account for more than half of the total decommissioning costs.

In March 2002, the European Parliament voted with a large majority to adopt an amendment to a Directive on opening up of the electricity market. This amendment called for decommissioning funds to be set up and managed in such a way that sufficient funds would be available when necessary for the safe decommissioning of all nuclear power plants, including for the management of the wastes. Moreover, the amendment said that the funds should not be used for any other purpose than decommissioning.

It should be kept in mind that decommissioning a nuclear installation is a major industrial undertaking which can take many years – often tens of years. The cost of decommissioning operations can be very high. Estimates of the full cost of decommissioning of a 1GWe nuclear power plant range from around $200 million to close to $1 billion. It is essential to avoid any possibility that the decommissioning of a nuclear installation will not be able to start as planned, can not be carried out using the appropriate safe procedures, or be abandoned before completion due to a lack of resources.

The primary objective of the proposed new European legislation in this area is to make sure that sufficient resources are collected over the operating lifetime of an installation to cover all end-of-life nuclear liabilities.

Normally, the necessary resources will have to have been built up by the plant operator during the active life of the nuclear installation. However, it is not simply a question of collecting money but of managing it in such a way that it is available as and when required over a long period of

time. Furthermore, because of the size of the funds, there is concern that they are managed in such a way so as not to disrupt the electricity market.

In order to meet the primary objective and other concerns, the legislation would require the creation of decommissioning funds that are independent from the regular accounts of the operators and specifically earmarked for the decommissioning of their nuclear installations. In other words, the funds would be "segregated" or "ring-fenced". Only in exceptional cases, where duly justified reasons make such a separation of funds impossible, the management of the funds could continue to be undertaken by the operator, provided that the availability of assets to cover the costs of decommissioning operations is guaranteed.

The proposed legislation covers the decommissioning of all nuclear installations – not just nuclear power plants. Nor is it limited to commercial installations, though non-commercial facilities will need special funding arrangements to be designated by the individual Member States.

While the funds are referred to as "decommissioning" funds for simplicity, they must cover all nuclear liabilities that remain at the end of an installations normal life. In other words, they must cover the management of any remaining spent fuel and radioactive waste, including disposal.

The present proposal leaves a great deal of the detail concerning the size of the funds, how they are to be collected and how they are to be managed by the individual Member States. This is reasonable given the variety of financing schemes presently in use throughout the Union which will take some time to harmonise and the fact that Member States will be ultimately responsible for making sure that decommissioning is completed to a high standard of safety. However, if, on the basis of the regular reports that will be received from the Member States, there are problems with the funds or irregularities which could either compromise the completion of decommissioning or create distortions in the electricity market, then the Commission has made it clear that it would be ready to propose further legislation.

Management of Spent Nuclear Fuel and Radioactive Waste

The use of nuclear energy to generate electricity results in the production of spent nuclear fuel and radioactive waste. In the European Union – as in other regions of the world - the most hazardous and radiological toxic forms of this material are presently held in temporary storage facilities. None has yet been disposed of. In the meantime, accumulations of this material continue to grow.

Irrespective of future strategies regarding energy production, the waste that exists now must be dealt with in a way that respects the basic principles of protection of human health and the environment. Action must be taken very soon to ensure that the responsibility and burden of managing the growing quantities of spent fuel and waste held in temporary storage are not passed on to future generations. Current policies in most Member States and those countries that are candidates to join the Union do not adequately address these issues.

This situation must change. It is simply not sustainable. What in the past might have been regarded as technical reasons for delaying decisions have now become excuses for failing to make progress. The proposed legislation sets out to address this issue. It is clearly motivated by the absence of progress in most Member States – particularly, but not exclusively, in the long-term management of high-level waste.

What is the situation in the EU?

In total, about 40,000 m^3 of radioactive waste are produced per year in the EU as a whole, the majority originating from activities associated with nuclear electricity generation.

Though disposal of the short-lived low- and intermediate-level waste is well established, it is currently only practised in five Member States with active nuclear power programmes (Finland, France, Spain, Sweden and UK (for LLW)). In Germany, disposal operations have taken place in the past, but neither Belgium nor the Netherlands has developed any disposal capabilities for this category of waste and both countries are currently storing their accumulations in centralised national depots. Similar indefinite interim storage is also practised in Member States without nuclear power programmes.

In the case of high level waste, all accumulations are being stored in surface or near-surface facilities pending the availability of a more permanent solution. Finland and Sweden are perhaps the most advanced, with long-established programmes for the development of deep disposal. Some Member States are once again reassessing all their options as well as the associated decision-making processes. Others are still following a policy of "wait and see".

What is the view of the European Commission?

In its Communication of nuclear safety in an enlarged Union and in the introduction ("Explanatory Memorandum") to the proposed new legislation, the Commission sets outs its views regarding the management of waste, in particular high-level waste. These are that:

- Further delays in decisions on the development of repositories for the disposal of radioactive waste cannot be justified. On the contrary, there is a sound basis on ethical, environmental and nuclear safety grounds for the rapid development of these facilities. Any delays that could be interpreted as passing on to future generations the responsibility for disposing of our wastes should be avoided, especially since such delays, particularly in the case of the more hazardous wastes, may also increase the potential risk of accidents and terrorist attacks.

- Member States should develop appropriate strategies and prepare detailed programmes for the long-term management of all the waste types under their jurisdiction. Though the Community as a whole should maintain the capacity to store its wastes, the emphasis of these programmes should be on the development of repositories for the disposal of radioactive waste. Open and comprehensive public information and involvement together with respect for the "polluter pays" principle are crucial aspects of these programmes.

- Member States should ensure that the necessary research and technological development (RTD) is carried out to enable the deadlines for implementing their programmes to be met. For the further extended use of nuclear energy it would also be beneficial to explore alternative technologies for possible application in the future.

The proposed new legislation

The objective of the proposed legislation is to bring about progress towards the safe long term management of spent nuclear fuel and radioactive waste. While the emphasis of the Directive is on high-level waste – including spent nuclear fuel that is to be disposed of directly – it does cover all forms of radioactive waste and all spent nuclear fuel regardless of the management route followed (reprocessing, storage or direct disposal).

The Directive is very much inspired by the **Joint Convention** on the safety of spent nuclear fuel and radioactive waste management. It includes a number of "basic requirements" for safe management that will be quickly recognised by all who have studied the Convention. These measures can be considered as established international best practice in the field of spent nuclear fuel and radioactive waste management, and cover such aspects as public health, environmental protection, nuclear safety, financing and governance. Many of these measures are part of current policy in many Member States.

The Directive requires that each Member State establish a **clearly defined programme** for radioactive waste management covering all radioactive waste under its jurisdiction and covering all stages of management including disposal. The programme must also cover the management of all spent nuclear fuel that is not subject to reprocessing contracts or, in the case of research reactor fuel, take-back agreements. In particular, the programme shall specify an approach to long-term management and disposal with a definite timetable for each step of the process. Where there is no suitable alternative to disposal available, a small number decision points must be included in the programme.

The Member States must report at regular intervals on their programmes and the Commission, with the help of national experts, will review these reports and publish its own report on the situation regarding radioactive waste management in the Union.

Possibly the most controversial element of the proposed legislation relates to the **decision points** that must be included in the programmes. There are three of these. They are:

- authorisation for development of appropriate disposal site(s) to be granted no later than 2008. In the case of geological disposal of high-level and long-lived waste, this authorisation could be conditional upon a further period of detailed underground study;

- in the case of short-lived low and intermediate-level waste, if this is to be disposed of separately from high-level and long-lived waste, authorisation for operation of the disposal facility to be granted no later than 2013;

- in the case of high-level and long-lived waste, to be disposed of in a geological repository, authorisation for operation of the disposal facility to be granted no later than 2018.

There have already been a number of comments that these dates are not "realistic". The main objection being that it will take time to develop the necessary local consensus around potential sites. It should be clear that we are not saying any Member State should be able to identify and authorise a site within 6 years of starting producing waste. Some of our Member States have been producing radioactive waste now for over 50 years and have still not identified even potential disposal sites. The message to these States is "if you have not already identified a site – you are late".

There has also been criticism that the Directive emphasises geological disposal to the exclusion of possible **alternative technologies**. This is not true. It clearly states that there is a consensus based on current knowledge that geological disposal is the best method for long-term management of high-level wastes. It is also very widely accepted that some of the present waste forms will not be further processed and that even if partitioning and transmutation becomes technically feasible and economically attractive, it would still leave a high-level waste stream that would need to be disposed of. The Directive does strongly encourage progress on geological disposal, but it also advocates research, including into new technologies that would result in less radioactive waste.

In addition, the Directive allows the **shipment of wastes to third countries** as an alternative to disposal in a national repository. However, in order to avoid the risk of radioactive waste being sent to a country that could not safely manage it, there are strict conditions that would apply to such shipments. In particular, the shipments must be covered by firm contracts and only take place to a country with appropriate facilities that met the accepted norms and standards of the country of origin and, in the case of special materials are under adequate safeguards.

Finally, the Directive aims to encourage more – and better – research on radioactive waste management. The Commission's concern here is two-fold. First, the level of **research on radioactive waste management** is presently inadequate. Secondly, the research that is done could be more effectively co-ordinated. From looking at the level of research being carried out in those countries that are the most advanced in management of their waste, and often closest to identifying disposal sites, we derived a figure for the amount of research that is required relative to the amount of nuclear electricity that is produced. This appears to be a reasonable application of the "polluter pays" principle. The amount is around 500 000 euros/year for every terawatt-hour of nuclear electricity generated. Only two or three of our Member States spend this much on radioactive waste research. The Commission believes that the present level of research in the Union is inadequate. But, in addition to encouraging a higher level of research, the Commission wants to see the work better co-ordinated and plans to introduce proposals to achieve this in the coming months.

Summary

The objective of the nuclear package, in particular of the proposed new legislation, is to try to provide better guarantees of a high level of nuclear safety throughout and enlarged European Union.

The proposed legislation will impact in a number of ways on the management of radioactive waste in the EU:

- It will promote the development of common standards and good practices for spent nuclear fuel and radioactive waste management;

- It will require the establishment of segregated funds that will cover all nuclear liabilities that remain at the end of life of nuclear installations, including for the management of the spent nuclear fuel and waste;

- It will require Member States to establish clearly defined programmes for waste management, including a firm time scale for disposal, and encourage a higher level and better co-ordinated research across the Union.

The proposals do not depend on future decisions about the role of nuclear energy. They should be implemented regardless of any changes in policy on the nuclear option.

OTHER NATIONAL PAPERS

FINLAND

FINANCIAL PROVISION FOR FUTURE NUCLEAR WASTE MANAGEMENT IN FINLAND

Anne Väätäinen
Ministry of Trade and Industry, Helsinki

General

The main principle as regards nuclear waste management in Finland is that the operator that has produced nuclear waste is responsible for the management of all such nuclear waste. It has to take care of its waste (including that of decommissioning) until it has been disposed of in a manner accepted by the authorities. Spent nuclear fuel is considered to be nuclear waste subject to disposal into a final repository.

According to the Nuclear Energy Act, all nuclear waste produced in Finland must be handled, stored and disposed of in Finland. The spent fuel and other nuclear wastes are stored at the power plant sites until they are disposed of. At the both two sites there already are the final repositories for low and intermediate level waste.

Financial provision and The State Nuclear Waste Management Fund

The financial provision for all nuclear waste management, including dismantling and decommissioning, has been arranged through the State Nuclear Waste Management Fund. The main objective of the system is that at each moment there shall be sufficient funds available to take care of the remaining nuclear waste management measures caused by the waste produced up to that moment. Payments to the fund are based on liabilities, which are yearly estimated. Accordingly, the capital of the Fund is annually adjusted, normally with additional contributions from the licence-holders, but repayments from the Fund to the operators are also possible if the fund capital exceeds the current liability. The part of liability that is not covered by money in the Fund must always be guaranteed by full securities.

The Fund does not pay for the waste management measures but keeps in safe the money corresponding to the costs of the remaining measures. Theoretically, all the funds have been returned to the operators when they have carried out all the necessary waste management operations. For these reasons, the Fund could be described as a “guarantee fund”.

The licence-holders are entitled to borrow back 75% of the capital of the Fund against full securities and at current interest rate. In addition to that, the State has the right to borrow the rest of the capital.

Each licence-holder can be said to have its own "account" in the Fund and the State authorities regularly establish the required balance of that account. In the case where the licence-holder is no more capable to take care of its obligation for financial provision and/or measures of waste management, the State can take over both the waste and the "account". The securities furnished by the licence-holder to the Fund guarantee that the Fund can return funds to the State in time with the actual waste management measures.

Liability estimates and the yearly procedure

Plans and cost estimates for the remaining measures of nuclear waste management are yearly updated by the nuclear power companies themselves and the reports submitted to the Ministry of Trade and Industry. The cost estimates are made according to the current plans and technology. Thus changes or corrections in plans, possible innovations and changes in the cost level as well as changes in national policy may change the assessed liability. The Radiation and Nuclear Safety Authority (STUK) and VTT Technical Research Centre of Finland review the proposals and give their opinions to the Ministry. The assessed liability and fund target of each licence-holder are then confirmed by the Ministry. No discounting is used, but the costs and the fund targets are always estimated on the basis of the current price level.

To handle high fixed costs and also major changes, the fund target can be less than the assessed liability. Detailed instructions for those are included in the legislation. Always, as a precaution against insolvency, the part of the assessed liability that is not covered by the money in the Fund must be covered with securities furnished by the licence-holder. The securities are given to the Ministry of Trade and Industry, not to the Fund. Mortgages on a nuclear power plant itself cannot be accepted as securities. Each security has to be separately accepted by the Ministry. As an additional precaution against unforeseen events, supplementary securities covering 10% of the assessed liability must be given to the Ministry.

Organisation and operation of the Fund

The State Nuclear Waste Management Fund, founded in 1988, is a special-purpose fund, segregated from the State budget. Its task is to collect, hold and invest in a secure way the funds needed to guarantee the future management of nuclear waste. The Ministry of Trade and Industry controls that the operation of the State Nuclear Waste Management Fund complies with the legislation.

Each year, after the Ministry has confirmed the fund targets, it is up to the Fund to see that the licence-holder's share of the capital in the Fund is balanced with the fund target. The Fund has a Board of four members nominated by the Government and a Managing Director, secretary and accountant, all part-time.

At the moment the Fund capital is about 1 260 million euro. In 2002 the profit of the Fund was 48 million euro.

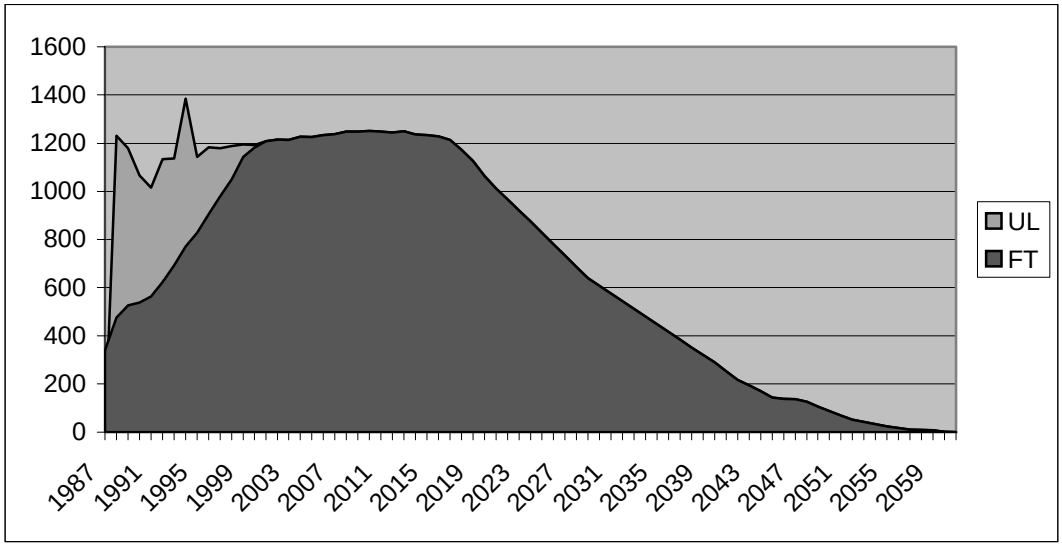


Figure 1. Accumulation of total liabilities and fund targets (price level 2002; mill. euro). UL=Unfunded liabilities, FT= Fund target.

Conclusion

The funding system is based on the principle that, if a nuclear facility would stop its operation and also stop to produce more waste, the money in the Fund and the securities given to the State would, together, always suffice to handle the situation and take care of the management of all the existing waste and dismantling and decommissioning of the plant. As the actual waste management measures would not be taken immediately, the interest accrued, in the meantime, by this existing capital is used to compensate for the inflation and cost escalation.

The critical question is how the system takes into account the difficulty of arriving at reliable estimates. The Finnish funding system contains some built-in features to minimise the risk of the State having to contribute additional funds to carrying out these operations. The system continuously requires new updated estimates that must take into account the practical experience accumulating world-wide. The estimates must, however, always be based on technology currently available. Additionally, the law also requires that the uncertainty of available information about prices and costs shall be taken into account, in a reasonable manner, as raising the estimated liability.

In the case, where a facility would unexpectedly stop its operation and the funds should be transferred to the State, the Fund has full rights to require the licence-holder to pay its loans back to the Fund or, alternatively, to realise the securities. The interest of this capital is also available to the State and is assumed to compensate for inflation and related cost escalation. The State can also, if there is a need, realise the 10% supplementary securities.

FRANCE

LIABILITIES IDENTIFICATION AND LONG-TERM MANAGEMENT REVIEW OF FRENCH SITUATION

French Delegation to RWMC

Description of the Current Situation

In France, long term liabilities due to nuclear activities concern four main operators : Electricité de France (EDF), AREVA (an industrial group created on September 3, 2001 and covering the entire fuel cycle from ore extraction and transformation to the recycling of spent fuel), the Atomic Energy Commission (CEA, the French public research organism in the nuclear sector) and the French Agency for radioactive waste management (ANDRA, in charge with the long term operation of radioactive waste installations).

Long term liabilities are due to the financing of both *decommissioning of nuclear installations* and *radioactive waste long term management*. **In the current French organisational scheme, the different operators must take the responsibility of these long term liabilities**. The possibility to transfer them to some other stable body (for example the French State) is not in our view.

The setting of national policies and the establishment of the legislation are carried out at a national level by the French state. These include the supervision of the three operators (which are still principally state owned) through different Ministries (finance and industry today merged in the Ministry of Economy, Finance and Industry) and the regulatory control of safety trough the Nuclear Safety Authority (ASN).

Decommissioning operations

Liabilities assessments

EDF, AREVA, CEA and ANDRA are responsible for all aspects of the decommissioning (from a technical and financial point of view). Within a safety regulatory frame, they have their own initiative concerning future expenses, based on estimated costs and the expected operational lifetime of the installations. They are responsible of the definition and implementation of the technical options.

Through its supervision activities, the French State regularly requires updating studies of these estimated costs, which are conducted by the operators. A general review of the management of these long-term liabilities is also carried out on a four years basis by the French Court of Accounts (Cour des comptes).

Accounts mechanisms

Operators are due to constitute provisions during the life cycle of their installations. Provisions are calculated for each installation on the basis of the decommissioning expenses and of the reasonably estimated lifetime (for instance during 30 years for the EDF PWR nuclear power plants). They are re-evaluated each year by taking into account the effect of inflation and if necessary, a (major) change of the estimated costs.

Radioactive waste management

The different waste producers (mainly EDF, CEA, COGEMA) assume the ownership of the radioactive wastes generated in their installations and are therefore responsible for the financing of their long term management. Provisions are based on a deep geological disposal for Long-Lived High Level Waste (HLW-LL), which is currently considered as the most mature solution between the different studied technical options, even if French research explore complementary issues.

But operators are not responsible for the definition and implementation of the technical options. Such missions have been transferred to a separated public establishment named ANDRA (the national radioactive waste management agency). ANDRA was created in 1992 as an application of the French law dated December 30th, 1991[2]. Three missions were assigned to the Agency :

1. *an industrial mission* (operational management of existing disposal facilities). With the Manche and Aube disposal facilities, ANDRA has implemented a definitive disposal solutions for 90% of the radioactive wastes produced in France[3] ;

2. *a research mission* for the implementation of new disposal techniques. For instance, in the scope of the French 1991 Waste Act, ANDRA carries out the feasibility study on HLW-LL disposal in deep geological environments;

3. *a public information mission* to improve public acceptance and knowledge on this complex subject.

ANDRA's industrial mission is financed by the producers through commercial contracts covering the monitoring phase of the Manche facility and the operation of the Aube facility. Research programs conducted by ANDRA in the scope of the 1991 Waste Act are also financed by the waste producers under the "polluter pays" principle.

2. Act No 91-1381 of 30 December 1991 (also known as the "loi Bataille" from the name of its mover), now incorporated into the French Environment Code) covers the research on long-lived high level radioactive waste and defines three main research lines. Responsibility for line 1 (research into solutions enabling long-lived radioactive elements present in this waste to be partitioned and transmuted) was entrusted to CEA, while that of line 2 on the study of the possibilities of reversible or irreversible disposal in deep geological formations, particularly through he construction of underground laboratories, was entrusted to ANDRA. Work on line 3 (study of conditioning and long-term surface storage processes is also being led by CEA. An overall assessment report on these three research lines have to be presented to French Parliament in 2006.

3. The short-lived, low level and medium level wastes (LLWs and MLWs).

Funding arrangements

There is no legal requirement for the operators to create a specific fund to accumulate the financial resources coming from provisions. However, in accordance with their supervision authorities, EDF, AREVA and CEA have already set up financial tools to create such funds : instead of setting up a specific legislation on this subject, the French State developed an economic approach based on the definition of appropriate governance rules in these companies.

In the case of CEA, a dedicated fund was created in 2001 to cover long term liabilities (both due to decommissioning operations and long-term radioactive waste management). This fund is managed by CEA under specific accountancy rules and is supervised by a special committee whose members are independent from the institute. This Committee plays an advisory role for the CEA board concerning costs estimations, financial statements and budgets.

In the case of AREVA, a specific fund was created in the mid-90th based on COGEMA business revenues. With the recent implementation of AREVA governance rules, a special Committee was created to supervise how long term liabilities are managed by the group and financially covered. This Committee plays an advisory role for the AREVA Supervisory board.

In the case of EDF, a specific fund has been created during the 1997-2000 contract concluded between the French State and the company. The management of this fund and resources accumulation have to be now carried out during the 2001-2003 current contract. If the decommissioning of the oldest nuclear power plants has already begun, the most important financial issue is forecast between 2020 and 2040, when the first decommissioning operations of the current PWR NPPs will probably take place. This enables the company to progressively set up a well-sized financial fund, which is different from the CEA situation where important decommissioning expenses have already to be yearly covered.

Future trends

The recent or announced evolutions in the European and French energy sectors could lead to changes in this organisational scheme:

a) both EDF and AREVA could be partly privatised in the next few years. Existing methods based on the public-owned status of these companies and on their direct supervision by the French State will certainly have to be reviewed. On the other hand, on a financial market point of view, it is necessary to clearly distinguish the roles and responsibilities between these companies and the French State ;

b) the European Commission recently adopted two proposals for Directives designed to pave the way for a Community approach to the safety of nuclear power plants and the processing of radioactive waste. In the first proposal, rules for the establishment, management and use of decommissioning funds are defined. The French position on this project is currently under review.

Because if this new context, an evolution of the French approach in that field is under consideration. At this stage, it seems difficult to be precise about future options which have not been decided and only general principles can be mentioned:

- estimated costs have to be regularly reviewed by an independent organisation ;

- a difference can be made between the shorter-term activities of decommissioning on the one hand and those responsible for longer-term activities associated with waste management on the other hand ;

- in regard of waste management and disposal, because of the important time scales, a key issue is assignment of responsibility between Government and waste producers. Because of its longevity, the responsibility shall have to pass to the Government at a point in the future to be determined. To that regard another key issue will be to fix an appropriate time period frame in which a progressive and controlled transfer between the waste producers and the State could take place ;

- concerning HLW-LL, it seems difficult to define a precise technical and financing strategy before the 2006 debate which is forecast by the French 1991 Waste Act ;

- financial tools have to be created to guarantee the availability and sufficiency of resources for decommissioning operations and waste management, at the time when they are needed. If appropriate supervision methods and governance rules are implemented, the management of these funds by separate bodies does not seem necessary.

Concerning waste management, different working groups are currently created with the concerned French Ministries to define future trends for the financing mechanisms and to set up terms of reference for future financial tools. For instance, a specific group is currently working on the definition of a secure mechanism which would enable the financing of the monitoring period of the ANDRA Manche disposal facility. On the other hand, another group will work in the next months on the financing of the HLW-LL long term management.

GERMANY

FINANCING LONG TERM LIABILITIES

German delegation to RWMC

I. Radioactive Waste Management and Decommissioning

In Germany the basis for the management of radioactive residues is the polluter-pays principle. All steps of treatment of radioactive waste arising from operation, decommissioning and dismantling including conditioning, interim storage and disposal of radioactive waste have to be financed by the waste producers. The waste producers are responsible for the harmless recycling of the residues or for their orderly management as radioactive waste. The Federal Government is responsible for establishing disposal facilities.

Accordingly the waste producers are constructing and operating facilities in which the radioactive residues can be treated and stored until their disposal. As far as the radioactive waste cannot be stored by the producer, waste originating from research, medicine and industry can be stored in surface storage facilities of the federal states (Länder).

Spent fuel from German NPPs is partly reprocessed in France and UK. The rest has to be disposed off directly in deep geologic formations. Until a repository for spent fuel is available in Germany spent fuel will be stored in interim storage facilities on the sites of the NPPs. The storage will take place in casks in a dry way. In exceptional cases, if the storage at a NPP site is not possible, there are two central storages at Ahaus and Gorleben which are in operation and can be made available as reserve. Radioactive waste returning from the reprocessing of German spent fuel in France and UK is stored in the Gorleben central storage.

The Federal Government is aiming to establish a repository in deep geological formations about the year 2030 which shall be available for all types and quantities of radioactive waste.

The necessary expenses for the planning and construction of radioactive waste disposal facilities are initially carried by the Federal Government. The Government recovers the costs by contributions or advance payments from the waste producers. The use of storage and disposal facilities is financed by charges and fees levied from the waste producers.

Altogether, financial resources for decommissioning are needed for the following steps: the post-operational phase in which the facility is prepared for dismantling after its final shut-down, dismantling of the radioactive part of the facility, management, storage and disposal of the radioactive waste, restoration of the site, licensing and regulatory supervision of all these steps. Additional means are necessary for the management, storage and disposal of the spent fuel.

The way in which the availability of financial resources is secured differs between public-owned installations and installations of the private power utilities:

- The costs for decommissioning and waste management of the public-owned facilities i.e. several facilities for nuclear research (most of them decommissioned), 46 research reactors (1 under construction, 14 in operation, 31 decommissioned) and 6 prototype reactors (all decommissioned) are paid from public budgets, with the Federal Government covering the major part of the costs.

- The financial resources for facilities of the privately owned power utilities, in particular nuclear power plants (19 in operation, 5 decommissioned), are provided in the form of reserves which are acquired during the operational phase from the profits achieved from electricity production. The formation of reserves according to Commercial Law is based on the obligation to ultimately remove the radioactive part of the facility. This obligation is derived from the Atomic Energy Act and the public law and further defined by the tax law concerning the appropriation in taxation. The existence of reserves for decommissioning guarantees that financial provisions will be available for decommissioning and dismantling after termination of electricity production and cessation of revenues from electricity charges. In addition, the formation of reserves serves to assign the costs for decommissioning and dismantling – which are ultimately caused by the electricity production itself – to the operational phase.

  The reserves cover all costs which are associated with decommissioning the plant. The costs are estimated from studies which are updated on a regular basis taking into account the progress in technology and the price trend. These cost estimates are checked by the fiscal authorities. Separate reserves are formed for the management and disposal of the spent fuel.

  From the reserves accrued so far by the utilities, totalling approximately EUR 35 billion, around 45 % are to be used for decommissioning and disposing off the plants, and around 55 % for the management and disposal of spent fuel.

II. Legacies

In Germany, past practices like the use of Radium for producing luminous paint or of Thorium for manufacturing of gas mantles etc., has resulted in singular contaminated sites of limited extent, mainly during the first half of the 20th century. Those contaminated sites have been or are being cleaned up and redeveloped. In comparison to the environmental legacy of Uranium mining and milling of the WISMUT in Saxony and Thuringia, those sites only present comparatively minor problems.

In large areas of Saxony and Thuringia, the geological formations permitted the surface and underground mining of Uranium ore. Facilities of the former Soviet-German WISMUT Ltd. where ore was mined and processed from 1946 until the early 1990´s can be found at numerous sites. The total Uranium production until 1990 amounts to about 200,000 t which corresponds to a high rank in worldwide comparison. In the course of the re-unification of Germany, the soviet shares of the WISMUT were taken over by the Federal Republic of Germany and the closure of the WISMUT facilities was initiated. In that phase the extent of the damages to the environment and of the necessary remediation work became clear. The Uranium mining and milling not only caused considerable surface damage and direct consequences of the mining work, it also gave rise to large amounts of radioactive and chemically toxic residues which had been disposed of in mill-tailing ponds and on heaps.

All mining and milling sites are now closed and are under decommissioning. A comprehensive remediation concept covers all WISMUT sites. Heaps and mill-tailing ponds are transferred into a long-term stable condition. The area of the facilities to be remediated amounts to more than 30 km^2. Heaps cover a total area of ca. 15,5 km^2, tailing ponds in which the tailings resulting from the Uranium production are stored as sludges cover 6,3 km^2 (with a total mass of some 160 million t).

In total, the remediation issues are very complex and without precedent. The implementation of the measures will cover a period of 15 to 20 years depending on the site. The necessary expenses are carried by the Federal Government and estimated to amount to about EUR 6.5 billion.

In addition the Federal Republic of Germany inhereted 6 operating NPPs of sovjet design from the former GDR (1 WWER-70 at Rheinsberg, 5 WWER-440 at Greifswald). Comprehensive safety analyses after the German reunifacation arrived at the conclusion that they did not correspond to Western German safety standards. They had to be shut down in 1990. As the power industry was not prepared to carry the financial risks of backfitting and re-licensing the reactors, the Federal Republic of Germany took over the liabilities. Presently Greifswald is the world biggest nuclear dismantling site. The aim is to finish the decommissioning activities around the year 2012. The total costs for dismantling the plants and storing the resulting waste are estimated to amount to about EUR 3.1 billion.

REPUBLIC OF KOREA

DECOMMISSIONING OF NUCLEAR FACILITIES IN KOREA

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Korea Research Reactors

Characteristics

The construction of the first Korea research reactor (KRR-1) was started in July 1959 and was reached its first criticality on March 19, 1962. The KRR-1 was utilised for the basic test of nuclear characteristics and for the education of the students of nuclear engineering until it was shut down in January 1995. The second Korea research reactor (KRR-2) came into operation in 1972 and enabled to widen the research on the nuclear characteristics and to produce several radioisotopes and relevant labelled compounds.

The KRR-1 was the TRIGA Mark-II type and had an open pool and fixed core. It had been operated for 36,000 hours and total heat generation during operation was 3,700 MWh. The fuel was 20 % enriched uranium-hydride and water was used as a moderator and coolant. The KRR-2 was TRIGA Mark-III type of open pool and movable core, and fuelled with 70 % enriched uranium. Total 69,000 MWh was generated during 55,000 hours operation. And water was used as a moderator, coolant and reflector while for the KRR-1 the graphite was used as a reflector.

Both reactors are located in Gongneung-dong, Seoul. The site had been formerly owned by the Korea Atomic Energy Research Institute (KAERI) before it was sold to the Korea Electric Power Company (KEPCO). The total area of the site is 48,000 m^2 and the ground space of building is 7,800 m^2. The estate of the site and buildings was transferred to KEPCO, but KAERI is still responsible for the decommissioning of KRR-1 and 2 as a licensee of the operation as it is defined in the Korea Atomic Energy Act.

Decommissioning Project

In 1996, it was concluded that KRR-1 and KRR-2 would be shut down and decommissioned. The main reason for the decommissioning was that the facilities became old and has become surrounded by the urbanised community. And many difficulties, including the higher cost, were faced according to the enhanced regulations. Another reason was the introduction of a new research reactor 'HANARO' in 1995. The new reactor can satisfy all the domestic needs of the research reactor utilisation in Korea.

A project to decommission the reactors was launched on January of 1997 with a goal of release of the site and buildings for unrestricted use by 2008. All the radioactive wastes generated are to be transported to the national repository, planned by the Korea Hydro and Nuclear Power Company (KHNP), and the final evaluation of the residual radioactivity will be made before the clearance of the site.

As a first step of the project, a decommissioning plan, including the assessment of the environmental impact and the quality assurance program, was prepared and submitted to the government in 1998. It was approved, after its safety evaluation, by the Korea Institute of Nuclear Safety (KINS) in November of 2000. After some preparative works such as documentation of procedures, the decontamination and dismantling works for the laboratories and hot cells of KRR-2 were started in September, 2001 and finished in December, 2002.

Waste Management

The spent fuels that had been generated from the reactors were transferred to the United States in 1998 and no spent fuel remained at the site. All the liquid waste, both operational and decommissioning, was very low in its radioactivity and was treated in a natural evaporation facility of 200 m^3/year capacity, developed by KAERI. Especially the laundry waste was treated in a membrane-filtering unit for the removal of surfactants before being introduced to the natural evaporator. The solid wastes were segregated and packed in the container of 4 m^3, designed according to the ISO-1496, and also in the normal 200-liter drums. The containers and drums will be stored in the reactor room of KRR-2 until they are transferred to the repository in 2008.

The total amount of the radioactive solid waste, to be generated during the decommissioning, was estimated to be 168 m^3 for KRR-1 and 453m^3 for KRR-2. Much of the radioactive waste was due to the removable surface contamination and it can further be re-segregated after chemical decontamination. In Korea, there has not been any clearance level, defined in the regulation, but a criterion of 0.4 Bq/g for beta-gamma was approved by the authority and is to be applied to the project. The releasable waste will then be discarded according to the prescribed route after the assessment of environmental impact and the evaluation of dose rate to the public.

Uranium Conversion Facility

Facility Characteristics

The uranium conversion facility, with an annual capacity of 100 ton-U, is located within the KAERI site in Yuseong, Daejeon. The total area occupied by all facilities, including the utility supply, is 1,550 m^2 and the building is three floored and divided into ADU process zone and AUC process zone. The facility mainly consists of vessels, tanks and many pipes of stainless steel used for the purification and conversion of uranium ore concentrates to uranium dioxide powder through ADU (Ammonium Di-Uranate) or AUC (Ammonium Uranyl Carbonate). The contamination level of the surfaces of equipment and epoxy-painted wall and floor were ranged from 0.12 Bq/cm^2 to 5.5 Bq/cm^2 for alpha and 33.4 Bq/cm^2 to 639 Bq/cm^2 for beta-gamma. There are two concrete tanks, called ‘lagoon’, for the liquid waste collection and the area of these lagoons is 760 m^2. The water collected in the lagoon was naturally evaporated, and the remained sludge waste is mainly composed of nitrate salt of ammonia and sodium.

Decommissioning Project

The uranium conversion facility was commissioned in 1982 for the development of the production technologies of nuclear fuels. And the facility was later modified for more automatic operation and the AUC process was added to meet the enhanced specification of nuclear fuels of PHWR till 1998. Around 350 tones of uranium dioxide were produced and supplied to KEPCO for the fuels of Wolseong-1 before it was shut down in 1993. Finally it was decided that the facility would be dismantled because of the deterioration of equipment and of the higher production cost due to its small scale. A project for the decommissioning was started in 2001. According to the article 55 of the Korea Atomic Energy Act, a decommissioning plan, including the environmental assessment and quality assurance program, has been prepared, submitted to the government and is being evaluated by KINS. After the approval, the decontamination and dismantling works is anticipated to start before the October of 2003 and will be finished in 2007.

Waste Management

The total amount of radioactive solid waste, to be generated during the decommissioning, was estimated to be 380 m^3, including the treated lagoon sludge waste. In this facility, only natural uranium was handled and therefore all the radioactivities were due to the removable surface contamination of uranium materials. And the introduction of chemical decontamination would significantly reduce the volume of the generated radioactive waste. The same concept and practice for the waste management as defined in the planning of the reactor decommissioning, were applied to the decommissioning of the uranium conversion facility except the level of release of 0.04Bq/g for alpha.

NETHERLANDS

THE IMPACT OF THE LIBERALISATION OF ELECTRICITY MARKETS ON NUCLEAR LIABILITIES

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Introduction

The situation with respect to electricity production within the countries of the European Union is rapidly changing. Directive 96/92/EC, concerning common rules of the internal market in electricity, introduced competition in the construction of new electricity generating capacity by a tendering or an authorisation procedure. The Netherlands has implemented this EC Directive by a revision of the Electricity Act which entered into force on 1st of August 1998.

While the EC Directive originally scheduled to open the market in three steps with the aim to have a fully liberalised system in 2007, the actual developments have accelerated the implementation rate. In 2002 already 63% of the electricity market in the Netherlands was opened and it is envisaged that in 2003/4 also small consumers will have access to the liberalised electricity market.

The liberalisation of the electricity market had two, basically opposite effects:

1. The electricity sector, aware that in a competitive environment less cost-effective activities should be discontinued, decided that the NPP in Dodewaard, which was mainly intended for nuclear research, be taken out of operation. The Dodewaard plant was closed in 1997, before the formal introduction of the EC Directive and the revised Electricity Act. About the same time an informal request was floated to the government, which the aim to investigate under which conditions the utilities could withdraw as shareholders in the Central Organisation for Radioactive Waste (COVRA), the recognised agency for the management of radioactive waste. Both actions are representative for the view that the future perspective for nuclear energy is rather dim, and that further association in any way with nuclear energy would be a liability in negotiating new contracts.

2. On the other hand EPZ, the electricity generating company which operates the NPP in Borsele, filed a request to continue operation of the plant after 2003, the year in which the government has agreed to shut down this plant. This request was stimulated by a ruling of 24 February 2000 of the State Council, the high administrative court in the Netherlands, that current law does not provide a legal basis to enforce a shut down of the NPP on grounds not related to safety. Finally the Civil Court in ‘s-Hertogenbosch in its ruling of 25 September 2002 denied the existence of any formal agreement between the government and the electricity board on a closure date. Together these rulings have now made clear that the operating license of the Borsele NPP is without an expiration date and is valid as long as the safe operation of the NPP can be guaranteed.

3. The argument in favour for continued operation of the NPP in Borsele is that it has low operating costs, it has an excellent operating record with a high load factor, it has undergone major upgrading to state of the art safety standards very recently, and it can consequently generate electricity at competitive prices. This is an asset in an electricity market which has dramatically changed in previous years.

COVRA restructuring

Following the explorative talks on the involvement of the utilities with future obligations related to electricity generation with nuclear energy (see Section 2 of the Introduction), steps have been undertaken to transfer ownership of COVRA from the original shareholders, the utilities EPZ and GKN (NPP's Borssele and Dodewaard respectively) and the research foundation ECN to the State.

Reasons underlying this intention included the liberalisation of the electricity market which became effective in the Netherlands as of 1 January 2001 and the government decision to phase out of nuclear energy for electricity production by the envisaged closure of the Nuclear Power Station in Borssele per 1-1-2004.

Although this last decision has been rescinded (see Section 2 of the Introduction), the wish to withdraw from COVRA was maintained. After a lengthy negotiation process an agreement was reached between the utilities and the government on the conditions for the transfer of shares to the State. Signature of the agreement by all parties concerned took place on 15 April 2002.

The main features of the agreement comprised the assurance of financial provisions (as an annual contribution or as a down payment) offering full coverage of the future obligations for the management of the high level radioactive waste by COVRA and partial coverage for the management costs of LILW. The agreement included the construction of the long-term storage facility HABOG, the operation of HABOG during 130 years as well as the final disposal of the waste in an underground repository. Under the agreement the utilities are now discharged of any further responsibility with regard to the management of radioactive waste. More details of the agreement are specified below.

One of the basic principles governing radioactive waste management and also adhered to in the Netherlands is *the polluter pays principle*. This principle requires that all costs associated with radioactive waste management are borne by the persons or institutes responsible for the generation of this waste. These costs, which include costs for removal, transport, treatment, conditioning, storage and disposal are charged by COVRA to its customers. According to its statutes COVRA is set up as a non-profit organisation which works on the basis of full cost recovery. In that respect COVRA is in practice a monopolist, because it is the only recognised radioactive waste management agency. On the other hand COVRA has a legal obligation to accept the waste offered by license holders for removal provided that it meets the acceptance criteria, as set by COVRA.

For LILW there are fixed tariffs for specified categories of radioactive waste which take into account all management costs as explained before. Once the transfer of the waste has been accomplished the customer is exempted from further responsibility for the waste. No surcharges can be made to make up for exploitation losses by COVRA and no waste can be returned to the customers. While the tariffs are annually adjusted with the price index, every five years the tariff structure is evaluated with the aim to reconsider the need for any structural adjustment. However, the utmost restraint is exercised to any proposal for an increase of the tariffs, in order to prevent the temptation of environmentally irresponsible behaviour with the waste by the customer. In the previous period COVRA suffered substantial and structural exploitation losses for the management of LILW which

can be partly attributed to a successful implementation of national waste separation and reduction policies. Financial support as a combination of a subsidy and a loan granted by the government, aimed to ensure that COVRA will have a positive financial result for the next 15 years.

While it is recognised that COVRA as a waste management agency has a public utility function, negotiations with the electricity sector on the transferral of shares focused on a fair share of all parties concerned in the future losses of COVRA.

The management costs for HLW are dealt with in a different way. HLW is presently generated by essentially 5 customers, namely the two nuclear power stations (Borsele and Dodewaard) and two research reactors (JRC in Petten and IRI in Delft) and one institute for nuclear energy research (ECN).

These 5 customers have joined forces and concluded an agreement for the construction of a long-term interim storage facility for HLW, the HABOG. This agreement includes a break-down of the costs associated with construction (1999 - 2003) as well as with maintenance of the HABOG both during its active phase of operation (2003 - 2015) and during its passive phase of operation (2015 - [4]).

The cost break-down for these customers is:

EPZ (operator of the Borsele NPP):	61.6 %
GKN (operator of the Dodewaard NPP):	15.9 %
JRC (research reactor):	12.4 %
ECN (research institute):	8.6 %
IRI (research reactor):	1.5 %

As mentioned before, in 2002 three of these main customers (EPZ, GKN and ECN), stepped down as shareholders in COVRA.

The total construction cost for the HABOG is estimated at € 116.- million (1999 price level).

For the realisation of an underground disposal facility which is designed for the disposal of both LILW and HLW a total amount of about € 1.23 billion is estimated (1985 price level). For HLW only a cost estimate of approximately € 0.82 billion is utilised. Financial provisions have been made on the assumption that disposal will not occur before 2130 and annual contributions are being paid into the fund which are based on a discounting rate of 3.5 %.

Envisaged take-over of GKN by COVRA

An advisory committee on the stranded costs in the electricity production sector recommended that as a next step after the transformation of COVRA into a State-owned Agency, a merger between GKN, the operator of the decommissioned nuclear power station at Dodewaard and COVRA, should be effectuated. Preliminary talks have demonstrated a mutual benefit from such a merger, because on one hand the technical expertise in the field of design and operation of the reactor installations would be maintained while on the other hand expertise on radioactive waste handling techniques is assured. It is envisaged that the joint venture between the two companies can be realised as soon as the financial obligations for the long-term management of the radioactive waste from the

4. The storage period ends with the disposal of the waste; for cost discount purposes the year 2130 is utilised.

Dodewaard power station have been settled. At present the negotiations are ongoing, and both parties have the intention to achieve an agreement in the course of 2003. The optimism sprouts from the fact that a substantial amount of money has been put aside in a fund managed by the electricity board.

The main issues of contention at the moment are related to the total cost estimates for the liabilities of GKN - which to the view of COVRA and the government are underestimated - broken down into the following specific items:

- Decommissioning costs of the NPP Dodewaard:

- Lower clearance levels to be adopted for decontamination of installations and structures;
- Estimated time for the removal of contamination from surfaces should be increased (labour cost);
- Removal of chemical hazardous materials (asbestos) should be taken into consideration.

- Uncertainties about the contents of the reprocessing contracts, and hence uncertainty about the possibility that the separated plutonium will be returned and provisions have to be made about its management or alternatively, that high costs will be charged for storage at the reprocessing facility during prolonged periods.
- Uncertainties about future decommissioning costs of the reprocessing plant which are likely to be apportioned over its shareholders including the NPP Dodewaard.

Irrespective of the outcome of the negotiations, it is clear that the result will set an example for the deliberations on the financial aspects of decommissioning with the NPP Borsele.

SLOVAK REPUBLIC

LIABILITIES IDENTIFICATION AND LONG-TERM MANAGEMENT DECOMMISSIONING OF NUCLEAR INSTALLATIONS IN SLOVAK REPUBLIC

Jana Burclova, Ladislav Konecny
Nuclear Regulatory Authority of the Slovak Republic

The decommissioning is defined as the safe removal of nuclear facilities from service and reduction of residual radioactivity and/or risk to a level enabling their use for the purpose of another nuclear facility or unrestricted use (site release) and termination of license.

I. Legal Basis for Decommissioning and Waste Management

1. Act 130/98 Coll. on peaceful use of nuclear energy (Atomic Act)

The act specifies the liabilities associated with radioactive waste management**:**

- the producer of radioactive waste is responsible for its safe management from origin till to its take over at the disposal facility
- a legal person established or assigned by the Ministry of Economy is responsible for the safe disposal of radioactive waste
- the authorised person can proceed with radioactive waste only on the basis of the permission issued by Nuclear regulatory Authority (ÚJD SR)
- all activities related to the radioactive waste management shall result in its safe disposal
- radioactive waste producer shall control the production of radioactive waste by the help of technical and organisational provisions in order to keep its quantity and activity at the lowest rational achievable level
- ÚJD SR shall appoint the organisation for management of orphan sources and abandoned radioactive waste.
- the repository can be located only on the territory, which is in the state ownership

as well as liabilities associated with decommissioning:

- the operator is responsible for decommissioning of nuclear facility including ensuring of financial resources,

- decommissioning may start after ÚJD SR issues the permit on the basis of assessment of application supported by safety analysis documentation. In case that decommissioning is running in more phases the permit is required for each phase.

- the act requires:

- initial and ongoing conceptual decommissioning plans (§ 14, § 15)

- updated conceptual decommissioning plan (§19)

- decommissioning safety documentation for individual phases of decommissioning including radioactive waste management (§19)

- final decommissioning (survey) report verifying completion of the decommissioning works (§19)

The respective regulation No 190/2000 Coll. on the radioactive waste management and spent fuel management specifies the basic safety requirements for all steps of radioactive waste management from collection to disposal of radioactive waste including the classification system and records keeping.

Radioactive waste management and decommissioning are also regulated by another regulations of ÚJD SR and safety guides:

- -regulation No 284/1999 Coll. on transport of nuclear materials and radioactive waste (on the basis of IAEA Regulation No ST-1 from 1996),

- regulation No 246/1999 Coll. on safety documentation for decommissioning

- safety guide on safety documentation for decommissioning (issued 2000)

- safety guide on disposal of radioactive waste (under preparation)

- safety guide on handling and processing of radioactive waste from nuclear applications (under preparation)

2. The act No 127/1994 Coll. on environmental impact assessment (amended 2000)

Establishes the responsibility of Ministry of Environment to evaluate the proposals for all new facilities which can influence environment. The scope of the evaluation includes all new nuclear facilities and also the changes exceeding 50 % of former extend of activity. This act also establishes the responsibility of Ministry of Environment to give the statement to the proposals for decommissioning options before start of decommissioning. Direct and indirect impacts resulting decommissioning and new activities to urban structure, health, living conditions and satisfaction of people including personnel are assessed.

The environmental impact assessment process includes **public hearings** of citizens in local and neighbouring municipalities, local initiatives and actions by public institutes. Local authorities, individual citizens, and public institutions may express their comments and opinions in public hearings and as written statements. A positive statement from the safety authorities (Nuclear regulatory and radiation protection authorities, Ministry of the Environment) is a binding prerequisite for the acceptance of decision by government.

3. The act No 254/1994 Coll. on creation of state found for NPP decommissioning, spent fuel management and disposal investment (amended 2000, 2001)

Gives the details how to create and use the found. The operator pays yearly 350 000 Sk/MWe and 6.8% of electric power market price. State grant can be the other source of finance, important source is interest from bank account.

The fund can be used for decommissioning, spent fuel and radwaste management of facilities under decommissioning, abandoned radwaste management, investment and RD for repositories.

4. The act No 272/1994 Coll. on protection of public health (amended 1996,2000)

Establishes the responsibility of Regulatory Body under Ministry of Health and requirements for radiation protection. From the point of the view of decommissioning, the Act and respective Regulation No. 12/2001 Coll. give the material and site release criteria and rules for remediation. ÚJD SR issues before import of radioactive sources the statement on possibility to dispose them in future.

II. Licensing process – check points

The licensing process for radioactive waste management installations as for all nuclear installations is running in following principal steps. The permits for siting, construction, operation including commissioning, individual steps (phases) of decommissioning and site release are issued by municipal environmental office on the basis of the Act No 50/1976 Coll. on territorial planning and construction rules (Civil Construction Act) and the decisions of ÚJD SR based on the Atomic Act. The safety documentation shall be prepared by applicant and it is subject of the regulatory bodies approval, for nuclear safety is responsible ÚJD SR, for radiation protection Ministry of Health, for fire protection Ministry of Interior and for general safety Ministry of Labour, Social Policy and Family.

ÚJD SR issues the permit for each decommissioning phase based on review and approval of safety documentation (§19 of Act No 130/98 Coll., §4 of Regulation No. 246/99 Coll.).

III. Decommissioning Strategy of Slovak Republic – time scales

Strategy was strongly influenced by the changes of Waste Management Strategy. During the last time ÚJD SR dedicated the great effort to principal improvement of legislation, to co-operation with Ministry of Economy with the aim to create rules for financial sources for decommissioning activities and to enforcement of operator to complete the radwaste and spent fuel management. All

these facts resulted to general acceleration of decommissioning activities and decommissioning planing.

As a consequence of historical approach, various technical objections and also for collocation of decommissioned facilities with operating ones, the preferred decommissioning option is deferred dismantling. The reduction of range and duration of safe enclosure from confinement to core structures and from 70 to 30 years was the result of changing radwaste management strategy.

Currently preliminary decommissioning studies for WWERs are being updated including the optimisation of the safe enclosure /differed dismantling duration, in accordance with the full set of parameters.

SLOVENIA

NATIONAL DEBATE

Maks Pečnik
SNSA

Miran Veselič
ARAO

The Governmental polices in the area of the safety of spent fuel management and of the safety of radioactive waste management are set in comprehensive nuclear legislation comprising of international agreements, domestic laws and regulations. In addition the government prepared several documents pertinent to the policy in the area of radioactive waste management. The most important are:

A Strategy of Energy Use and Supply of Slovenia, adopted by the Slovene Parliament in 1996. In this document the following policy was adopted:

- The long-term aim is to abandon electricity generation based on nuclear power in a safe, ecological, as well as economically acceptable way. Based on this it is not foreseen to construct any new nuclear power plants.

The Decommissioning Plan for the Krško NPP was produced and approved by the Government in September 1996. In this document the following policy was adopted:

- For the purpose of cost assessment for decommissioning and radioactive waste and spent fuel management and for estimation of the contribution to the decommissioning fund, various options were evaluated from radiological-safety, financial and political aspects.

- The immediate dismantling was decided as the most appropriate option. Due to many uncertainties in the Plan, the Slovenian Government decided to update the Plan with frequency three to five years.

The Strategy for Long-term Spent Fuel Management was adopted by the Slovenian Government in 1996. Due to the size of Slovenian nuclear fuel cycle and the magnitude of task it was decided to defer decision for final solution of this problem. According to current strategy, the decision on final solution for spent fuel in Slovenia will be adopted by 2020. The disposal of the spent fuel in the third countries will be also considered. As an alternative it is planned to dispose spent fuel by year 2050. Until then the fuel will be stored in the reactor pool or in dry storage at reactor site.

The Strategy on Low and Intermediate Level Waste Management has been prepared by the Agency for Radioactive Waste Management. The document has been submitted to the Government for approval. In the proposed strategy the LILW management is treated as an integral process, covering all stages from the waste generation to the waste disposal. The site selection and the construction of a repository for short-lived LILW is the principal strategic goal. The limited storage capacities in nuclear facilities call for decisions and practical solutions as soon as 2007, or at the latest by 2010. The more details on the LILW management strategy will be available after the approval of the strategy by the Government.

National programme for radioactive waste and spent fuel management

According to the new *Act on Ionising Radiation Protection and Nuclear Safety* (Off. Gaz., RS, No. 67/2002 – hereinafter referred to as 2002 Act) the National programme for radioactive waste and spent fuel management shall be adopted by the Parliament as a part of the national programme for the protection of the environment pursuant to the regulations on environmental protection. This National programme will substitute The Strategy for Long-term Spent Fuel Management and The Strategy on Low and Intermediate Level Waste Management.

The technical groundwork for the National programme for radioactive waste and spent fuel management, together with a detailed description of the measures relating to the reduction of the occurrence of radioactive waste, to the treatment thereof prior to disposal and to its disposal, and the measures relating to the treatment and disposal of spent fuel, shall be carried out and communicated to the ministry competent for the environment by the ARAO Agency. The operative programmes within the national programme of the radioactive waste and spent fuel management shall be drawn up by the ARAO Agency adopted by the Government. The operative programmes shall be adopted for a maximum of four years.

Role of actors

Based on legislation, number of measures were implemented to protect environment and human society against harmful impact of radioactive waste and spent fuel. The most important measures were the definition of actors in the area of radioactive waste management:

- Establishment and functioning of the regulatory body, Slovenian Nuclear Safety Administration (SNSA), which is competent in the area of nuclear safety and radioactive waste management. It was established in 1987. Previously, the functions of the regulatory body were within the Committee of Energy.

- Establishment of ARAO Agency, a public service for radioactive waste management (1991).

- Establishment of Mine irovski Vrh, a public enterprise for decommissioning of uranium production sites (1992).

- Establishment of Fund for the Decommission of the NPP Krško (1995)

- Stakeholders such as local communities and NGOs are informed about activities and shall be included in the siting process

Liabilities

A clear requirement for the management of radioactive waste and spent fuel is set in new *Act on Ionising Radiation Protection and Nuclear Safety* which provides that the holder of radioactive waste and spent fuel must ensure that the radioactive waste and spent fuel are handled in the way prescribed and that the transfer of the burden of disposing of radioactive waste and spent fuel to future generations is avoided as far as possible. The person responsible for the occurrence of radioactive waste and spent fuel must ensure that the wasted radioactive substances occur within the smallest possible quantities. The costs of radioactive waste and spent fuel management shall be paid by the person responsible for the occurrence of the radioactive waste; or by the holder of the waste if the possession of it transferred from the person responsible for the occurrence of it, or if he acquires it in any other way.

If the person responsible for the occurrence of radioactive waste or spent fuel is not known, the state shall take the responsibility for its management.

Liabilities are determined by legally binding instruments such as Law and subsidiary legislation. They are verified by regulators and approved annually through the report on Nuclear and Radiation Safety by the Slovenian Parliament.

Funding

The Krško NPP is also obliged to assure the funds for the decommissioning and the final disposal of radioactive waste and spent nuclear fuel. The decommissioning of the NPP Krško is regulated through the Act on the Fund for Financing the Decommissioning of the Krško NPP and on Radioactive Waste Disposal from the Krško NPP (Off. Gaz., RS, No. 75/94). Based on this Act, the Fund for Decommissioning of the NPP Krško was established. The Fund is a legal entity. It has the mandate to collect financial resources. Based on the Plan the Slovenian Government decided that the Krško NPP must contribute 0.61 SIT per every kWh of generated electricity to the decommissioning fund.

The activities of the Agency RAO are funded partially through national budget, Decommissioning fund and other producers of radioactive waste. Contribution from Decommissioning fund is strictly used for financing of siting and construction of LILW repository that will be built until 2013.

Situation

The current situation is perceived as satisfactory.

Confidence level

The information is open to general public, NGO and media.

Internet Resources

The following internet sites are available for additional information:

- Slovenian Nuclear Safety Administration: http://www.gov.si/ursjv/,
- Krško NPP: http://www.nek.si/,
- IJS Reactor Centre: http://www-rcp.ijs.si/,
- Jo ef Stefan Institute: http://www.ijs.si/,
- Agency for Radwaste Management: http://www.gov.si/ARAO Agency/,
- Fund for Financing the Decommissioning of Nuclear Power Plant Krško and for the Disposal of Radioactive Waste from Nuclear Power Plant Krško: http://www.sklad-nek.si/.

SPAIN

LIABILITIES IDENTIFICATION AND LONG-TERM MANAGEMENT AT NATIONAL LEVEL

José Manuel Espejo Hernández and **José Luis González Gómez**
ENRESA

EXECUTIVE SUMMARY

Radioactive Waste in Spain is due to 9 reactors in operation (7 NPP's) and another one (Vandellós I) under decommissioning, the Juzbado Nuclear Fuel Factory and some 1,300 radioactive installations.

From the legal and administrative standpoint, there is an organisation, based on a developed legislative framework in keeping with the evolution of international regulatory requirements, that defines and brings together the main responsibilities of the different parties involved in the process: the Government, through the Ministry of Economy (MECO), responsible for defining policies and awarding the corresponding permits and licenses; the Nuclear Safety Council (CSN), as the sole party responsible for nuclear safety and radiological protection, that reports to the Parliament; ENRESA, (Empresa Nacional de Residuos Radiactivos) a state owned corporation, as the company responsible for radioactive waste management, and the waste producers.

From the economic-financial point of view since early 1983, there is a system that covers the financing of radioactive waste management costs, based on the principle of generating funds up-front, throughout the operational lifetime of the nuclear power plants. Those are collected by a fee, consisting of a percentage (*) of the total electricity billing. The income collected through the application of the fee is accumulated in an interest-earning fund for financing of the costs that will normally occur years later. Small producers (hospitals, research centres, industrial applications of radioisotopes, etc) pay a tariff for the service of collecting and disposing of their waste.

The fee is aimed to cover the total costs of managing all types of radioactive waste and spent fuel, as well as of decommissioning of nuclear installations. Although its amount is calculated by summing up the expected costs from all these areas, its collection, and accordingly the rules for it, does not make any distinction of the future destination of the money.

(*) Due to the new Electricity Law, since 1998, there are two different values for the fee: one applied to the tariff consumers (regulated prices) and other for the qualified consumers (free choice for the suppliers) that is charged to the regulated part of the price, (costs for transmission and distribution of electricity).

ENRESA must evaluate every year the whole life system cost of radioactive waste management. The economical appraisal is presented to the MECO. The annual value of the fee is established in the Royal Decree of electricity tariffs, taking into account those cost calculations and in accordance with the estimates of the General Radioactive Waste Plan (GRWP), in such a way that the income arising from application thereof over a given period of time be proportional to the nuclear kWh produced during the said period. The 5th GRWP approved by Spanish Government in July 1999 is the currently in force.

The final economic balance of the management performed by ENRESA should be zero. Both the incomes from the quota and that arising as a result of the financial yield of net surpluses are set aside for the Fund. This Fund must be used only in compliance with the objectives for which ENRESA was created and therefore for financing of the costs of radioactive waste management activities contemplated in the GRWP (some 10.000 M€02 during the period 1985-2070). As of 31-12-2002 the Fund amounted to 1.735 M€.

The supervision, control and qualification of the financial investments of the Fund are the responsibility of the Tracking and Control Committee that reports to the Minister of Economy.

In this background, the Spanish financing system may be considered generally consolidated, as it addresses the obligations involved and may be adjusted to respond to whatever events may arise. However, due to the lack of experience in implementing some installations and to the long periods of time involved, uncertainties of two types remain in the system: uncertainties derived form cost estimates and forecasting and uncertainties associated to the potential mismatch between the collection and facility implementing periods.

ENRESA continues to work on perfecting minor issues, especially in relation to cost planning and forecasting. In this respect, and in view of the specific activities carried out as regards facilities, services and projects (e.g., the El Cabril Waste Disposal Centre, the Vandellós I NPP Dismantling Project, the construction of a dual purpose metallic cask, the Temporary Spent Fuel Storage Facility at Trillo NPP, etc…), greater accuracy is achieved when developing cost hypotheses, and consequently planning is better tuned. The quantification of economic uncertainties in high level waste disposal systems is a constant line of work, and in this respect ENRESA attempts to incorporate the most adequate techniques for cost analysis in a probabilistic framework.

Even though the economical calculations are revised every year, tempering forecasting inaccuracies, in the longer term, it is felt that problems might arise if there were a particularly significant time difference between the dates of plant decommissioning (when the ordinary revenues to the Fund cease) and the initiation of repository construction work (the period of greatest investments and outgoings). Under these conditions, any delay in constructing the definitive disposal facility might lead to not having sufficient financial resources available for its construction, operation or dismantling. The Spanish legislation includes no indications in this respect. Conceptually, various treatment hypothesis could be envisaged, such as legally increasing the period of fee collection, the creation of an extra fee during the last few years of collection, the obligation for the waste producers to contract additional guarantees (deposits, bank guarantees, etc.) in order to address uncovered risks, or acceptance by the State of responsibilities in relation to this issue.

Obviously, the case of a surplus of money after the completion of waste disposal is also to be taken into account. In relation to this hypothesis, criteria and procedures for liquidation or distribution should have to be set out. It is considered that, at present, it is to soon to approach such a question.

USA

Paper provided by the US delegation to the RWMC

1. Site Decontamination and Clean-up Under the U.S. EPA "Superfund"

Background: Contaminated and hazardous waste sites, including nuclear facilities, may be subject to clean-up under the U.S. Environmental Protection Agency (EPA). The Comprehensive Environmental Response, Compensation, and Liabilities Act (CERCLA), commonly known as "Superfund," authorises EPA to respond to releases or threatened releases of hazardous substances, pollutants, or contaminants that may endanger public health or the environment. The legislation defines hazardous substances to include radiation.

Entry into Superfund: The EPA may be notified of a site potentially requiring clean up from any source. Potential sites are evaluated under a numerical hazard ranking system, and are then included on the clean-up list ("National Priorities List") if they meet an established threshold.

Nuclear Facilities and Radioactively Contaminated Sites under Superfund: Any site may be subject to CERCLA action if EPA determines that it poses a hazard. There are three major types of sites that have been or are subject to action under this program:

- Federal nuclear facilities: For numerous nuclear facilities owned and operated by the U.S. government, portions or all of the site are undergoing clean up under CERCLA. Binding agreements between EPA, the U.S. Department of Energy and other Agencies establish roles and oversight at such sites in accordance with Superfund requirements.

- Decommissioned facilities: Nuclear facilities operating under an NRC license (including during decommissioning under license) aren't subject to CERCLA. However, upon license termination, a site may enter the Superfund system if additional contamination is discovered, or if EPA determines that decommissioning terms aren't sufficiently protective.

- Privately-owned, unlicensed sites: These include, for example, sites where operators go bankrupt or at which contamination occurs from unlicensed or "orphan" source or from private citizens inadvertently handling radioactive materials.

Liabilities Under Superfund: The authorising legislation specifically provided for liability of persons responsible for releases of hazardous waste at uncontrolled sites. Liability extends to those who are

- Current facility owners,

- Past facility owners or operators at the time of disposal of a hazardous substance,

- Generators of hazardous substances disposed at a site, and
- Transporters of hazardous substances who selected the disposal site.

Liability under CERCLA is "strict," "retroactive," and "joint and several." Thus, the burden of proof for disproving liability is quite high, and that the extent of the liability is not limited to the share of the waste or hazardous substance contributed by a party.

The EPA may pursue liable parties to recover past and future costs associated with clean-up, including direct costs and indirect costs incurred by both EPA and its contractors.

Clean-Up Levels: Clean-up goals and technologies are established on a site-specific basis. In general, clean-up goals must meet risk requirements (10^{-4} to 10^{-6} lifetime cancer risk) and be consistent with applicable standards. Other factors such as community acceptance, volume reduction capability, permanence, and cost may be considered to select between or modify alternatives. The ultimate disposal destination and disposal method for decontamination waste may be specified as part of the clean-up agreement.

Release from Liability: Once clean-up goals have been met, a site may undergo "close-out" and be removed from the National Priorities List. Due to the nature of liability under the Superfund law, however, a potentially responsible party remains potentially liable indefinitely. New information revealing additional hazards can provide grounds for re-opening a site.

Current Issues: Some nuclear facilities have the potential to be regulated by both the Nuclear Regulatory Commission (NRC) and the EPA upon decommissioning. To avoid uncertainty and duplication of effort in these situations, EPA and NRC signed a Memorandum of Understanding in 2002. The agreement clarifies how EPA and NRC will cooperate regarding sites that operate and are decommissioned under an NRC license.

2. Geologic Disposal at Yucca Mountain

2.1 Funding Mechanism

In accordance with the Nuclear Waste Policy Act of 1982 (NWPA), the costs for disposal of commercial spent nuclear fuel (SNF) in a potential repository are to be funded by $0.001 per kWh fee levied on electricity generated and sold. For SNF generated prior to enactment of the NWPA, utilities were required to pay a one time fee equivalent to an average charge of $0.001 per kWh. These fees are deposited in a Nuclear Waste Fund (NWF) held by the U.S treasury and managed by DOE The NWF is to be used for development and implementation of a radioactive waste management system in accordance with the NWPA, including a potential geologic repository. The U.S. Congress annually disburses monies from the NWF to the Nuclear Waste Disposal Appropriation, NRC Appropriation and the Nuclear Waste Technical Board Appropriation. Any fees received in excess of annual funding are invested in U.S treasury obligations at prevailing rates. Periodically, an assessment is made on the adequacy of the fees paid by the utilities to support the waste management program through permanent repository closure. Utility fees may be raised with Congressional approval should a funding shortfall be expected.

DOE is required to pay its fair share of cost for disposal of defence-related materials such as DOE SNF, naval SNF, and high level radioactive waste generated by weapons production activities. Costs for disposal of government-managed materials are currently paid through the Defence Nuclear Waste Disposal Appropriations by Congress, in lieu of direct payment of defence fees into the NWF. A

methodology for allocating costs between government-managed nuclear materials and commercial wastes was published in 1987, which provided a vehicle for computing each party's fair share of total disposal costs.

2.2 Costs for Repository Closure and Decommissioning

DOE is currently in the process of developing a license application to be submitted to the NRC in December 2004 for the construction of a geologic repository at the Yucca Mountain site located in the State of Nevada. Should the license application be approved, the repository would be developed in stages, initially providing only limited operating capacity in 2010. It is planned that, after waste emplacement and performance confirmation DOE would file an application with NRC for an amendment to the license to permit closure of the repository. Once the license amendment has been received from NRC, DOE will be able to permanently close the repository. The Environmental Protection Agency (EPA) and NRC regulations require DOE to undertake measures to regulate or prevent activities that could impair long-term isolation and to institute a monitoring program after permanent closure. Permanently closing the repository will require the sealing of the shafts, ramps, exploratory bore-holes, and other openings in the repository. Closure seals will be designed to discourage human intrusion and prevent water from entering through these openings. In concert with 10 CFR Part 63 requirements, a network of permanent monuments and markets will be erected around the site to warn future generations of the presence and nature of buried waste, and detailed public records will identify the location and layout of repository and the nature and hazard of the waste it contains. For planning purposes, the closure and decommissioning phase covers the period 2110 through 2119. The surface area will be restored to its original condition and the repository protected from future unauthorised intrusion. The federal government would maintain institutional control of the site and assume associated liabilities. Active and passive security systems and monitoring would prevent deliberate or inadvertent human intrusion and any other human activity that could adversely affect the repository.

Cost

The costs associated with the closure and decommissioning phase includes costs to fabricate and install drip shields; backfill shafts, ramps, mains, and extension drifts; permanently seal the underground repository; dismantle surface facilities; and construct monuments. The costs associated with these activities are (in 2000$):

- Surface: $ 210 M
- Subsurface: $ 470 M
- Drip Shield Fabrication and Installation: $ 3220 M
- Regulatory, Infrastructure and Management Support: $ 140 M
- Total: $ 4040 M

The NRC requires that the potential repository be designed to allow retrieval of waste at any time prior to closure. However the cost for the possibility of retrieving waste packages is not included in the costs described above.

ANNEX: PROGRAMME OF THE TOPICAL SESSION

11:30 12. TOPICAL SESSION ON 'LIABILITIES IDENTIFICATION AND LONG-TERM MANAGEMENT AT NATIONAL LEVEL'

CHAIR: JOSÉ-LUIS GONZALEZ
RAPPORTEUR: PETER BROWN

The topical session will cover liability assessment and management for decommissioning of all types of nuclear installations, including remediation of historic sites and waste management, as applicable.

Items that will be addressed are: The national debate and the role of actors; how are/were liabilities determined; how are they verified; is the exercise over or are there check points; what time scales are envisaged; mechanisms and steps necessary to set up a comprehensive funding; is the situation satisfactory and/or what are the open problems; how are funds managed; what issues of information and confidence arise vis-à-vis the relevant stakeholders, including media and the general public.

The presentations will cover the current, national situations and will be followed by a brief period of Q&As for clarification only. The first presentation, from Switzerland, will set the scene by providing a broad coverage of the relevant issues.

A plenary discussion period is foreseen at the end of the topical session.

Each national delegation is kindly asked to provide a two-to-three page text reviewing the situation in its own country [e-mail: lydie.guyot@oecd.org]. Intention is to collate the information with the written materials from the topical session speakers and to issue a set of proceedings

INTRODUCTION OF TOPICAL SESSION

11:40 12.A SWITZERLAND
M. Aebersold, Deputy Head of Nuclear Energy Section Federal Office for Energy
A. Zurkinden, head of "Transport and Waste Management Section, at the Swiss Federal Nuclear Safety Inspectorate.

12:30 ***Lunch***

14:00 12.B BELGIUM
Jean-Paul Minon, Acting Director of ONDRAF/NIRAS

14:30 **12.C SWEDEN**
T. Hedman, Director of Safety and Technology Dept.
M. Westerlind, Director, Office of Nuclear Waste Safety

15:00 **12.D UNITED KINGDOM**
Robin Sellers, Liabilities Management Unit of the UK Department of Trade and Industry

15:30 ***Break***

16:00 **12.E ITALY**
L. Noviello, SOGIN, Power Plants Decommissioning Director

16:20 **12.F HUNGARY**
I. Czoch, Head, Dept. CNFF Technical Administration
Hungarian Atomic Energy Authority

16:40 **12.G THE EC "NUCLEAR PACKAGE" (WITH EMPHASIS ON LIABILITIES FROM DECOMMISSIONING)**
D. Taylor, Head, Nuclear Safety, Regulation and Radioactive Waste Management, European Commission

17:00 **12.H PLENARY DISCUSSION**

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17:50 **12.I RAPPORTEURS' REPORT ON KEY FINDINGS AND MESSAGES**

18: 00 ***Adjourn***