

Unclassified

NEA/CNRA/R(99)4



Organisation de Coopération et de Développement Economiques
Organisation for Economic Co-operation and Development

OLIS : 18-Feb-2000
Dist. : 22-Feb-2000

English text only

PARIS

NUCLEAR ENERGY AGENCY
COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES

NEA/CNRA/R(99)4
Unclassified

Working Group on Inspection Practices (WGIP)

**REGULATORY PRACTICES FOR DECOMMISSIONING OF NUCLEAR
FACILITIES WITH SPECIAL REGARD OF REGULATORY INSPECTION
PRACTICES**

87619

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The primary objective of the NEA is to promote co-operation among the governments of its participating countries in furthering the development of nuclear power as a safe, environmentally acceptable and economic energy source.

This is achieved by:

- *encouraging harmonization of national regulatory policies and practices, with particular reference to the safety of nuclear installations, protection of man against ionising radiation and preservation of the environment, radioactive waste management, and nuclear third party liability and insurance;*
- *assessing the contribution of nuclear power to the overall energy supply by keeping under review the technical and economic aspects of nuclear power growth and forecasting demand and supply for the different phases of the nuclear fuel cycle;*
- *developing exchanges of scientific and technical information particularly through participation in common services;*
- *setting up international research and development programmes and joint undertakings.*

In these and related tasks, the NEA works in close collaboration with the International Atomic Energy Agency in Vienna, with which it has concluded a Co-operation Agreement, as well as with other international organisations in the nuclear field.

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COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES

The Committee on Nuclear Regulatory Activities (CNRA) of the OECD Nuclear Energy Agency (NEA) is an international committee made up primarily of senior nuclear regulators. It was set up in 1989 as a forum for the exchange of information and experience among regulatory organisations and for the review of developments which could affect regulatory requirements.

The Committee is responsible for the programme of the NEA, concerning the regulation, licensing and inspection of nuclear installations. The Committee reviews developments which could affect regulatory requirements with the objective of providing members with an understanding of the motivation for new regulatory requirements under consideration and an opportunity to offer suggestions that might improve them or avoid disparities among Member Countries. In particular, the Committee reviews current practices and operating experience.

The Committee focuses primarily on power reactors and other nuclear installations currently being built and operated. It also may consider the regulatory implications of new designs of power reactors and other types of nuclear installations.

In implementing its programme, CNRA establishes co-operative mechanisms with NEA's Committee on the Safety of Nuclear Installations (CSNI), responsible for co-ordinating the activities of the Agency concerning the technical aspects of design, construction and operation of nuclear installations insofar as they affect the safety of such installations. It also co-operates with NEA's Committee on Radiation Protection and Public Health (CRPPH) and NEA's Radioactive Waste Management Committee (RWMC) on matters of common interest.

ABSTRACT

In many countries the industrial activities for the decommissioning of shut down nuclear facilities have increased within the last ten years and are constantly increasing as older facilities retire and the need for their dismantling or safe enclosure (safe-store) becomes prominent. The regulatory requirements and inspection programmes for the decommissioning of shut down nuclear facilities have drawn increasing attention.

This report summarises the answers of fourteen countries to a questionnaire describing the licensing requirements and the programmes on regulatory inspection during decommissioning. As background material some short information on ongoing decommissioning projects is given. Also, brief information on the national status of projects for final repositories for radioactive waste has been included in the answers.

FOREWORD

The NEA Committee on Nuclear Regulatory Activities (CNRA) believes that an essential factor in ensuring the safety of nuclear installations is the continuing exchange and analysis of technical information and data. To facilitate this exchange the Committee has established Working Groups and Groups of Experts in specialised topics. The Working Group on Inspection Practices (WGIP) was formed in 1990 with the mandate "... to concentrate on the conduct of inspections and how the effectiveness of inspections could be evaluated...".

As part of its programme of work, WGIP proposed and CNRA approved preparation of a report covering Inspection Requirements for Decommissioning Activities. In order to perform this study it was necessary to acquire general information on basic principles of regulatory and licensing practices in the Member countries. In pursuing this information, it became apparent it was not readily available through existing documents. Additionally, at the same time a joint OECD Workshop on Decommissioning was being planned for April 1999 in Rome, Italy. With the approval of CNRA the questionnaire was expanded, using input from the CRPPH secretariat and other OECD/NEA committees working in the fields of nuclear safety, radiation safety and waste management.

Although the CNRA Working Group on Inspection Practices (WGIP) primarily deals with regulatory inspection, WGIP with approval of CNRA agreed to compile the basic principles of regulatory licensing requirements and inspection programmes for decommissioning from the results of the questionnaire. The preliminary draft of this report was used as a background document for the Rome workshop.

As part of its mandate the WGIP is charged to identify commendable inspection practices. These commendable practices are extracts from the topics, which were discussed by WGIP and were thought to be reference for Member countries. These are not international standards nor guidelines. Inspection practices should be determined by each country, considering its own historical, social and cultural backgrounds, and the commendable practices can be useful reference when each country improves its inspection practices

In offering thanks to the members of WGIP who provided valuable time and considerable efforts towards the production of this report, the NEA Secretariat also wishes to acknowledge the special work of several key persons. Dr. Hartmut Klonk of BfS in Germany provided much of the analysis provided in the report and many hours in editing and compiling the final report. Mr. Thomas Warren, Chairman of WGIP who provided clear insights on the objectives and skilfully chaired many meetings and assisted in developing the questionnaire. Finally, Dr. Ted Lazo, NEA Secretariat for CRPPH for his invaluable insights into formulating the questionnaire.

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1. INTRODUCTION

In many countries the industrial activities for the decommissioning of shut down nuclear facilities have increased within the last ten years and are constantly increasing as older facilities retire and the need for their dismantling or safe enclosure (safe-store) becomes prominent. Technical solutions have been proved to be feasible and safe. They rely heavily on the regulatory provisions for clearance of radioactive material, on at least intermediate storage capacities of decommissioning waste and ultimately on the existence of final repositories.

The regulatory requirements for the decommissioning of shut down nuclear facilities have drawn increasing attention. Nevertheless, special regulatory inspection programmes for decommissioning are not yet widely established. In turn, even the approaches for regulatory approval of these activities have not yet been based on a legal framework in many countries.

Although the CNRA Working Group on Inspection Practices (WGIP) primarily deals with regulatory inspection, WGIP with approval of CNRA has agreed to compile the regulatory licensing requirements and inspection programmes for decommissioning.

Fourteen countries have contributed answers to a questionnaire. This report summarises the current regulatory programmes for decommissioning of nuclear facilities in the contributing countries following to the given answers.

The full answers are compiled in a tabular form in Annex 1. Some brief information on the decommissioning programmes in the different countries is given in Annex 2.

2. GENERAL REMARKS ON REGULATORY APPROACHES FOR DECOMMISSIONING

Decommissioning is defined to include all activities after the final termination of operation of a nuclear facility. Decommissioning consists of:

- the final shut down of a nuclear facility,
- sometimes followed by transferring it into safe store condition,
- decontamination and dismantling of systems and components,
- demolition of some or all of the buildings, and
- the clearance and release of the site to the green-field state if possible.

The phase of decommissioning is the last life cycle phase of a nuclear facility. All these activities are considered to be kept under regulatory control, in continuation from the operational phase. This includes licensing procedures where legally required or regulatory approval as well as regulatory inspection by the authorities.

Licensing and Inspection

The regulatory approaches to decommissioning vary widely in scope and depth of regulatory control. Some countries regard decommissioning as part of the licensed activities covered by the site licence or to be an “extension” of the operational phase and therefore treat this phase similar to major plant modifications. On the other hand, most countries define a new life cycle state requiring a licence for decommissioning or plan to introduce such a licensing regime.

Although the total inspection programme will be influenced by the reduction in risk potential, regulatory inspection is continued in almost the same manner and under the same principles like the inspection of operation has been carried out. This also concerns systems and components left over from the operation of the plant and continue to be necessary while decommissioning takes place. The emphasis of regulatory inspection will be shifted from questions concerning nuclear safety precautions to other items of inspection, which then become more prominent. These items are in particular radiation protection problems, waste considerations, release of material and industrial safety.

Decommissioning options

In all countries but in Spain, the utility as licensee or, respectively, the owner of the plant remains responsible for the safety of his plant. In most cases, it is his choice to select a decommissioning strategy, e.g., immediate dismantling or delayed decommissioning including safe store. He is requested to submit a decommissioning plan including a safety case (safety analysis report) and a justification for his proposals for regulatory review and approval.

The option for delayed decommissioning (safe store) mostly is justified by dose considerations for the personnel and by financial reasons. The latter argument indeed strongly depends on the individual cases and can lead to a different result. Some licensees conclude to prefer immediate dismantling also in terms of

costs, considering social effects and the benefits of retention of knowledge by keeping their qualified staff. Not all countries have made up yet a regulatory approach on how to judge on safe store in terms of safety.

Spain points out, that the subject of safe store condition needs an international consensus and common understanding about rules, standards and technical criteria.

In most countries the ultimate goal of decommissioning is the release of the site for unrestricted use for other purposes. Only in Japan, a nuclear site will remain under institutional control forever.

Clearance of waste material

An important feature of decommissioning is the possibility to clear waste material for recycling, reuse or conventional disposal. The clearance might be unrestricted or subject to conditions after clearance e.g. a prescribed installation for processing or disposal. Related regulations for this, i.e. clearance criteria and procedures, are developed and applied in almost all countries. The clearance criteria are in most cases based on the internationally agreed criteria for the resulting radiation exposure as recommended by IAEA/NEA.

Waste storage

The availability of intermediate storage facilities or final repositories for radioactive waste is of great importance for the timely conduct of decommissioning activities. The associated problems are not yet solved in all countries. Nevertheless, decommissioning of nuclear facilities may proceed as in any case the licensee has to demonstrate his ability to manage the radioactive waste safely as far as conditioning and storage is concerned.

Future regulatory developments

Some countries develop further requirements for licensing of decommissioning activities and develop corresponding standards and guidelines. The members of the European Union are in the process of introducing the EURATOM 96/29 directive into their legal framework. In general, most countries see the need for more precise legal requirements and regulatory guidelines to regulate or license and inspect decommissioning activities of nuclear facilities.

3. SUMMARY OF COUNTRY CONTRIBUTIONS (QUESTIONNAIRE)

This chapter summarises and reviews the answers given by the contributing countries. The questionnaire had 20 questions, divided into 6 main topics (represented by the following chapters 3.1 - 3.6). Conclusions are drawn to describe common practices as well as different approaches. Where possible, commendable practices are identified on the basis of the used regulatory practices in order to give advice for further enhancement of the safety of decommissioned plants and their regulatory control. These commendable practices are repeated and compiled in chapter 4.

The full answers are presented in tabular form in Annex 1 following the 20 questions and compiled by countries in alphabetical order.

3.1 General remarks, definitions, licensing

1. *What are your national policies or practices, laws and licensing requirements for the decommissioning of nuclear facilities and sites?*

Legal requirements for specifically issuing a licence for the decommissioning and dismantling of shut down nuclear facilities are given in the Czech Republic, Hungary, Italy, Germany and Spain. In the United Kingdom the site licence covers all activities from construction through decommissioning. Most countries have no specific regulations in place, some countries plan to introduce a licensing regime for decommissioning. Decommissioning is regulated mostly on a case by case basis by approval of the regulatory body similar to plant modifications. Safety reviews for these activities are generally required. In Italy, it is required by law that decommissioning is to be finalised by the release of the site for uncontrolled use. In Japan, power reactors shall be removed at the earliest stage after the termination of operation. A special reason for that requirement is not given, but obviously this reduces radiological risks and the burden on future generations. This may be recognised as commendable practice.

A special legal system is found in Spain. After final cessation of operation of a NPP the Ministry of Industry may decide to transfer the full responsibility and the licence from the utility having operated the plant to ENRESA which is a public company in charge of waste management. Decommissioning licence is granted to ENRESA.

Some countries require submission of preliminary decommissioning considerations (feasibility study) as a licence condition already for operation. Such data are to be revised regularly. Again, this is considered as commendable practice.

2. *Who determines when decommissioning should start and how long it should take? Briefly explain any license procedure covering the transition from operation to decommissioning.*

All countries assign the responsibility for starting decommissioning and elaboration of a decommissioning plan to the licensee. In Belgium, an agreement between the licensee and the regulatory body is sought. The UK NII has the power to direct that the licensee starts decommissioning in the interest of safety. This can be considered as commendable practice.

Some countries explicitly answered that after the final end of operation the removal of nuclear fuel and operational waste as well as first decontamination actions may be performed under the provisions of the still valid operation licence. It can be assumed that this is the case in almost all countries.

3. *At what stage does decommissioning or dismantling usually take place, e.g. immediately after reactor shutdown, after defuelling, a short time later to allow short-life contamination or activation to decay or after a few tens of years to allow longer half-life material to decay?*

As a common understanding decommissioning starts after defuelling the reactor. In most countries all of the mentioned options are possible. Their choice strongly depends on specific and individual factors of the facility. No single routine strategy should be prescribed by regulations. The choice for delay is made mainly on financial reasons, whereas in some countries the opinion is growing that immediate dismantling is in favour due to the retention of detailed knowledge of the plant. Some countries have not yet decided on the requirements for future decommissioning plan after a period of delay. In the case of delay, the regulatory body's agreement on a fixed time schedule and the directive to start dismantling after this period can be considered commendable practice.

4. *Can the regulatory authority insist that plant be decommissioned following the licensee's decision to cease operation?*

Only in Hungary, Spain and the UK, a legal requirement for starting decommissioning exists. In Switzerland, a legal requirement for decommissioning after cessation of operation is planned. In all countries, the regulatory bodies have sufficient enforcement power to ensure the licensee's responsibility for all questions concerning safety. In the Czech Republic the regulatory body can request to start decommissioning by license condition. In Japan, the licensee would be obliged to decommission the plant if the operating licence had to be revoked for safety reasons.

A legal requirement for decommissioning and removal of permanently shut down nuclear facilities may be considered a commendable practice.

5. *How does the regulatory authority ensure funding for decommissioning is made available?*

Only a few countries have no legal requirements for accumulating funds for decommissioning. In most countries, this is stipulated by other legal provisions than nuclear regulations. In many cases, the nuclear regulatory bodies have no jurisdiction to inspect on this.

No answer has been given on funds available in the case of premature closure of nuclear facilities. Nevertheless, the requirement for accumulating funds for decommissioning, even for a premature shut-down, and provisions to inspect on this should be considered a commendable practice.

6. *Does your country have or intend to have a national intermediate or final repository for radioactive waste?*

As decommissioning activities strongly depend on the availability of waste storage, this question was to gain a brief overview on the current status. A summarising description was not foreseen within this report. For information on national waste storage programmes see the answers given to question 6 in Annex 1.

3.2 Nuclear and Radiological Safety Considerations

7. *Who regulates safety and radiation protection after operation ceases and during decommissioning? Do the safety requirements (rules, regulations, standards, etc.) for construction and operation of nuclear plants apply partly or fully to decommissioning or are there alternative requirements? Please briefly explain any significant differences. Is there a requirement for a list of material to be decommissioned and a decommissioning plan with stated steps or priorities? Does a safety justification have to be provided for each phase of decommissioning outlining safeguards against current hazards?*

In all countries the regulatory bodies continue to be in charge of regulating safety and radiation protection as the plants change over from operation to decommissioning activities. The relevant regulations (safety requirements, rules, standards), normally applicable to construction and operation, continue to be valid also for decommissioning, sometimes including adaptations or amendments as appropriate. In Germany, a regulatory document exists giving guidance on how to use or adapt the current applicable regulatory rules according to the specific safety needs regarding decommissioning (see German answer to question 1). Only Finland and Hungary point out the need for establishing explicit regulations concerning decommissioning.

All countries require the submittal of a detailed decommissioning plan including safety justifications for the applied decommissioning tasks. In Italy, this decommissioning plan covers the complete project up to the final release of the site; safety justifications have to be provided for each decommissioning phase. The Netherlands has taken over the relevant IAEA RADWASS Predisposal Safety Requirements, calling among other things for an inventory list of material in the plant including the amount and nature of radioactive contents. Compilation and regulatory review of such a “radiological atlas” of the plant is considered commendable practice.

8. *How does the regulatory authority inspect the transition from operation to decommissioning and the decommissioning process, including any periods when safe stores are used?*

Basically, the inspection philosophy in all countries does not change during transition from operation to decommissioning. Increased emphasis is put on radiation protection, waste management and industrial safety aspects. In many countries, progress reports by the licensee on completed decommissioning steps are required which lead to subsequent inspection activities of the regulatory body. Structuring the regulatory inspection programme by the decommissioning steps seems to be commendable practice.

In Germany, the work order procedure as required by radiation protection guidelines and already in place for maintenance work during operation gets a high importance to control the safety of individual decommissioning tasks and gives valuable information to the regulatory body for inspection items. This can be regarded as commendable practice.

9. *How does the regulatory authority ensure that the actual radiological hazards to be encountered during the decommissioning process are known bearing in mind any delays before each phase if the process takes place.*

The given answers are not homogenous. In combination with the answers given on the previous questions, the following conclusions can be drawn.

The decommissioning plan has to include the safety evaluation of all hazards involved including estimation of the personnel doses and ALARA considerations. These plans are subject to regulatory review. However, given the nature of actual decommissioning work not everything can be identified, planned and assessed in that framework. Therefore, sufficient flexibility must be given (e.g., in the licence, in order to enable the inspection authority to deal with unforeseen issues and to ensure proper managing of safety by the licensee. It is commendable practice to make provision for such unexpected findings in the inspection strategy. The decommissioning plan has to take into account any potential loss of knowledge when delayed decommissioning is applied.

10. *Do care and maintenance regimes covering inspection, surveillance, and maintenance have to be provided before decommissioning starts and between phases? How are equipment, components or systems regulated which are left over from the operational phase and continue to be necessary while decommissioning takes place? How is new equipment regulated that is needed for decommissioning, decontamination and dismantling activities? Are there special safety requirements for new technologies e.g., remote controlled dismantling techniques?*

In some countries, including the Czech Republic and obviously all countries which already have substantial experience in decommissioning, care and maintenance regimes have to be provided before start of decommissioning. Also, new technologies, e.g. remote controlled techniques, have to be demonstrated to the regulatory body as to their safe application in those countries. It is commendable practice to have the foreseen use of dismantling techniques described in the decommissioning plan and reviewed by the regulatory body. Any change must then be justified and discussed with the regulatory body.

In most other countries, special requirements on this subject do not exist.

In general in all countries, systems and components left over from the operational state and needed for decommissioning as well as new equipment are regulated in the same way as during operation of the plant.

3.3 Waste Considerations

11. *Who is responsible for ensuring that appropriate waste facilities exist or are planned in order to meet the needs of practical decommissioning? Are the waste storage facilities licensed, inspected and regulated as nuclear sites? What happens to radioactive waste material from decommissioning e.g. is the waste released for unrestricted use, conventional disposal, recycling or reuse for non-nuclear purposes, or is the waste stored in a site-based radioactive waste storage facility? Please give some examples.*

In all countries, the waste producers are responsible for proper managing and storage of radioactive waste. In general, the national governments are in charge for establishing final waste repositories.

In Italy, the licensee is a national utility, therefore, all waste management activities will be performed by governmental agencies according to planned legislation. In Spain, the licensee of a nuclear facility under decommissioning is a governmental agency (public company) which also is responsible for all waste management activities and final repositories (see question 1).

In all countries all waste management facilities are licensed nuclear sites, although in Hungary the licence is granted by a different ministry.

The release of waste material (containing radioactivity below prescribed limits) for unrestricted use, conventional disposal, recycling or reuse is possible in all countries but in France. By this provision the amount of radioactive waste to be disposed off can be kept small. For the relevant criteria and procedures see question 12. If necessary, the release of waste material is regulated on a case by case basis.

12. *Briefly describe the specific activity and surface contamination clearance criteria and clearance procedures for the release of waste material for unrestricted use, and authorised reuse. How have these criteria been developed? Do they take account of the proposed IAEA, EU or other international clearance criteria?*

Some countries have not yet established release and clearance criteria and procedures but are in progress of developing such criteria. In all countries but in the UK release criteria refer to the international criteria discussed at the IAEA or the European Union. The international criteria are based on a dose of the order of 10 $\mu\text{Sv/y}$ to the public for each practice of release pathways. In the UK national criteria are in place. In France release of radioactive waste is not possible, therefore no criteria and procedures exist. As to clearance of material for unconditional use, in Finland an activity concentration constraint of 1 Bq/g is defined for beta-gamma nuclides and one tenth of that for alpha nuclides. In Germany nuclide specific values have been developed, e.g. 0.1 Bq/g for Co-60. In the Czech Republic, this value is 0.3 Bq/g; also limits for collective doses are in place in this country.

In addition to the above mentioned activity concentration limits, further requirements for surface contamination apply.

The development of an integrated approach for clearance criteria to release waste material from licensed activities taking into consideration the fundamental international guidance on acceptable radiation exposure is commendable practice.

13. *When is radioactive waste transferred from site-based waste storage facilities to the intermediate or final national repository?*

A general answer is not possible. Transfer of waste from the facility under decommissioning depends on the availability of intermediate storage and acceptance requirements of final repositories. In some countries waste is or should be transferred off-site immediately. France and Netherlands have regulations in place for interim storage on-site not to last longer than two years unless otherwise authorised.

3.4 Safe Store

14. *If decommissioning is significantly delayed with use of the safe store concept, what are the time spans or goals in terms of allowance for the decay of contaminated and activated material? Is the duration of a safe store phase limited by the regulatory body and what happens after that phase?*

Delayed dismantling normally is justified by expecting lower personnel doses due to the decay of Co-60 as well as by financial reasons. Time spans considered in the given answers range from 5 to less than 100 years, mostly 10 to 40 years. In Finland, different time spans for PWR and BWR are planned. In Sweden, no safe store period for shut down plants is foreseen.

In most countries the safe store time period is to be justified within the decommissioning plan and to be reviewed by the regulatory body. It may be viewed as commendable practice to develop a good balance between the benefits and the drawbacks of delaying the dismantling phase.

Only in Canada, Germany and Italy, submission of plans for final dismantling or the cleaning of the site after a period of safe store is required. Although in most countries the time span of safe store is not legally regulated it is commendable practice that the regulatory body develops its own view in terms of safety and requires the licensee to present a dismantling plan and strategy in due time before the end of this period.

15. *What technical criteria have to be satisfied before redundant plant, systems and components can be placed in a safe store? Does a safety case have to be prepared for each safe store phase covering all credible faults, and ageing? How are the safety cases, subsequent modifications, systems and structures regulated for safe stores? How does the regulatory authority ensure that necessary maintenance, care and surveillance are carried out?*

Eight countries explicitly require preparation of a safety case (safety analysis report) including provisions for care and surveillance for safe store for regulatory review. These are the countries that already have experience in decommissioning of shut down nuclear facilities. The items of concern are ageing of structures and the placement of material in a chemically and physically stable state in a manner, which minimises the need for human intervention. Consequently, the facility remains under regulatory inspection. Although not explicitly mentioned in the given answers it can be concluded that closing the facility for safe store without any personnel access for care and surveillance is not a safe approach.

The other countries have not yet such requirements in place.

Spain points out, that the subject of safe store condition needs an international consensus and common understanding about rules, standards and technical criteria.

16. *How does the regulatory body ensure that the licensee retains adequate knowledge about the remaining plant structures, systems and components during the safe store phase?*

The retention of knowledge is of great importance (see also the answers to other questions). This concerns the actual condition of the facility when placed in safe store as well as relevant records from the operational phase. The problem is not yet sufficiently solved in all countries.

In general, the licensee has to prepare a mechanism how this knowledge is retained and made available for future dismantling. All countries that have such requirements in place inspect these provisions. In Germany also the handing over of documentation in the case of a change of ownership is inspected. Netherlands refers to the IAEA safety code and guides on Quality Assurance (50-SG-Q2) which also give the requirements for proper storage conditions.

It is commendable practice to inspect the licensee's provisions for retaining of all relevant documentation and knowledge about the actual status of the facility, of relevant information from the operational phase, and for storage of documentation and handing over in case of change of ownership.

3.5 Future use or restoration of the site

17. *Will the site remain a controlled nuclear site forever or will it eventually be released for other purposes?*

In most countries the site will have to be released for uncontrolled use for other purposes (green-field). In Italy, this is even required by law. Nevertheless, in some countries there are other acceptable proposals conceivable like converting the site into another nuclear facility or even keeping it under perpetual institutional control. Only in Japan the site of a decommissioned nuclear facility will remain a nuclear site forever even if the green-field condition is achieved.

18. *When and with what conditions will the responsibility of the licensee be terminated? Who releases the licensee from the period of responsibility and imposes conditions, if any?*

Not all countries have solved this question on a legal basis. For the other countries the licensee will be released from his responsibility when all radioactive material has been removed from the site and stored, the site cleaned up and no further danger from ionising radiation exists, and the proper documentation has been prepared and reviewed by the regulatory body.

In Spain, the responsibility of the utility having operated the nuclear facility, terminates by decision of the Ministry when the licence and the full responsibility is transferred to ENRESA, the Spanish waste management agency (see Annex 1 question 1).

Germany points out that the licensee remains responsible for retaining any radiation protection documentation for at least 30 years according to Radiation Protection Regulations.

19. *How does the regulatory body ensure that the site can be released for unrestricted use? What kind of documentation is kept, and by whom, to describe the former nuclear activities and the checks that have been made to determine that there has ceased to be any danger from ionising radiation from anything on the site?*

In most countries the licensee performs the final radiological measurements of the site, the regulatory body inspects and reviews the results and in some cases performs own measurements. In general, governmental authorities are in charge for retaining the corresponding documentation when the responsibility of the licensee is terminated.

In Japan, where the decommissioned site remains a nuclear site forever, the licensee keeps the documentation within his responsibility. The requirements for this documentation are regulated, the documentation is inspected by the regulatory body.

3.6 Future Regulatory developments

20. *Are there any regulatory developments that are likely to occur in the near future?*

The members of the European Union (here: Belgium, Finland, France, Germany, Italy, Netherlands, Spain and United Kingdom) are in the process of incorporating the EURATOM 96/29 directive into their legal framework. This includes development of criteria for radioactive material eligible for unconditional clearance or for recycling, reuse or conventional disposal. In Germany, the process of setting up a new Ordinance on Radiation Protection is in an advanced state comprising clearance criteria.

Some countries are planning to introduce further legal requirements for licensing of decommissioning activities and develop corresponding standards and guidelines. Canada plans to improve on the legal basis of the regulatory body, including the capability to require financial guarantees to cover the costs of decommissioning in the event that a licensee becomes unable to carry out its responsibilities.

In general, most countries see the need for more precise legal requirements and regulatory guidelines to regulate or license and to inspect decommissioning activities of nuclear facilities.

4. COMMENDABLE PRACTICES

From the review of the country contributions within the previous chapters related to individual national approaches two sets of commendable practices have been identified. They were discussed, commented and finally agreed by the members of the Working Group on Inspection Practices (WGIP).

The commendable practices are not international standards nor guidelines. Inspection practices should be determined by each country, considering its regulatory environment and practices as well as its social and cultural backgrounds. Commendable practices can be useful reference when each country improves its inspection practices.

The identified commendable practices are based on those regulatory practices that are already in use in order to give advice for further enhancement of the safety of decommissioned plants and their regulatory control.

The preparation of a decommissioning plan including a safety case (safety analysis report and justification) for regulatory review is common practice and therefore not explicitly pointed out as commendable practice.

Commendable practices related to the regulatory body

- a) The regulatory body considers a legal requirement for timely decommissioning and removal of redundant nuclear facilities. The removal of nuclear facilities at the earliest stage after the termination of operation is expected to reduce radiological risks and the burden on future generations.
- b) The regulatory body imposes a licence condition as early as for the operation of nuclear facilities for submission of preliminary decommissioning considerations (feasibility study) by the licensee. Such data are to be revised regularly by the licensee during plant operation.
- c) The regulatory body has the power to direct the licensee to start decommissioning activities after final closure of a plant for the interest of safety.
- d) The regulatory body agrees on a fixed time schedule in the case of delayed decommissioning including starting dismantling the facility after this period.
- e) Within the scope of the regulatory regime a requirement for accumulating funds for decommissioning and associated waste management is stated, even for premature shut-down of nuclear facilities. The inspection authority has provisions to inspect on this.
- f) The regulatory body requests the licensee to describe the foreseen use of dismantling techniques in the decommissioning plan for review by the regulatory body. Any change has to be justified and to be discussed with the regulatory body.
- g) The regulatory body develops an integrated approach for clearance criteria to release waste material from licensed activities taking into consideration internationally accepted guidance on acceptable radiation exposure and optimisation. This serves to manage released material safely and to keep the amount of radioactive waste to be disposed off small.

- h) The regulatory body requires the licensee to justify any delay of decommissioning (safe store period) being based on a good balance between the benefits and the drawbacks of delaying the dismantling phase.
- i) The regulatory body develops its own view in terms of safety even if the time span of safe store may not be legally regulated. The regulatory body requires the licensee to present a dismantling plan and strategy in due time before the end of such period.

Commendable practices related to the inspection authority

- a) The inspection authority requests an inventory list of material in the plant to be decommissioned including the amount and nature of radioactive contents (“radiological atlas” of the plant) to be compiled by the licensee, updated regularly and made available to the inspection authority for information. This allows improved planning of decontamination, dismantling and waste management and correspondingly is valuable information for regulatory inspection.
- b) The inspection authority structures its inspection programme by the decommissioning steps of the licensee in order to enhance the effectiveness of regulatory inspection.
- c) The inspection authority requests the licensee to implement a work order procedure, e.g., as required and already in place for maintenance work during operation. This is a valuable tool for the licensee to control the individual decommissioning tasks, the involved safety considerations, the radiation protection and industrial safety for the personnel and gives information to the inspection authority for inspection items.
- d) The inspection authority includes in its inspection strategy provisions for unexpected findings that must be considered and duly dealt with to ensure proper managing of safety by the licensee.
- e) The inspection authority inspects the licensee’s provisions for retaining of all relevant documentation and knowledge about the actual status of the facility, of relevant information from the operational phase, and for storage of documentation and handling over in case of change of ownership.

Annex 1 Tabular compilation of national contributions

WGIP QUESTIONNAIRE ON DECOMMISSIONING

<i>General remarks definitions, licensing</i>	<p>1. What are your national policies or practices, laws and licensing requirements for the decommissioning of nuclear facilities and sites?</p>
BELGIUM	<p>1.1 The Belgian regulation concerning radiation protection, licensing requirements and procedures for the nuclear facilities is given in the Royal Decree of 28.2.63 and later modifications (latest modification on 2.10.97).</p> <p>a) Some organisational aspects are to be noticed: Two ministerial departments form the „regulatory authority“:</p> <ul style="list-style-type: none"> • SSTIN/DTVK in the Ministry of Labour, • SPRI/DBIS in the Ministry of Health. <p>Recently, the Ministry of Internal Affairs has taken over the responsibility of these two departments (situation not yet written in the regulation), awaiting the creation of a “Federal Nuclear Agency” depending from this Ministry.</p> <p>a) A “Special Commission for Ionising Radiation” has an advisory role for the regulatory authority, especially for the licensing of the installations.</p> <p>b) Non-profit organisations are licensed by the Belgian Authorities in the field of radiation protection and nuclear safety. They are in charge of the technical aspects (safety assessment, reception of the installations, inspection during operation,..). In particular, these organisations give reports of their safety assessments to the Special Commission. AVN is the most important one.</p> <p>c) The owner is responsible for all the aspects of the operation. A department “Health Physics” must exist in its organisation, responsible for radiation protection and nuclear safety (more generally, responsible for the respect of the authorisation). The department head is approved by the regulatory authority.</p> <p>Evolution of the regulation is foreseen in the near future (see question 20).</p> <p>At the present time, decommissioning of nuclear facilities and sites is not foreseen in the regulation (no licensing requirements). Nevertheless, some articles of the Royal Decree of 28.2.63 are used to cover the decommissioning:</p> <ul style="list-style-type: none"> • Art. 13 deals with the possibility for the regulatory authority to modify the decree of authorisation for operation of an installation, after proposal of the Special Commission. • Art. 17 deals with the responsibility of the owner in case of cessation of activity and with the duty of information to the regulatory authority. <p>1.2 Two nuclear facilities are under decommissioning in Belgium:</p> <ul style="list-style-type: none"> • BR3, a small pressurised water reactor, • Eurochemic, a reprocessing plant. <p>The decommissioning operations are approved, on a case by case basis:</p> <ul style="list-style-type: none"> • description of each operation by the owner, • approval of the operation by the Health Physics department of the owner, after review, • approval by the licensed organisation, after safety assessment, • notification to the regulatory authority. <p>The Health Physics department or the licensed organisation may ask additional studies or safety measures if necessary, before approval.</p>

General remarks definitions, licensing	1. What are your national policies or practices, laws and licensing requirements for the decommissioning of nuclear facilities and sites?
CANADA	<p>The decommissioning of nuclear facilities and sites is regulated by the Atomic Energy Control Board (AECB), a federal government agency. The authority for this regulation is founded in the Atomic Energy Control Act. The AECB issues licences for the siting, construction and operation of nuclear facilities. This licensing process is comprehensive and is based on the licensee making a safety case for its intended activities and maintaining resulting effects on the environment and humans as low as reasonably achievable (ALARA).</p> <p>The AECB also co-ordinates the input of various other federal and provincial regulatory agencies with relevant/applicable requirements into establishing the licensing conditions for operations at and decommissioning of nuclear facilities.</p> <p>Except for uranium mining facilities, where separate regulations empower the AECB to issue decommissioning licences, all decommissioning of nuclear facilities is currently regulated by amending the conditions of operating licences. With the coming into effect of the Nuclear Safety Control Act (NSCA) and the creation of the Canadian Nuclear Safety Commission (CNSC), the replacement agency for the AECB, the CNSC will issue decommissioning licences for other types of facilities, instead of amending the operating licences.</p> <p>Finally, there are extensive requirements placed on the proponent and the AECB for review by the public of documentation, including environmental assessment documentation, prepared in support of licensing actions. These requirements are contained in AECB policy and in the Canadian Environmental Assessment Act (CEAA).</p> <p>Among the requirements for an operating licence is a preliminary decommissioning plan whose purpose is to demonstrate the feasibility of decommissioning of the facility, and to provide cost estimates as the basis for financial guarantees.</p>
CZECH REP.	<p>Decommissioning is an activity, which is related to the utilisation of nuclear energy and is regulated by the Atomic Law, Act No. 18/1997. Decommissioning is defined by this law as an activity, which aim is to release nuclear facilities or workplaces with ionising radiation sources, after their operation have been finished, for other use or remove them from regulatory control. According to this law, for decommissioning activities a licence is required granted by the regulatory authority (State Office for Nuclear Safety). To the licence application, documentation has to be submitted by a licensee, which is set down by the law, the content of documentation is being specified by the implementing regulation and approved by the regulatory authority.</p>
FINLAND	<p>Our nuclear energy legislation stipulates that a licensee is responsible for the implementation and financing for decommissioning, but no detailed licensing requirements are given. A Government's decision requires that a licensee shall maintain decommissioning plan with updating every five years. There are no major decommissioning activities underway or foreseen in near future.</p>
FRANCE	<p>The obligations that the operator has to implement during decommissioning procedure are described into the new article 6ter of the decree of 11th December 1963 which is regulating basic nuclear installations (BNI). This decree is founding DSIN action. The article 6ter, issued on 19th January 1990, modify the procedure for decommissioning of basic nuclear installations. Before the issuing of this article, there were no requirements specifically applicable for decommissioning of a nuclear installation. The applicable procedures were the general ones relating to major modifications of installations.</p> <p>An administrative note (9th November 1990) was issued to explain in details the new procedure.</p>

General remarks definitions, licensing	1. What are your national policies or practices, laws and licensing requirements for the decommissioning of nuclear facilities and sites?
GERMANY	<p>According to section 7(3) of the Atomic Energy Act a licence is required for decommissioning, dismantling the entire plant or parts of it or for transferring the plant into a safe store condition. The licensing prerequisites are essentially the same as for construction and operation of NPPs and have to be applied as appropriate:</p> <ol style="list-style-type: none"> 1. Reliability and professional qualification of responsible personnel 2. Required qualification and knowledge of all other personnel 3. Precaution against damage resulting from decommissioning activities according to the status of science and technology 4. Liability provisions 5. Physical security against third party impacts 6. Environmental considerations <p>According to the Atomic Energy Act, the competent regulatory authority for licensing and supervision is within the federal state (<i>Land</i>) in which the nuclear plant is located. The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety performs the federal supervision and may give directives to the state (<i>Länder</i>) authorities.</p> <p>The ordinances under the Atomic Energy Act, especially the Radiation Protection Ordinance and the Nuclear Licensing Procedure Ordinance, apply to decommissioning as well as to construction and operation of nuclear plants. There are no further special laws and regulatory rules and standards specifically applicable to decommissioning. The regulatory body has to apply all relevant rules, guides and safety standards (e.g. KTA Safety Standards) as appropriate and according to the specific safety needs. In order to give guidance on the current applicable regulatory framework regarding decommissioning the "Guide to the Decommissioning of Facilities as Defined in §7 of the Atomic Energy Act" has been issued in June 1996.</p> <p>Submission of a preliminary decommissioning plan (feasibility study and estimation of waste) as a licence condition already for operation is required. This plan is to be revised every five years.</p>
HUNGARY	<p>There is no direct order declaring the national policy for decommissioning of NPPs.</p> <p>The Nuclear Safety Regulations (NSR) launched as Appendices of Gov. Decree No. 108/97(VI.25.) contains the orders to licensing for decommissioning of NPP's. The NSR estimates full releasing of the site for unlimited use as free, non nuclear area..</p> <p>The juridical background for the decommissioning of NPP's are the CXVI./1996. Act about Nuclear Energy and the Government Decree No. 108/1997.</p>
ITALY	<p>The Italian laws that regulate nuclear activities (D.L.vo 230/1995 L. 1860/1962) state that an application for Decommissioning Licence has to be submitted by the licensee of the NPP. The licence is granted by the Ministry of Industry and Trade, which is the same authority that grants Construction and Operation Licences.</p> <p>It has to take into account the advises of other interested ministries, of the local authorities (mainly regions) and of ANPA (Agenzia Nazionale per la Protezione dell'Ambiente) which takes charge of most duties of Nuclear Safety Authority.</p> <p>The main document to be produced by the applicant is an overall Decommissioning Plan up the final release of the site; the overall period may be divided in phases.</p> <p>For each decommissioning phase, the activities to be performed have to be described, together with their safety implications, the initial and final state and the wastes' management.</p> <p>No general policy has been issued up to now on the decommissioning strategy to be followed (DECON, SAFESTOR etc.), so decision are taken on a case by case basis. It has been announced, at governmental level, the institution of a National Agency for the operational management of radioactive wastes and for the operational decommissioning of nuclear installations</p>

General remarks definitions, licensing	1. What are your national policies or practices, laws and licensing requirements for the decommissioning of nuclear facilities and sites?
JAPAN	<p>1. Japanese national policies concerning the decommissioning of nuclear facilities are as follows:</p> <ul style="list-style-type: none"> a) The licensee of nuclear facilities shall bear the responsibility for decommissioning. b) Decommissioning shall be proceeded with sufficient attention to assurance of safety and in co-operation with the communities around the facilities. c) Power reactors shall be removed at the earliest stage after the termination of operation. d) The green grass site shall be continuously utilised as a controlled nuclear site after the completion of decommissioning. e) Japanese government shall support the research and development activities on technology for decommissioning and dismantling of nuclear facilities. The R&D activities are now being made based on the experiences in decommissioning of JPDR and JRTF. Decommissioning technology for commercial power plants is also being developed in national R&D projects. f) The licensee shall be responsible for processing and disposal of radioactive wastes resulting from decommissioning by establishing appropriate waste disposal program and bearing the costs for it. <p>2. The Law for the Regulations of Nuclear Source Material, Nuclear Fuel Material and Reactors (LRNR) stipulates the requirements for decommissioning of nuclear facilities. For commercial power plants, the Electric Utility Industry Law (EUIL) is also applied in addition to the LRNR.</p> <p>Apart from the laws above, in 1985, the Nuclear Safety Commission announced a specific guideline for ensuring the safety during the decommissioning of JPDR.</p>
NETHERLANDS	<p>In the Netherlands nuclear facilities are regulated via the Environmental Protection Act and the Nuclear Energy Act. At this very moment, decommissioning as such is not mentioned as a licensable activity in the Nuclear Energy Act and the Environmental Protection Act. Although, it must be said that the Nuclear Energy Act forbids to modify a nuclear facility in such a manner that it no longer complies with the description of the Safety Analysis Report without a proper licence. Nevertheless, currently the Nuclear Energy Act and the Environmental Protection Act are being revised that decommissioning is explicitly mentioned as a licensable activity. Also within this new licensing framework an Environmental Impact Statement will be required to be submitted in conjunction with a Safety Analysis Report.</p> <p>Pursuant to the Nuclear Energy Act a set of IAEA safety fundamentals, requirements and guides within the RADWASS programme is adopted for a more detailed regulation concerning decommission. To mention is the Safety Requirements on Predisposal Management of Radioactive Waste and Decommission; IAEA Safety Standard Series 152.</p> <p>Also in all the licences which are currently in force a requirement is put to submit a decommissioning plan to the licensing authorities. This decommissioning plan shall be updated on a regular basis.</p>

<i>General remarks definitions, licensing</i>	<p>I. What are your national policies or practices, laws and licensing requirements for the decommissioning of nuclear facilities and sites?</p>
<p>SPAIN</p>	<p>The main codes and standards related to nuclear facilities are:</p> <ul style="list-style-type: none"> • Nuclear Energy Act (Law 25/1964) • Nuclear Safety Council Law (Law 15/1980) • Electric Industry Law (Law 54/1997) • Regulations on Nuclear and Radioactive Facilities (Decree 2869/1972) • Establishment of ENRESA as the Spanish Radioactive Waste Management Agency (Royal Decree 1522/1984). <p>In the Nuclear Energy Act and Regulations on Nuclear and Radioactive Facilities it is not included the closure authorisation and decommissioning licensing process.</p> <p>The Nuclear Safety Council Law from 1980 states the closure authorisation by the Ministry of Industry but the licensing procedure to this process is not developed in the Law.</p> <p>A draft of the new Regulations on Nuclear and Radioactive facilities, reviewed to include the decommissioning licensing and to update other issues, has been submitted by the CSN to the Ministry for approval at the end of 1997. This draft has been distributed to different organisations and Ministries for comments and the process for approval is ongoing at this moment.</p> <p>The legal system in Spain defines the transfer of responsibility for decommissioning:</p> <p style="padding-left: 40px;">ENRESA was created as the Spanish Radioactive Waste Management Agency by Law in 1984. It is a public non-profit company and financed by fees. The utilities as licensees of nuclear power plants are paying these fees since 1984 as a fund to waste management and disposal.</p> <p style="padding-left: 40px;">According to the Law ENRESA has to collect and manage all radioactive waste generated in Spain, including in some cases waste from small radioactive installations closed without owner known. ENRESA is the owner and operator of the low and intermediate radioactive waste repository El Cabril. The repository is licensed by CSN. The radioactive waste from nuclear and non nuclear facilities (sanitary uses, etc.) are sent to this repository.</p> <p style="padding-left: 40px;">When a NPP has finished its operational life, the licence will be transferred from the utility operating the NPP to ENRESA, according to the concept laid down in the law. This will be based on a decision to be taken by the Ministry of Industry, it is not a decision that owners could take by themselves.</p> <p style="padding-left: 40px;">The owner of a closed nuclear facility will not get money for the plant but will be free of all future decommissioning expenses. ENRESA then has to cover all expenses of decommissioning and waste management based on the fees already paid by the utilities during the operational life of the plant. ENRESA has qualified staff and sufficient funds to carry out these activities in a safe way. It can contract other companies for specific tasks like other utilities with plants under operation. Ultimately, the state will be responsible in a situation where the funds accumulated by ENRESA are not sufficient.</p> <p>To solve the Vandellos situation after the incident of 1989, a procedure for licensing has been worked out between the Ministry, the CSN, ENRESA and the owner of Vandellos, taking into account the role of ENRESA by Law, before than new Regulations on details could be approved.</p> <p>For details concerning Vandellos see Annex 2</p>

General remarks definitions, licensing	I. What are your national policies or practices, laws and licensing requirements for the decommissioning of nuclear facilities and sites?
SWEDEN	<ul style="list-style-type: none"> • The “Act on Nuclear Activities” regulates safety in all types of nuclear activities including also decommissioning of nuclear facilities. Responsible authority is the Swedish Nuclear Power Inspectorate, SKI. • The “Act on Financing” regulates requirements on a system for funding future costs for final disposal of spent fuel and for the decommissioning of nuclear facilities (including the NPPs). Responsible authority is the Swedish Nuclear Power Inspectorate, SKI. The actual management of the fund is not a responsibility of the SKI. • The “Act on Radiation Protection” regulates radiation protection requirements. Responsible authority is the Swedish Radiation Protection Institute, SSI. <p>Remark: It should also be pointed out that general plans for decommissioning should exist at an early stage, long before a decision to phase out an individual reactor is taken. Detailed planning for individual reactors will come at later stages.</p>
SWITZERLAND	<p>The Swiss Atomic Energy Law (AtG) itself makes no reference to decommissioning. A Federal Act on the Atomic Energy Law establishes that the general licence for a nuclear installation can only be issued if a concept for decommissioning and eventual dismantling of the facility at the end of its life has been prepared. Studies on the feasibility of decommissioning have been accepted as sufficient proof in this context.</p> <p>The future Law on Nuclear Energy (KEG) will include more detailed requirements. So far, decommissioning of research reactors has had to be approved by the Swiss federal government.</p>
UNITED KINGDOM	<p>The Nuclear Installations Act 1965 (as amended) requires certain installations to be licensed. The requirements for licensing have gradually been increased over recent years and all major UK nuclear installations are now licensed. A licence, once granted, applies throughout the lifetime of an installation from manufacture, construction, commissioning, operation, modification through to eventual decommissioning and demolition. Each nuclear site licence contains 36 standard licence conditions. Licensing and nuclear and waste management aspects of the Nuclear Installations Act are regulated by HM Nuclear Installations Inspectorate (NII) of the Health and Safety Executive (HSE).</p> <p>The general safety legislation for all places of work, including nuclear sites, is the Health and Safety at Work Act 1974 and the numerous regulations which have been issued under it. Amongst these regulations are the Ionising Radiation Regulations 1985 (IRR85) which lay down the requirements to be met in respect of radiological protection.</p> <p>Details of the licensing procedure and what is expected from prospective licensees are given in an HSE publication "Nuclear Site Licences under the Nuclear Installations Act 1965 (as amended) - Note for Applicants".</p> <p>Details of the specific standards which NII will require a licensee to meet in the design of new facilities or modifications to existing facilities are given in an HSE publication "Safety Assessment Principles for Nuclear Plant". The regulation of planned waste discharge and disposal is undertaken by the Environment Agency in line with The Radioactive Substances Act 1993.</p> <p>The HSE policy on decommissioning is set out in "HSE Policy on Decommissioning and Radioactive Waste Management at Licensed sites" - Nuclear Energy - Vol. 36 No. 1 February 1997.</p>

<i>General remarks definitions, licensing</i>	2. <i>Who determines when decommissioning should start and how long it should take? Briefly explain any license procedure covering the transition from operation to decommissioning.</i>
BELGIUM	<p>2.1 The important question is not “who determines...” or “how long it should take...”, but to obtain an agreement between the regulatory authority, the owner and other organisations if any, on the successive operations and the time schedule.</p> <p>This agreement is based on technical, economical, safety and radiological reasons. An unilateral decision is not desirable.</p> <p>2.2 The transition from operation to decommissioning is characterised by an important step: safe shutdown of the facility after operation (and eventually defuelling).</p> <p>This operation has been approved for the BR3 reactor, following procedure described in point 1.2, due to the lack of any other license procedure.</p> <p>After this operation, the facility is in a safe state, with adequate safety systems and maintenance or surveillance procedures, awaiting decommissioning operations.</p>
CANADA	<p>One of the features of the Canadian nuclear regulatory system is its relative lack of prescriptive regulations. In effect, the licensee proposes its manner of operating or decommissioning a nuclear facility and the AECB reviews the supporting safety case prior to permitting the activity. Hence, in effect, the licensee proposes when the decommissioning should start and end. The AECB has the decision-making power as to whether to accept these proposals or require their modification prior to licensing, subject to the requirements under the CEAA for public consultation on environmental assessment including socio-economic impacts.</p> <p>As mentioned above, after agreement between the AECB and the proponent as to how the decommissioning will proceed and the satisfaction of all requirements under the CEAA, decommissioning would be allowed to proceed under control of a licence.</p>
CZECH REP.	<p>Under normal conditions, both the start and the duration of decommissioning are determined by the licensee and approved by the regulatory authority. The decommissioning follows after the termination of the operation of nuclear facilities or workplaces with a significant source of ionising radiation. This is prone to the permission of the regulatory authority, based on the approval by the regulatory authority of a required documentation set down in the implementing regulation.</p>
FINLAND	<p>A licensee proposes a decommissioning plan that is reviewed by the regulators. No specific decommissioning licence has so far specified in our laws or regulations. Transition from operation to decommissioning status would probably be regulated by STUK as a plant modification.</p>

<i>General remarks definitions, licensing</i>	<p>2. <i>Who determines when decommissioning should start and how long it should take? Briefly explain any license procedure covering the transition from operation to decommissioning.</i></p>
FRANCE	<p>As a general rule, the utilities are responsible for the safety of their installations. They have to implement dispositions to prevent the occurrence of accidents and, if necessary, limit their consequences.</p> <p>If the safety criteria are completed, utilities are free to choose their decommissioning strategy and the techniques to be used. The safety criteria are formulated by the nuclear safety authority, through the issuance of technical prescriptions that take into account the specific risks due to dismantling.</p> <p>So, in the case of a total completion of the safety criteria, the operator is free to decide when the decommissioning should start and how long it should take.</p> <p>In regulatory terms, the decommissioning of nuclear facilities requires 3 major phases:</p> <ul style="list-style-type: none"> – A phase leading to the end of operation of the facility. This phase includes the removal of all the fuel, removal of the waste produced during the operation phase and still present on site, disposal of fluids, some decontamination and drainage. They are similar to the ones taking place during the operation of the facility. They can be performed under the provisions of the authorisation decree for operation of the facility, in compliance with the same safety analysis report and the same general operating rules subject if necessary to some modifications. The operator must inform DSIN 6 months prior starting these operations and submit a safety case. DSIN formally acknowledges the end of this phase on the basis of a completion report and after a thorough visit. – A phase leading to the shut down status of the facility. This phase that can be started while the previous one is still going on, consists in dismantling the equipment outside the nuclear island which are no longer required for surveillance and safety. The containment is reinforced. At the end of this phase, a complete inventory of the remaining radioactivity is conducted. These operations need a formal authorisation given through a decree signed by the ministers for industry and for environment, after assent of the minister for health and after a thorough examination of the documents (safety analysis report, proposed general operating rules, decommissioning plan, etc.) by experts attached to DSIN. – A phase consisting in actually dismantling the facility. This phase can be started as soon as the previous one is completed or can be delayed. Sometimes, this phase is subdivided into two sub-phases, the first one leading to decommissioning IAEA level 2, the second one leading after some delay to a decommissioning IAEA level 3. An authorisation decree and an assessment by the safety experts are needed. This procedure involves, in general terms, a local inquiry (which is not required for the previous phase) and last 18 to 24 months.
GERMANY	<p>Within his responsibility for the safety of his plant the licensee is responsible for operation and finally for the decision to permanently shut down his facility (notwithstanding decisions by the regulatory body concerning major safety implications). The licensee has to apply for a decommissioning licence. As long as this licence is not yet granted, all conditions and provisions of the still valid operation licence remain in force. Within this period, the licensee in general may defuel the reactor, transport nuclear fuel and operational radioactive waste off site and perform decontamination works and radiation and contamination surveys of the plant. These activities are covered by the operation licence.</p> <p>Usually, the entire process of decommissioning will be divided into several project phases with application and granting of individual licences. It has been proven advantageous for both the licensee and the regulatory body as a first phase to apply for a licence covering deregulation of operational procedures, in particular cut back of control room staff requirements, suspending regular testing and inspection of operational safety equipment, etc.</p>

<i>General remarks definitions, licensing</i>	2. <i>Who determines when decommissioning should start and how long it should take? Briefly explain any license procedure covering the transition from operation to decommissioning.</i>
HUNGARY	<p>The licensee determines.</p> <p>The Nuclear Safety Regulations orders to prepare the documentation for decommissioning as part of Safety Reports. During the operation phase the documentation must be actualised in every 2 years. 5 and 1 years before final shutdown of NPP this documentation have to be re-prepared regarding to the life cycle of the NPP.</p> <p>License procedure covering the transition from operation to decommissioning:</p> <ol style="list-style-type: none"> I. Final shutdown II. Period of preparation for decommissioning (can include a period of safe enclosure) III. Period of decommissioning. <p>For the phases I and II needs Final Shutdown License, for the III phase needs a License for Decommissioning launched by the Regulatory Authority.</p>
ITALY	<p>The licensee applies for decommissioning by sending a General Plan together with the application. Decommissioning starts when the application is approved by the Ministry of Industry and Trade. In the Overall Decommissioning Plan, the licensee proposes the duration of the decommissioning. Italian licensee is a national utility, whose plans are strictly conditioned by the government. In the period between the end of operations and the start of decommissioning, the Licence for Operation applies and technical documents are amended by the licensee and approved by the Safety Authority in order to take into account the needs of the specific plant status.</p>
JAPAN	<p>The licensee decides when decommissioning should start and how long it should take. The license procedure from the termination of operation to decommissioning consists of the following four notifications. These notifications are submitted to and approved by regulatory authorities:</p> <ul style="list-style-type: none"> • Notification of Operation Plan (stipulated in the Article 30 of LRNR) • Notification of Dismantling Plan ⁽¹⁾ (Article 38 of LRNR) • Notification of Supply Plan (Article 29 of EUIL) • Notification of Change or Alteration of Electric Facilities (Article 9 of EUIL). <p>⁽¹⁾ Notification of Dismantling Plan is required to be filed to the regulatory authorities for approval 30 days before the start of system decontamination for the first time. During decommissioning process, it must be also submitted whenever the dismantling methods and procedure that have been notified are altered. (stipulated in Article 38, LRNR)</p>
NETHERLANDS	<p>In principle the licensee determines the start and duration of the decommissioning. The license procedure of this process is described in Question 1.</p>
SPAIN	<p>The Ministry of Industry is the responsible to grant the closure authorisation and to approve when the decommissioning process should start.</p> <p>In some cases the operators have decided to cease the operation of their facilities and ask to Ministry the closure authorisation. In these situations the facilities can stay in safe shut down condition but they need a specific permit to start the decommissioning.</p>

General remarks definitions, licensing	<p>2. Who determines when decommissioning should start and how long it should take? Briefly explain any license procedure covering the transition from operation to decommissioning.</p>
SWEDEN	<ul style="list-style-type: none"> – The responsibility rests with the reactor owner. The Swedish reactor owners have set up a joint company the Swedish Nuclear Fuel and Waste Management Co, SKB to fulfil many of the requirements on management of spent fuel and decommissioning of the power reactors. An other task of SKB is to perform the necessary R&D work. – Every third year SKB presents a R&D programme. This programme also contains the SKB's plans for decommissioning including time schedules. The programme is reviewed by SKI. SKI reports to the government that decides if the programme fulfils the requirement in law. The government can also issue conditions on future R&D work. – According to the "Act on Financing" a fee on energy production is decided by the government after SKI's review of SKB's cost calculations and SKI's recommendation on the fee. The cost calculations also include decommissioning. – Licensing procedure: Application for construction and operation of a NPP is reviewed by SKI. The government can issue a license. According to existing law no new NPPs can be licensed. A licence also covers the activities (operation of cooling systems, ventilation etc.) after the permanent close down of reactor operations. SKI can issue new conditions for the safe management of the facility. Dismantling of a reactor requires the acceptance by SKI (and SSI). New conditions related to dismantling and waste management will be issued. <p>Remark: One phase in decommissioning not specifically covered by the questionnaire is the phase between a decision to close down a reactor and the actual shut down. In this phase the personnel may be in stress because the decision creates a situation of uneasiness. This situation asks for special considerations by the management and also by the supervising body.</p>
SWITZERLAND	<p>To date, the start of decommissioning and the timetable for this are not regulated. Decommissioning is a major change at the facility which is subject to licence.</p> <p>The future Law on Nuclear Energy (KEG) will include more precise requirements on decommissioning. Following the end of operation, the owner of the plant must prepare and submit for approval a detailed decommissioning project. This project shall contain the phases of decommissioning and the timetable for this.</p> <p>The licensing procedure for decommissioning will be handled from the authority side in the same way as for other licences. However, the procedure will result in an order rather than in an authorisation.</p>
UNITED KINGDOM	<p>It is the responsibility of the licensee to prepare programmes for decommissioning. There is a specific requirement for these under Condition 35 attached to each nuclear site licence. This condition also gives NII the power to require the arrangements and programmes to be submitted to it and the power to approve them, or parts of them. Once approved the licensee cannot deviate from them without NII's prior approval.</p> <p>In normal circumstances it will be the licensees who determines when decommissioning should start in accordance with its arrangements and programmes. But NII has the power under the licence condition to direct, in the interests of safety, that a licensees starts decommissioning in accordance with its arrangements and programmes.</p> <p>As outlined in the answer to Question 1, a licence, once granted, applies throughout the lifetime of an installation from the time of manufacture through construction, commissioning, modification, decommissioning to demolition. The initial licence for a site therefore contains the same licence conditions as for a site which is being decommissioned. There is no written licence procedure covering the transition from operation to decommissioning but NII requires the licensee to manage this process in accordance with the licence conditions covering such topics as safety documentation, modifications, radiological protection, operating instructions and limits, inspection, maintenance and testing and radioactive waste.</p>

General remarks definitions, licensing	3. <i>At what stage does decommissioning usually take place, e.g. immediately after reactor shutdown, after defuelling, a short time later to allow short-life contamination or activation to decay or after a few tens of years to allow longer half-life material to decay?</i>
BELGIUM	<p>A general answer to this question is not possible.</p> <p>As a matter of fact, decommissioning for BR3 reactor or Eurochemic plant began some years after the end of operation, for different reasons not related to the radioactive decay.</p> <p>Ideally, a study should determine the best moment to begin the decommissioning, taking into account technical, economical safety and radiological aspects. This moment should not be dictated by regulation.</p>
CANADA	Depending on the licensee's plans and the approval via licence amendment of a comprehensive safety case supporting these proposals, any of the above scenarios could be permitted by the AECB. To date, all such proposals related to nuclear power reactor decommissioning have involved tens of years of delay before final dismantlement.
CZECH REP.	In the case of a nuclear installation with a nuclear reactor the decommissioning is anticipated to be carried out after the stage of defuelling and few tens of years to allow shorter and longer half-life radionuclides to decay. Workplaces with a significant source of ionising radiation are mostly decommissioned immediately after termination of operation.
FINLAND	For the two operating NPPs, rather detailed decommissioning plans exist. The plan for the PWRs involves an early dismantling, within 10 years from the final shutdown of the reactors, while the plan for the BWRs includes a safe storage period of about 30 years.
FRANCE	In France, the decommissioning strategy chosen by EdF consists in delaying the total dismantling 50 years to take benefit from the Co60 decay. The first and the second phase (see question 2) are completed immediately after final shutdown. The third phase is divided into two sub-phases. The first sub-phase is started at the end of the phase two. The second sub-phase is delayed 50 years. During this period, the installation is a storage unit of the equipment left in place and is kept under surveillance (safe enclosure concept). After this period, the installation is fully dismantled (level 3).
GERMANY	According to the Atomic Energy Act, it is put to the licensee's discretion to determine the starting point of decommissioning. Both ways, i.e. immediate or deferred dismantling have been chosen in the past. Decisions on deferred dismantling were taken mainly on financial reasons. Nevertheless, some decommissioning activities after reactor shutdown are necessary to put the plant into safe store condition. The majority of the licensees decided in favour of immediate dismantling of the entire plant including setting up plans for future restoration of the site.
HUNGARY	Some activities of decommissioning can be take place during the operation under the Operation License, other activities under the License for Decommissioning only. Definition of start of decommissioning phase and the end of operational phase is the job of Regulatory Authority.
ITALY	It is the licensee, which is a state utility, that has to propose a General Plan (see answer to question 2), in which it provides the bases of the specific choices, demonstrating that the chosen strategy is able to optimise the different needs, the most important ones being risk and dose reduction. As a matter of fact, for the Italian plants facing to decommissioning, more than ten years have already passed since the end of operation and still major decommissioning activities have to start.

General remarks definitions, licensing	3. <i>At what stage does decommissioning usually take place, e.g. immediately after reactor shutdown, after defuelling, a short time later to allow short-life contamination or activation to decay or after a few tens of years to allow longer half-life material to decay?</i>
JAPAN	<p>According to the standard decommissioning process proposed by the MITI, dismantling and demolition of nuclear facilities are conducted after the safe store of 5-10 years, which comes subsequent to removal of spent fuel and system decontamination.</p> <p>The standard process is not rigid but depends on the site-specific factors of each facility, waste disposal capacity, and the level of decommissioning technology. Therefore, it is expected for the licensee to flexibly arrange the standard process for decommissioning of each facility.</p> <ol style="list-style-type: none"> 1. In the case of the decommissioning of JPDR, there was no consideration for safe store period. After the permanent cessation of operation, however, it took about four years to develop decommissioning techniques and design decommissioning process by demonstrating them with mock-up. In addition, spent fuels and neutron source were removed and transferred outside the facility, and main components including the reactor vessel were dismantled during the period. 2. The licensee schedules for decommissioning of Tokai-1 that its spent fuels are removed during three and a half years after the permanent cessation of operation. Detailed schedule after that is being discussed at present.
NETHERLANDS	<p>On October 3, 1996, the Board of Directors of SEP (an alliance of Dutch utilities which is the sole shareholder of the utility which operates the Dodewaard Nuclear Power Plant) decided to permanently shut down the Dodewaard reactor in the near future. The shut-down became effective as of March 26, 1997. This decision was taken for two main reasons; (1) the SEP felt that there was no longer any prospect of the Dutch government giving the go-ahead to the further development of nuclear energy in the Netherlands in the foreseeable future. (2) the Dodewaard NPP had been built primarily as a means of gaining experience with nuclear energy. It was never 'economic' in the sense that revenues were higher than costs, and the situation was likely to be exacerbated by the impending deregulation of the European electricity market.</p> <p>In order to get some relaxation for the operational requirements as being put on the licensee by the license and the underlying Technical Specifications and to be able to do some preparatory work for mothballing systems and components a new license was requested for the current post-operational phase. Currently all fuel elements are waiting in the on-site fuel storage pool for further shipment to the reprocessing plant in the UK. Due to some problems with the fuel transport containers, the transport route, and in a lesser way with some political problems regarding reprocessing as an (un)desirable option for the fuel cycle, the first spent fuel transportation has not been started yet.</p> <p>Regarding the decommissioning Dodewaard has clearly indicated its intention to prepare the plant for a safe enclosure of about 40 years followed by a complete dismantling. The sole reason for this waiting period of 40 years is the financial benefit due to the fact that for the necessary allocation of money, a real rate of interest can be included in the decommissioning costs. The difference is approx. 130 million Dutch guilders.</p> <p>Currently Dodewaard has prepared an Environmental Impact Statement and a Safety Analysis Report as supporting documents for a new license for the real decommissioning, i.e., safe enclosure of the installation for approximately 40 years followed by a complete dismantling. In this Environmental Impact Statement all the environmental consequences, as well as the social and economic associated factors of three different options for decommissioning are compared. The first option is the desired option; dismantling after a waiting period of 40 years. The second option is direct dismantling and the third option is dismantling after 100 years. In the mid of 1999 Dodewaard expects these studies to be finished and to submit these together with a request for this 'decommissioning' licence.</p> <p>After the Environmental Impact Statement has been finished, an official standpoint of the government is foreseen regarding the length of the waiting period. In case the government has strong arguments for direct dismantling (no waiting period), than negotiations with the SEP are to be expected and the question: "Who pays the bill of this extra 130 million guilders?" has to be answered.</p>

General remarks, definitions, licensing	3. <i>At what stage does decommissioning usually take place, e.g. immediately after reactor shutdown, after defuelling, a short time later to allow short-life contamination or activation to decay or after a few tens of years to allow longer half-life material to decay?</i>
SPAIN	In the case of Vandellos NPP the authorisation to start the decommissioning process has been granted after defuelling. The conditions of the licence after ceasing the operation were that the spent fuel and the operational radioactive wastes should be taken out of the site before decommissioning.
SWEDEN	According to SKB's plans decommissioning will start within a few years after a permanent shut down of a reactor.
SWITZERLAND	In Switzerland, to date, only research reactors (Lucens, Diorit) but no power reactors have been decommissioned. In the case of the research reactors, decommissioning did not begin immediately. In the context of future decommissioning of power reactors, it is expected that no single, routine strategy will be applied, but rather that individual circumstances will be taken into consideration. The opinion is growing that too long a delay before decommissioning should be avoided, so that specialised, detailed knowledge concerning the plant does not become lost.
UNITED KINGDOM	UK practice has varied. For example, research reactors have been shutdown and immediately decommissioned with removal of all radioactive waste and buildings from the sites. Another example is a case where an isotope production reactor has been shutdown, immediately followed by fuel removal, but the reactor has been left for about 30 years in a care and maintenance mode to allow Co60 activity to decay. For decommissioning magnox power reactors, fuel has been removed and some plant and buildings have been demolished. But no decision has yet been taken by NII over the use of the "safestore" concept and overall decommissioning programmes for these sites (see also the answer to question 14).

General remarks, definitions, licensing	4. <i>Can the regulatory authority insist that plant be decommissioned following the licensee's decision to cease operation?</i>
BELGIUM	The present regulation (see question 1) does not specify that the regulatory authority "can insist...", but it specifies that the licensee remains responsible for the future destiny of the radioactive matters (evacuation or reuse in satisfactory conditions), after cessation of the operation.
CANADA	This would only occur if a case could not be made by the operator/licensee for maintaining the nuclear facility safely without decommissioning it. When its new legislation comes into effect, the CNSC will have the capability, should a licensee no longer be able to maintain safety, to revoke the licence and draw upon the financial guarantee established for that purpose to complete the decommissioning process.
CZECH REP.	Yes, it can. As the termination of operation, as an activity, which may significantly influence the nuclear safety and radiation protection, has to be licensed, the regulatory authority can bound the permission with conditions to start the necessary decommissioning activities.
FINLAND	The Ministry of Trade and Industry decides on waste management policy (including decommissioning policy) based on the proposals made by the licensees and statement by STUK. Thus in principle, the Ministry can influence the timing of decommissioning.
FRANCE	The 11th December 1963 decree enable DSIN to stop any operations in a basic nuclear installation in the case of a radiological, safety or waste management problem. This provision can be used during decommissioning operations as long as the installation is a basic nuclear installation (as long as the total radioactivity of the remaining radioactive substances is more than the threshold for classification as a basic nuclear installation).

General remarks, definitions, licensing	4. Can the regulatory authority insist that plant be decommissioned following the licensee's decision to cease operation?
GERMANY	No, there is no legal requirement to remove radioactive material and to dismantle a redundant radioactive plant or plant equipment as long as all safety and radiation protection requirements are met. On the other hand, it is usually economic for the licensee to apply for a decommissioning licence soon, as the costly continuation of maintenance, in-service-testing and operators' qualification retraining, etc. according to the operation licence and the Operational Limits and Conditions of the plant remain to be required.
HUNGARY	Yes, but there is no practice.
ITALY	The regulatory authority supervises the operator activities on the plant and verify that the plant state is inside the operating restraints and in accordance with applicable technical documents. It singles out possible problems concerning nuclear safety and radiation protection that can arise if decommissioning is not properly planned and carried out (e.g. ageing), but if no such problem exists, it cannot insist on asking for decommissioning.
JAPAN	<p>In order to assure the nuclear safety, the regulatory authorities regulate nuclear facilities through periodical inspection which is compulsory for the licensee to undergo every year. If unconformity is found as a result of the periodical inspection, the authorities order to make the licensee maintain the facilities in compliance with the requirements of technical standards. Furthermore, they can revoke the license or order the licensee to cease the operation for a certain period. In case of revocation of license, the licensee would be obliged to decommission the plant.</p> <p>In addition to the legal responsibility for nuclear safety assured by regulatory authorities, the licensee also manage to maintain and enhance the safety by spontaneously repairing and replacing the plant components. As a result of ageing, the costs for repair and replacement increase, and consequently, would surpass the profit some time. Considering the balance between the costs and profit, the licensee decides to continue the operation or to decommission the plant.</p>
NETHERLANDS	There is not a strict legal requirement for decommissioning. However, unofficially, a tacit consent exists to do so. Based on some general principles in the Environmental Protection Act and associated governmental policy plans, the licensees are strongly urged to decommission the plant after their normal operating life. Also the requirement in the respective licenses to have a decommissioning plan supports this demand. After revision of the Nuclear Energy Act this will even be strengthened. Another point is that the possession of an installation which is capable to generate nuclear fission power is a licensable activity. Also an installation which has stopped with its power generation falls under this category. The moment, the license is no longer valid, the owner has to do something in order not to violate the law.
SPAIN	Yes. Due to Spanish regulations, in particular with the Royal Decree from 1984 related to establishment of ENRESA as the Spanish Radioactive Waste Management Agency, this public company is in charge of the nuclear power plant decommissioning activities. Before that, the property of the facility must change from the electric companies to ENRESA. The Ministry of Industry manages this ownership change and then the decommissioning process may start.
SWEDEN	The decommissioning is a responsibility of the reactor owner according to law. Plans on decommissioning has to be presented to SKI by the reactor owner. SKI (and SSI) can issue conditions on the decommissioning activities.
SWITZERLAND	Basically, it is assumed that the licensee will submit a proposal for further procedural measures after stopping power operation. The regulatory authority can only take the initiative if there is a foreseeable danger to people or to the environment. The future legislation will set the requirement for decommissioning.

<i>General remarks, definitions, licensing</i>	4. Can the regulatory authority insist that plant be decommissioned following the licensee's decision to cease operation?
UNITED KINGDOM	Yes. Condition 35 attached to each nuclear site licence requires the licensee to make and implement adequate arrangements for the decommissioning of any plant or process which may affect safety and to make arrangements for the production and implementation of decommissioning programmes for each plant. It also gives NII the power to direct the licensee, in the interests of safety, to commence decommissioning in accordance with these arrangements and programmes.

<i>General remarks, definitions, licensing</i>	5. How does the regulatory authority ensure funding for decommissioning is made available?
BELGIUM	For the nuclear power plants in operation now, the owner must foresee funding for the future decommissioning (convention of 09/10/1985). This funding is taken into account in the price of the electricity, submitted to control.
CANADA	Except for uranium mining facilities where regulations exist requiring financial guarantees for decommissioning from licensees, the AECB currently has no legislative/regulatory basis for requiring financial guarantees for the decommissioning of other nuclear facilities. With the coming into force of the NSCA, the CNSC will have the power to require financial guarantees for the decommissioning of other licensed activities.
CZECH REP.	According to the Atomic Law, each licensee is obliged to create steadily a financial reserve so that financial resources be available for the preparation and implementation of decommissioning at the required time and in the required amount, according to the proposal of decommissioning method, approved by the regulatory authority.
FINLAND	The nuclear energy legislation includes provisions concerning funding for decommissioning. The financial liabilities and adequacy of funds are reviewed annually by the regulators.
FRANCE	The financial aspects of decommissioning are not an assignment of DSIN. Another service of the ministry of industry, DGEMP (general directorate for energy and raw materials) is in charge of these questions.
GERMANY	According to trade and budgetary financial legal requirements, the licensees have to accumulate funds during the operation of the NPP for waste disposal and decommissioning. These funds are sufficient to cover all dismantling costs. The responsible government has to finance the decommissioning of nuclear research facilities (including research reactors, critical assemblies and reprocessing plants) within the federal or state budget.
HUNGARY	The CXVI./1996. Act about Nuclear Energy orders establishing a Central Nuclear Financial Funds (CNFF) for decommissioning of nuclear facilities. For the enforcement of above mentioned act the Government launched the Decree No. 240/1997 (XII.18.) and the Ministry for Industry, Commerce and Tourism (current name: Ministry of Economic Affairs) launched the Decree No. 67/1997. (XII.18.). The CNFF started his activity in 01 Jan 1998.
ITALY	The operator of Italian NPPs is a state utility, which has been forced by state directives, to shelve funds for decommissioning.
JAPAN	A MITI ordinance stipulates that the licensee must reserve a certain amount of money for decommissioning fund every fiscal year. The total cost for the decommissioning of a LWR plant with output of 1,100MWe was estimated to be about \30 billion in 1984. The estimate was made by the regulatory authorities based on the standard decommission process. The regulatory authorities ensure the adequacy of the reserved amount by financial audit and review of accounting report submitted by the licensee.

<i>General remarks, definitions, licensing</i>	5. How does the regulatory authority ensure funding for decommissioning is made available?
NETHERLANDS	Also here, there is not a strict legal requirement to ensure the necessary funding for decommissioning. In practise, the licensees bear all the costs associated with the decommissioning of the plant. The same arguments as given under 4 apply here.
SPAIN	The Royal Decree mentioned above states that the licensees of nuclear power plants must pay a fee to ENRESA to ensure funding for radioactive waste management and disposal on appropriate manner and also for decommissioning activities.
SWEDEN	The "Act on Financing" regulates requirements on a system for funding future costs for final disposal of spent fuel and for the decommissioning of nuclear facilities (including the NPPs). Responsible authority is the Swedish Nuclear Power Inspectorate, SKI. The actual management of the fund is not a responsibility of the SKI.
SWITZERLAND	The Federal Act on the Atomic Energy Law establishes a decommissioning fund, into which the licensees make financial payments. This fund is administered by the Federal Government. Supervision of the finances does not fall within the mission of the Inspectorate (HSK).
UNITED KINGDOM	NII is not responsible for ensuring the availability of funds to meet the cost of decommissioning nuclear licensed sites. The majority of such sites are owned directly or indirectly by the UK Government. In the case of privatised nuclear power stations, segregated funds have been established by the licensee for meeting their costs of decommissioning and associated waste management.

<i>General remarks, definitions, licensing</i>	6. Does your country have or intend to have a national intermediate final repository for radioactive waste?
BELGIUM	A national intermediate repository exists in Belgoprocess. A national final repository for radioactive waste is in project. Options are to be defined by ONDRAF/NIRAS, and a site is yet to be found.
CANADA	There is no national repository in Canada for radioactive waste. A process of consultation and development is under way which may lead to a national repository for spent fuel. There is currently no comparable activity relating to low and intermediate level wastes. There are some waste management facilities whose licences permit them to accept certain types of radioactive waste from other licensees, and these facilities may act as intermediate storage sites. However, these facilities are under no legal obligation to accept such wastes.
CZECH REP.	In the Czech Republic there are two near surface repositories for final disposal of low and medium level radioactive waste containing artificial radionuclides and one near surface disposal facility for radioactive waste containing natural radionuclides. One intermediate storage facility for high level radioactive wastes is also in the operation. In our country we strictly distinguish between intermediate storage of radioactive waste and interim storage of spent fuel until the latter is declared as radioactive waste. We intend to construct one deep geological repository for high level radioactive waste in the next century, the research and developing work being in progress.
FINLAND	Both of the NPPs have on-site final repositories for operational LLLW and later on, those repositories are envisaged to be expanded for decommissioning wastes as well.
FRANCE	A final repository of low-medium waste is in operation in France: the CSA at Soulaives. Another was closed in 1994 at La Hague. A final repository of very low level waste is in project and could be in operation in 2001.

General remarks, definitions, licensing	6. Does your country have or intend to have a national intermediate final repository for radioactive waste?
GERMANY	<p>At present, there is no federal final repository for radioactive waste in operation (The Morsleben Repository - ERAM was in operation until September 1998). Another repository for radioactive waste with negligible heat generation (i.e., low and intermediate level waste) is well ahead in the licensing procedure (Konrad Repository). A repository project for all types of radioactive waste including particularly heat generating radioactive waste (i.e., high level waste and spent nuclear fuel) is in the planning phase; the activities during the last years have been focused on the underground investigation to confirm the site's suitability (Gorleben Repository). Both projects have been stopped. Investigations will start to identify the suitability of one single final repository site, including considerations of alternative sites.</p> <p>There are sufficient interim storage facilities in operation for, e.g., spent fuel, operational waste and decommissioning waste.</p>
HUNGARY	<p>Hungary has got a temporary storage for fuel elements in the area of NPP Paks. In Hungary exists a repository for low and intermediate level wastes for waste producers other than the NPP. Repositories for low, intermediate and high level wastes are under exploration for final storage of wastes originating from operating and decommissioning of nuclear facilities.</p>
ITALY	<p>Italian Ministry of Industry and Trade committed itself to find a site for low and Intermediate radioactive waste disposal in a ten years period. That site should also host a temporary storage facility for high activity wastes and spent fuel. To this purpose, it has sponsored actions for the site selection and facilities' design.</p> <p>The intermediate storage of spent fuel outside the reactor building (on site AFR) is an essential step in order to reach the "safe storage" condition for the plants and nuclear storage facilities which still have fuel on site. The national Italian utility (ENEL), owner of the nuclear power plants, has chosen dry storage in metallic casks as the preferred option, and an international bid is underway for the supply of dual-purpose casks (storage and transport) for this purpose. The casks, according to the utility proposal, will be properly stored at the Trino and Caorso sites, until they can be transferred to a national storage facility. The definition of the safety criteria both for the metallic casks and the associated intermediate storage facilities have already been identified by the Safety Authority.</p> <p>The selection, characterisation and operation of the centralised national site for the disposal of low and intermediate level waste and for the temporary (long term) storage of spent fuel is on-going.</p>

General remarks, definitions, licensing	6. Does your country have or intend to have a national intermediate final repository for radioactive waste?
JAPAN	<p>In Japan, there is no national intermediate/final radioactive waste repository nor its construction plan. Instead of the nation, however, a private enterprise, Japan Nuclear Fuel Limited (JNFL) owns Low-level Waste Disposal Centre, a final repository for LLW, and Spent Fuel and Vitrified Waste Storage Centre, an intermediate repository for HLW, in Rokkasho Village, Aomori Pref.</p> <ol style="list-style-type: none"> 1. The Low-level Waste Disposal Centre was constructed based on the plan to bury tentatively 1 million 200-liter containers, and finally 3 million containers of the waste. During the period from December 1992 to September 1996, 76,800 containers were carried into the centre. 2. The Spent Fuel and Vitrified Waste Storage Centre has a capacity available for 1,440 masses of vitrification waste at present. It will be expanded to store more than 3,000 masses in the future. The first acceptance of vitrification waste was on April 26, 1995. The high-level waste is to be stored in the centre for 30 to 50 years, then transferred to a final repository. <p>Concerning the final repository, Japanese government announced its principal policy in June 1994. In the announcement, the government stated its schedule to establish an organisation for the operation of final repository by 2000 and to construct the repository around 2030, or at the latest, mid-2040's. It also mentioned that the operator of the final repository is expected to be a private sector.</p> <p>The Working Group on Regulations for Radioactive Waste, which is the subordinate group of the Nuclear Safety Commission, has started to prepare for establishing the safety regulations for high-level waste, including the limits of permissible radioactivity.</p>
NETHERLANDS	<p>Yes, there is a national interim radioactive waste storage facility exists. The Central Organisation for Radioactive Waste (COVRA) is responsible for all aspects of the management of radioactive waste in the Netherlands. This comprises also the waste associated with the dismantling of a nuclear facility. COVRA is a non-profit company operating under Dutch private law. Its shareholders are the two nuclear power stations GKN (Dodewaard) and EPZ (Borssele), the Netherlands Energy Research Foundation (ECN) and the State. As a private company, COVRA must comply with all regulatory requirements, laws and licensing procedures to be allowed to operate.</p>
SPAIN	<p>There is a final national repository for low and intermediate activity level wastes (El Cabril). For spent fuel and high level wastes we do not have an official decision yet and they remain in the spent fuel pools in nuclear power plants sites.</p>
SWEDEN	<p>There is a central storage facility for spent fuel (CLAB). A repository for decommissioning waste is planned to be constructed as an expansion of the existing SFR facility (repository for low and intermediate level waste from reactor operation). No intermediate storage facility for decommissioning waste is planned.</p>
SWITZERLAND	<p>A central storage facility for radioactive waste is under construction. This facility is not intended to be used for waste from decommissioning. Apart from this, all Swiss nuclear power plants have their own, on-site storage capacity which is intended to be used for operational waste, but not for waste from decommissioning. The general procedure for the repository project (Wellenberg) is currently blocked for political reasons.</p>
UNITED KINGDOM	<p>The UK has disposal facilities for Low Level Waste (LLW) and for Very Low Level Waste (VLLW). The UK Government is currently considering the options for disposal of Intermediate Level Waste (ILW) and High Level Waste (HLW).</p> <p>No facilities for disposal of ILW and HLW are anticipated to be available for many years. In the mean time ILW and HLW are being stored on licensed sites.</p>

Nuclear and Radiological Safety Considerations	<p>7. <i>Who regulates safety and radiation protection after operation ceases and during decommissioning? Do the safety requirements (rules, regulations, standards, etc.) for construction and operation of nuclear plants apply partly or fully to decommissioning or are there alternative requirements? Please briefly explain significant differences. Is there a requirement for a list of material to be decommissioned and a decommissioning plan with stated steps or priorities? Does a safety justification have to be provided for each phase of decommissioning outlining safeguards against current hazards?</i></p>
BELGIUM	<p>7.1 In the present regulation, no distinction is made for regulation in operation, after operation and during decommissioning.</p> <p>Safety requirements continue to apply during decommissioning as much as corresponding safety functions must be ensured.</p> <p>7.2 The future regulation (see question 20) will foresee the approval by the regulatory authority of a decommissioning plan giving among others rules to be applied. Additional rules may be required by ONDRAF/NIRAS, the agency responsible for radioactive waste management and disposal.</p> <p>7.3 A safety justification has to be provided for each phase of decommissioning, outlining safeguards against current hazards.</p>
CANADA	<p>The AECB regulates all phases in the lives of licensed facilities in the entire nuclear fuel cycle, including decommissioning and closure. All fundamental safety requirements applied to operating facilities and facilities under construction are also applied to facilities undergoing decommissioning. As mentioned above, additional site-specific requirements may be identified and placed in the licence authorising the decommissioning.</p> <p>Among the requirements for an operating licence is a preliminary decommissioning plan whose purpose is to demonstrate the feasibility of decommissioning of the facility, and to provide cost estimates as the basis for financial guarantees. When a licensee proposes to shut down a facility, a more detailed comprehensive decommissioning plan, including safety justifications for all proposed steps/phases, is required from the proponent in support of its application for approval by the AECB.</p>
CZECH REP.	<p>Nuclear safety and radiation protection during decommissioning are also regulated by the regulatory authority. For this purpose, there are special requirements set down in the regulation of decommissioning, but some of the rules, regulations, standards, criteria, etc. for construction and operation are applied, too. These are modified for the requirements of decommissioning, e.g., limits and conditions for safe radioactive waste management, measurement of exposure of workers, workplaces, public and environment, safety analyses, on-site emergency plans, etc.</p> <p>The documentation on decommissioning approved by the regulatory authority contains a list of material to be decommissioned in individual stages of decommissioning with stated priorities. Safeguard issues are also considered and safety justification is provided for each phase of decommissioning in which spent nuclear fuel is managed.</p>
FINLAND	<p>STUK regulates the nuclear and radiation safety of decommissioning. So far STUK has regulated only plant modifications involving rather extensive dismantling activities. The regulations and procedures intended primarily for operational repair and maintenance have been applied. For the actual decommissioning phase, our regulations need to be developed to consider the specific safety and radiation protection issues related to decommissioning.</p>
FRANCE	<p>The general regulatory rules for nuclear safety are still applicable during decommissioning operations. The different steps of the decommissioning are regulated by the article 6ter of the 11th December 1963 decree (see questions 1, 2). On a technical plan, according to a classical scheme, the French nuclear safety authority, DSIN, sets out general safety objectives. Utilities suggest solutions to reach these objectives and, if approved by DSIN, the utilities may implement their proposed solutions. This implementation is done under the control of DSIN through inspections. So, the operator is free to choose what technical standards and techniques to be used if he can complete the safety criteria that are notified by DSIN. A safety justification has to be provided at each of the three phases presented on point 2.</p>

<p>Nuclear and Radiological Safety Considerations</p>	<p>7. <i>Who regulates safety and radiation protection after operation ceases and during decommissioning? Do the safety requirements (rules, regulations, standards, etc.) for construction and operation of nuclear plants apply partly or fully to decommissioning or are there alternative requirements? Please briefly explain significant differences. Is there a requirement for a list of material to be decommissioned and a decommissioning plan with stated steps or priorities? Does a safety justification have to be provided for each phase of decommissioning outlining safeguards against current hazards?</i></p>
<p>GERMANY</p>	<p>The <i>Länder</i> authorities in charge of regulating (licensing and inspection) the construction and operation of nuclear facilities remain to be responsible for regulating safety and radiation protection during decommissioning. All safety requirements (rules, regulations, standards) for construction and operation of nuclear plants apply as appropriate to the decommissioning activities and according to the remaining radiological hazards (see also questions 1 and 10). For each decommissioning phase and the planned activities safety considerations (similar to a Safety Analysis Report) have to be submitted to the regulatory body. In order to judge on the sequence of the applied decommissioning activities, the regulatory body may ask for an overall decommissioning plan going beyond the applied step and covering the entire project. In general, the regulatory authority will request technical expertise from expert organisations (e.g. TÜV) for assessment of the licensee's safety justification.</p>
<p>HUNGARY</p>	<p>The safety is regulated by Hungarian Atomic Energy Authority, the radiation protection is regulated by Ministry of Health.</p> <p>During decommissioning the followings have to be partly or fully considered:</p> <ul style="list-style-type: none"> • principle ALARA • minimal amount of wastes • repository capacity must be sufficient • appropriate technologies have to be ready for waste processing • technologies used for waste processing should have good reference. <p>The Nuclear Regulatory System in Hungary is under renewal, the orders containing requirements for decommissioning will be elaborated later. Alternative requirement system does not exist.</p> <p>There are no requirements for a list of material to be decommissioned and a decommissioning plan.</p> <p>According to present regulation the decommissioning takes place in 3 phases and for licensing of each phase needs a safety justification. Each activity belonged to decommissioning requires a license. For each license needs a grounding material, which can be same as earlier if it has sufficient information.</p>
<p>ITALY</p>	<p>Safety and radiation protection after the end of operation and during decommissioning are regulated by means of licences.</p> <p>The Safety Authorities that supervise decommissioning are the same of operation. They perform inspections to verify the observance of the Technical Specifications concerning safety and radiation protection that are conditions for the licence.</p> <p>A suitable consideration of applicability of the safety requirements for operation is made, mainly in the first stages of decommissioning.</p> <p>An Overall Decommissioning Plan has to be submitted, which identifies phases, priorities and steps applicable to the activities to be performed.</p> <p>A safety justification has to be provided for each phase of decommissioning, according to the applicable law (D.L.vo 230/1995). It has to be addressed to the identification and analysis of the possible hazards, to the definition of applicable standards and rules, to the wastes management.</p>

<p><i>Nuclear and Radiological Safety Considerations</i></p>	<p>7. <i>Who regulates safety and radiation protection after operation ceases and during decommissioning? Do the safety requirements (rules, regulations, standards, etc.) for construction and operation of nuclear plants apply partly or fully to decommissioning or are there alternative requirements? Please briefly explain significant differences. Is there a requirement for a list of material to be decommissioned and a decommissioning plan with stated steps or priorities? Does a safety justification have to be provided for each phase of decommissioning outlining safeguards against current hazards?</i></p>
<p>JAPAN</p>	<p>The regulatory authorities regulate safety and radiation protection after operation ceases and during decommissioning. The safety requirements for construction and operation of nuclear plants underneath partly apply to decommissioning, as follows:</p> <ul style="list-style-type: none"> • Permission for Alteration of Construction • Approval of Detailed Design and Methods of Construction • Pre-operational Inspection • Welding Inspection • Periodical Inspection • Maintenance of Record • Measures for Safety of Nuclear Facilities and Fuel Material • Order for Submission of Report <p>In addition to the requirements above, Notification of Dismantling Plan ⁽¹⁾ and Notification of Completion of Decommissioning ⁽²⁾ are required to be submitted to the regulatory authority, specifically as parts of decommissioning process. Whenever the conditions of decommissioning changed, Technical Specification (Self Safety Regulations) must be revised and submitted to the regulatory authority.</p> <p>The safety requirements above are being considered by the MITI at present.</p> <p>⁽¹⁾ Notification of Dismantling Plan is required to be filed to the regulatory authorities for approval 30 days before the start of system decontamination for the first time. During decommissioning process, it must be also submitted whenever the dismantling methods and procedure that have been notified are altered. (stipulated in Article 38, LRNR)</p> <p>⁽²⁾ Notification of Completion of Decommissioning must be filed within 30 days after whole decommissioning process terminates. (stipulated in Article 65-1, LRNR)</p>
<p>NETHERLANDS</p>	<p>The regulation of safety and radiation protection after operation ceases and decommissioning is done by the Ministry of Environmental Protection and the Nuclear Safety Department (KFD) of the Ministry of Social Affairs as long as the facility falls under art. 15 of the Nuclear Energy Act (see question 1). When the facility has “moved over” from art. 15 to art. 29 of this act the regulation will be done by the Ministry of Environmental Protection and the Labour Inspectorate (Ministry of Social Affairs).</p> <p>The safety requirements resulting from these acts are fully implied during all stages of the decommissioning or dismantling of the NPP.</p> <p>The IAEA Safety Requirements on Predisposal Management of Radioactive Waste and Decommission requires a list to be made containing all the materials in the plant including the amount and nature (isotope content) of the respective contamination and/or activation of those materials. This radiological ‘atlas’ of the plant allows an improved planning of decontamination, mothballing and dismantling activities. Also a check of the amount of radioactive waste to be stored by COVRA can be made.</p> <p>Furthermore a decommissioning plan with stated steps is required and a safety justification and analysis has to be provided for each phase of the decommissioning.</p>

Nuclear and Radiological Safety Considerations	<p>7. <i>Who regulates safety and radiation protection after operation ceases and during decommissioning? Do the safety requirements (rules, regulations, standards, etc.) for construction and operation of nuclear plants apply partly or fully to decommissioning or are there alternative requirements? Please briefly explain significant differences. Is there a requirement for a list of material to be decommissioned and a decommissioning plan with stated steps or priorities? Does a safety justification have to be provided for each phase of decommissioning outlining safeguards against current hazards?</i></p>
SPAIN	<p>The CSN as Spanish regulatory body is in charge of regulating safety and radiation protection in all situations of nuclear facilities (construction, operation, decommissioning and closure). The whole activities in nuclear facilities are regulated by the CSN.</p> <p>There is not yet a specific licensing process approved by the Government included in the Decree from Regulations on nuclear and radioactive facilities (1972), but the Vandellos NPP decommissioning process has been a good experience about it.</p> <p>Before granting the required permit, ENRESA has submitted to the Ministry and the CSN a Decommissioning Plan. In this Plan, several documents following the operational permit standards have been developed. A Safety Report, Technical Specification Limits, Radioactive Protection Manual, Emergency Plan, Waste Management Plan, Quality Assurance Manual, Decommissioning Activities Plan and others have been submitted to the CSN for approval taking into account the current facility risk.</p> <p>The licensing process has been very similar to any other authorisations and the main point on safety requirements used to assess these reports has been the current facility risks.</p>
SWEDEN	<p>SKI regulates safety. SSI regulates radiation protection. Existing and relevant safety regulations, codes etc. apply also for the decommissioning phase. Decommissioning aspects has partly been taken into account during construction (construction material) and during operations (system decontamination). When a decision to permanently shut down a reactor has been taken decommissioning aspects have to be taken into account (planning for decommissioning). After shut down the safe operation of the shut down facility must be in focus. Spent fuel will be removed to the central storage facility for spent fuel (CLAB). Detailed planning for dismantling of the facility and for the management of waste will be started. The plans will be reviewed by SKI. SKI will issue special conditions if necessary.</p>
SWITZERLAND	<p>A nuclear power plant undergoing decommissioning continues to be subject to the Atomic Energy Law and to the regulatory supervision by the Inspectorate.</p> <p>No specific legislation is involved and the regulations for nuclear safety and radiation protection apply.</p>
UNITED KINGDOM	<p>Radiological and nuclear safety is regulated by NII during all stages of the plant's life including the stages after operations cease and during decommissioning. NII's regulation includes matters related to prevention and mitigation of accidental releases of radioactivity. Planned discharges to the environment (including the associated radiological implications) are regulated by the Environment Agency for sites in England and Wales and by the Scottish Environment Protection Agency for sites in Scotland.</p> <p>The basic safety requirements that apply during construction and operation also apply during decommissioning. The requirements include a continuation of the need to carry out periodic safety reviews during the decommissioning phase, as part of which ageing, obsolescence and the need to uprate plant to modern standards have to be considered by the licensee.</p> <p>NII expects decommissioning to be taken into account during the design, commissioning and operational phases of a plant. As the plant nears the end of its operational life NII expects decommissioning plans and prioritised programmes to be produced by the licensee.</p> <p>As in the operational phase a safety justification for each phase of decommissioning has to be provided before the plant moves from one phase to another.</p>

Nuclear and Radiological Safety Considerations	8. <i>How does the regulatory authority inspect the transition from operation to decommissioning and the decommissioning process, including any periods when safe enclosures are used?</i>
BELGIUM	The organisation of the inspection is not changed, and is the same during operation as during transition from operation to decommissioning or during the decommissioning process. Periodicity or subjects of the inspections may vary, following progress of the decommissioning; concerns for the inspection remain the same: safety, radiation protection....
CANADA	The AECB has a comprehensive compliance program in place. This program includes, as appropriate, periodic inspections of all licensed activities. Such inspections are conducted and would be conducted during all periods/phases of the licensed process, including decommissioning and safe storage.
CZECH REP.	The licensee must report regularly the status and its change of the nuclear facility or workplace with significant source of ionising radiation. Transition from operation to decommissioning involves a stage of shut-down, which is liable to licence granted and on-site inspected by the regulatory authority including period of the safe enclosure decommissioning process.
FINLAND	No detailed plans exist. In general, the inspection procedures will be similar to those for NPP operation, taking account of the hazards involved.
FRANCE	During these periods, the installation is still a basic nuclear installation (BNI) and is submitted to the provisions of the 11th December 1963 decree that, in particular, include the inspections by the nuclear installations inspectors of the DSIN and of the local services of the ministry of industry (DRIRE). Specifically, the completion of the different steps of decommissioning operations are followed by report and inspections. On the basis of these completion reports and inspections DSIN formally acknowledges the end of these phases.
GERMANY	All activities of the licensee within his licensed plant are subject to continuous regulatory inspection and supervision. Under this scope, the approach of regulatory inspection philosophy and programme during decommissioning remains the same as during operation. For the decommissioning and dismantling works the licensee has to submit work plans and schedules for regulatory safety assessment. The established work order procedure, as required by radiation protection guidelines and already in place for maintenance work during operation of the facility, gets a high importance to control the individual decommissioning tasks, the involved safety considerations and the radiation protection measures for the personnel. Usually, expert organisations are involved by the regulatory authority for safety assessment of the work.
HUNGARY	The regulatory approach is similar during decommissioning and normal operation, but the emphasis can be different. It means, that the frequency and nature of inspection can change reflecting to the changing hazard. However other regulators play role in the phase of decommissioning, the Nuclear Regulatory Authority plays the leading role in licensing and inspection of the nuclear facility.
ITALY	No major difference of the organisation of inspections with respect to the operation can be singled out; in particular, in the transition phase from operation to decommissioning, the inspection plan remains practically unchanged. During decommissioning particular attention is given to the most important activities and to the verification that the prescriptions given by the Safety Authority are correctly implemented. Inspections are related to safety, radiation protection of public/workers and waste management.

Nuclear and Radiological Safety Considerations	8. <i>How does the regulatory authority inspect the transition from operation to decommissioning and the decommissioning process, including any periods when safe enclosures are used?</i>
JAPAN	<p>During the decommissioning of the JPDR, the STA conducted inspections of 108 times. The major contents of the inspections were as follows:</p> <ul style="list-style-type: none"> • Condition prior to decommissioning • Methods of decommissioning and dismantling • Condition after decommissioning • Radiation Management • Radioactive Waste Management <p>The licensee was also required to submit quarterly/yearly report to the STA to notify it of the progress of decommissioning.</p> <p>The inspection manuals for decommissioning of commercial power plants are in preparation by the MITI.</p>
NETHERLANDS	<p>The organisation of the inspections during decommissioning is the same as during operation. The subjects of the inspections will change more to radiological protection and conventional safety aspects. Also the frequency of the inspections will change; normal (2 times a week) during dismantling activities, lower (2 - 3 times a month) during “stable operation” and very low during the decaying period.</p>
SPAIN	<p>The CSN has an Annual Inspection Programme related to nuclear and radioactive facilities. To design this plan to each facility we consider the activities involved in any case and its risk to ensure the safety and radioactive protection to the public and environment. The CSN have decided that a site inspector with identical duties than operating plants will follow the decommissioning activities in Vandellos. Then, inspections from CSNI are carried out through the site inspector and technical people from the headquarters, with experience in each subject (maintenance, radioactive protection, waste management, etc.)</p>
SWEDEN	<p>SKI will closely follow all phases in the operation and decommissioning of nuclear facilities (inspections, review of reports etc.). This supervision is a responsibility of the SKI.</p>
SWITZERLAND	<p>A supervisory procedure corresponding to the one for the construction and operation is applied. Inspections are carried out routinely during the steps involved in decommissioning and dismantling, as well as when special circumstances require this.</p>
UNITED KINGDOM	<p>NII inspects all operations on licensed nuclear sites throughout all stages of the life of the plant. Particular attention is paid by NII to any major change of plant status and the transition period between operation and decommissioning is no exception. In practice no significant decommissioning work is permitted to proceed without NII's agreement.</p> <p>The style of inspection by NII during the transition from operation to decommissioning, of "safestores" and the decommissioning phase generally is the same as that used during the operational phase. However, the amount of inspection resource applied by NII is reduced as the risks to people from the plant reduce during the decommissioning process.</p>

Nuclear and Radiological Safety Considerations	9. <i>How does the regulatory authority ensure that the actual radiological hazards to be encountered during the decommissioning process are known bearing in mind any delays before each phase if the process takes place.</i>
BELGIUM	It is first of all the responsibility of the decommissioning licensee to ensure that the actual radiological hazards to be encountered are known, and that radiation exposure is maintained ALARA. The regulatory authority may ensure that these actual radiological hazards are known, by a careful examination of the decommissioning plan and during the inspections.
CANADA	It is not always possible to ensure that the actual radiological hazards to be encountered during the decommissioning process are known ahead of time. Any decommissioning plans must be sufficiently comprehensive and supported by technically reasonable predictions of all hazards associated with the proposed activities. The comprehensive AECSB inspection program mentioned above and the various radiation protection, quality assurance and contingency programs implemented by the licensee and modified with approval by the AECSB as required, are intended to ensure that the risks associated with the decommissioning process are managed appropriately.
CZECH REP.	This is based on the safety analyses of each phase of the decommissioning, which is an important part of the required documentation before the start of the decommissioning, specified by the Atomic Law and implementing regulation.
FINLAND	The decommissioning plan, to be approved by the regulator, shall include a description of the radiological hazards in each phase of decommissioning.
FRANCE	In the case of a delayed dismantling (safe enclosure), DSIN requires the utility to demonstrate its ability to keep a good level of record, including radiological aspects. The decree licensing dismantling also includes some specific technical prescriptions to ensure that the owners of the facilities, responsible for their safety, set up an organisation that must include the implementation of a quality assurance system able to ensure this record keeping.
GERMANY	It is good practice and may be required by the regulatory authority that the licensee prepares a radiation and contamination atlas (inventory) of the plant, its systems, structures and components before starting decommissioning, and revises this document as decontamination and dismantling proceeds. This helps in calculating the expected radiation exposure of the personnel and defining the radiation protection precautions for each work activity. Nevertheless, unexpected findings must be considered and procedures established to regulate changes in already approved work plans according to the safety and radiation protection needs. Lessons learned from completed decommissioning projects include project delays due to corresponding deficiencies.
HUNGARY	The managing and inspection of radiological hazard is duty of Ministry of Health. The details are not regulated, yet.
ITALY	The documents that have to be submitted for obtaining Decommissioning Licence have to single out all the radioactivity sources and the radiological hazards coming from the planned activities. The activities must be performed in the frame of the conditions that are considered and analysed in the licence documents. Regular inspections are performed.

Nuclear and Radiological Safety Considerations	<p>9. <i>How does the regulatory authority ensure that the actual radiological hazards to be encountered during the decommissioning process are known bearing in mind any delays before each phase if the process takes place.</i></p>
JAPAN	<p>Prior to the start of the decommissioning of JPDR, the Nuclear Safety Commission announced that the licensee had to estimate the following amounts of doses which could be received during the decommissioning and notify them to the regulatory authority (STA):</p> <ol style="list-style-type: none"> 1) Exposure Dose to the Public Exposure dose in normal condition Exposure dose in accidental condition 2) Exposure Dose to the Workers in normal condition The estimated doses above were submitted to the STA included in the Notification of Dismantling Plan⁽¹⁾. <p>The MITI is considering whether the estimated doses should be filed as one of the required items for Notification of Dismantling Plan⁽¹⁾ of commercial plants.</p> <p>⁽¹⁾ Notification of Dismantling Plan is required to be filed to the regulatory authorities for approval 30 days before the start of system decontamination for the first time. During decommissioning process, it must be also submitted whenever the dismantling methods and procedure that have been notified are altered. (stipulated in Article 38, LRNR)</p>
NETHERLANDS	<p>Before starting a phase of the decommissioning process a plan has to be set up by the licensee in which also the radiological hazards must be handled according to ALARA-principles. This plan is sent to the regulatory body for approval.</p>
SPAIN	<p>The Decommissioning Plan includes a safety report with safety and radiological studies and considerations. Furthermore the radiological criteria (ALARA) are used also during these activities, as well as operation activities, taking into account the potential radiological hazards in each process.</p>
SWEDEN	<p>Planning and reporting will be required well in advance of any new activity. SKI will review these plans and reports and will, if necessary, issue new conditions for the safe operation of the facility.</p>
SWITZERLAND	<p>The documentation concerning the state of the plant must be available and continually updated. Decommissioning should be started without too long a delay after operation ceases in order to prevent a loss of knowledge.</p>
UNITED KINGDOM	<p>It is a requirement of the site licence that any operation, including a decommissioning action, is conducted in accordance with a safety justification. The Ionising Radiation Regulations also require radiation doses to be kept as low as is reasonably practicable. In practice NII expects the licensee to carry out a radiological survey, including an isotopic survey where practicable, to provide the basis for any safety justification for decommissioning activities. This practice will to some extent alleviate potential hazards created by any loss of knowledge when decommissioning is significantly delayed after the end of the operational phase of the plant.</p>

Nuclear and Radiological Safety Considerations	10. Do care and maintenance regimes covering inspection, surveillance, and maintenance have to be provided before decommissioning starts and between phases? How are equipment, components or systems regulated which are left over from the operational phase and continue to be necessary while decommissioning takes place? How is new equipment regulated that is needed for decommissioning, decontamination and dismantling activities? Are there special safety requirements for new technologies e.g. remote controlled dismantling techniques?
BELGIUM	<p>10.1 Those aspects are not covered by the regulation, present or foreseen. They are to be described in the decommissioning report and to be discussed during the inspection by the regulatory authority.</p> <p>10.2 Equipment, components or systems which are left over from the operational phase and continue to be necessary are regulated like in the operational phase by "Technical specifications". Those specifications may be adapted, after justification (safety analysis) in consequence of the decommissioning process.</p> <p>10.3 Remote controlled dismantling techniques may be necessary in some cases. Doses forecasting may indicate the necessity of those techniques (ALARA policy). There are no "special safety requirements". Like for all techniques or operations, safety is to be evaluated.</p>
CANADA	<p>Yes. These are all regulated/controlled via the licence issued by the AECB for all the activities (operational or decommissioning) at the licensed site. Equipment used for decommissioning, decontamination and dismantlement is regulated in the same way as equipment used during operation.</p> <p>The use of new technologies could be permitted by licence after review and acceptance by the AECB of the proposed technology in the overall comprehensive safety/decommissioning plan. If the technology was not mentioned in the plan, the licensee would be required to make a safety case for its approval by the AECB. A licence amendment might be required if the changes to approved activities were significant.</p>
CZECH REP.	<p>Care and maintenance regimes covering inspection, surveillance, and maintenance have to be provided before decommissioning starts and between phases of decommissioning. The regulatory authority regulates the equipment, components or systems, which are left over from the operational phase and continue to be necessary while decommissioning takes place. The same is valid for new equipment or systems that are needed for all decommissioning activities. The safety requirements for new technologies e.g. remote controlled dismantling techniques result from the Atomic Law and from its implementing regulations.</p>
FINLAND	<p>No specific requirements exist yet.</p>
FRANCE	<p>During decommissioning operations and surveillance periods, the operator has to reach the safety general objectives notified by DSIN by implementing technical solutions approved by DSIN. These solution can concern surveillance and maintenance, equipment left in place and needed for decommissioning, new techniques, if needed (see question 7).</p>
GERMANY	<p>Care and maintenance regimes covering inspection, surveillance and recurrent testing have to be provided as application documents for a decommissioning licence. This is important for all equipment, systems and components necessary for the safe conduct of decommissioning tasks. Such equipment may cover systems left over from the operational phase as well as equipment especially installed for the decommissioning work. For new equipment, the regulatory requirements are the same as for plant modifications during operation, requiring a licence for major modifications essential to safety and regulatory inspection approval for minor changes. For new technologies, e.g. remote controlled devices, the safety aspects of such equipment have to be demonstrated, if necessary by mock-up tests.</p>

Nuclear and Radiological Safety Considerations	10. Do care and maintenance regimes covering inspection, surveillance, and maintenance have to be provided before decommissioning starts and between phases? How are equipment, components or systems regulated which are left over from the operational phase and continue to be necessary while decommissioning takes place? How is new equipment regulated that is needed for decommissioning, decontamination and dismantling activities? Are there special safety requirements for new technologies e.g. remote controlled dismantling techniques?
HUNGARY	<p>Care and maintenance regimes covering inspection, surveillance, and maintenance should be provided.</p> <p>Regulations for equipment, components or systems which are left over from the operational phase and continue to be necessary will be determined in the future. There is no decision taken yet.</p> <p>Erecting and using of a new equipment are licensed according to the valid licensing procedure by the competent authority. Detailed regulation does not exist.</p> <p>There are no special safety requirements laid down yet for new technologies e.g. remote controlled dismantling techniques.</p>
ITALY	<p>The regime covering inspections, surveillance and maintenance is provided in Technical Documentation approved in decommissioning licensing. The systems, components and equipment which are important to safety and radiation protections continue to be regulated through a regime of technical specifications and surveillance tests. The requirements applicable to new equipment are chosen on a case by case basis, on the basis of the importance for safety and radiological protection. The same concept applies to new technologies, for which adequate experimental tests are often required.</p>
JAPAN	<p>The care and maintenance regimes for decommissioning have to be established before the process is initiated and have to be notified to the regulatory authorities by Notification of Dismantling Plan⁽¹⁾ and filing of Alteration of Technical Specification (Self Safety Regulations) for approval. When a change is made in the regimes between or during the phases of decommissioning process, the licensee must notify it to the authorities and be approved.</p> <p>The equipment, components or systems which are left over from the operational phase and continue to be necessary during decommissioning are also subject to the jurisdictional process of notification and approval same as those described above.</p> <p>Special safety requirements for new technologies are to be discussed in the MITI.</p> <p>⁽¹⁾ Notification of Dismantling Plan is required to be filed to the regulatory authorities for approval 30 days before the start of system decontamination for the first time. During decommissioning process, it must be also submitted whenever the dismantling methods and procedure that have been notified are altered. (stipulated in Article 38, LRNR)</p>
NETHERLANDS	<p>At each new operating status a new license is needed and new Technical Specification based on a revised Safety Analysis Report has to be set up. In the new license and Technical Specifications inspections, surveillance and maintenance of equipment, components and systems which are left over and continue to be necessary will be regulated. New equipment needed for decommissioning, decontamination and dismantling activities will be checked on the appropriate safety and quality requirements based on the "normal" codes (ASME, KTA, CE).</p>
SPAIN	<p>There are standard technical specifications with similar structure than the operational phase. They are adapted to the new situation, taking into account the systems and equipment required in each case.</p> <p>There are not special requirements but in some cases new technologies and remote controlled devices have been used for defuelling and waste disposal.</p>
SWEDEN	<p>As said in answer to question 9, decommissioning plans have to be presented. All aspect of relevance to safety must be included. SKI will review plans and reports.</p>
SWITZERLAND	<p>No such regulations exist. With the research reactors decommissioned to date, such activities were dealt with on a case-by-case basis. Future decommissioning will carried out on the basis of a project approved by the regulatory authorities.</p>

<i>Nuclear and Radiological Safety Considerations</i>	<p>10. Do care and maintenance regimes covering inspection, surveillance, and maintenance have to be provided before decommissioning starts and between phases? How are equipment, components or systems regulated which are left over from the operational phase and continue to be necessary while decommissioning takes place? How is new equipment regulated that is needed for decommissioning, decontamination and dismantling activities? Are there special safety requirements for new technologies e.g. remote controlled dismantling techniques?</p>
UNITED KINGDOM	<p>Yes. The licensee is required to continue appropriate inspection, surveillance and maintenance at all times until the plant is demolished and the site is cleared and delicensed.</p> <p>All equipment, components or systems which are necessary while decommissioning takes place are regulated in the same way as if the plant was operational. Key elements in this regulatory process are the requirements for a prior safety justification which identifies limits and conditions for operation and the inspection, maintenance and testing regime. If new equipment is provided then a new safety justification has to be provided under modification arrangements that are required under Conditions attached to the site licence in a similar way to any modifications or new equipment supplied during the operational phase of the plant.</p>

<i>Waste Considerations</i>	<p>11. Who is responsible for ensuring that appropriate waste facilities exist or are planned in order to meet the needs of practical decommissioning? Are the waste storage facilities licensed, inspected and regulated as nuclear sites? What happens to radioactive waste material from decommissioning e.g. is the waste released for unrestricted use, conventional disposal, recycling or reuse for non-nuclear purposes, or is the waste stored in a site-based radioactive waste storage facility? Please give some examples.</p>
BELGIUM	<p>The owner of the facility to be decommissioned is responsible for the waste facilities on the site: treatment (if any on the site), interim storage,....</p> <p>A national waste facility exists (Belgoprocess), with installations for incineration, supercompaction,... and interim storage. A national agency (ONDRAF/NIRAS) is responsible for the waste policy, including final disposal (yet to be defined).</p> <p>The waste storage facility Belgoprocess is licensed and inspected as nuclear site.</p> <p>Radioactive waste material from decommissioning may have various purposes, depending of its nature and activity:</p> <ul style="list-style-type: none"> • clearance (see question 12) for unrestricted use or conventional disposal <ul style="list-style-type: none"> – example: concrete from the BR3 building or the Eurochemic plant, steel from Eurochemic – recycling or reuse for non-nuclear purposes is possible for material released for unrestricted use • recycling or reuse for nuclear purposes <ul style="list-style-type: none"> – example: steel from the RHRS of Tihange 1 (not coming from decommissioning but from repair) melted and used as shielding for waste drums. • radioactive waste disposal.

Waste Considerations	<p>11. Who is responsible for ensuring that appropriate waste facilities exist or are planned in order to meet the needs of practical decommissioning? Are the waste storage facilities licensed, inspected and regulated as nuclear sites? What happens to radioactive waste material from decommissioning e.g. is the waste released for unrestricted use, conventional disposal, recycling or reuse for non-nuclear purposes, or is the waste stored in a site-based radioactive waste storage facility? Please give some examples.</p>
CANADA	<p>The Government of Canada has a national policy on radioactive wastes which states that the producer is responsible for its wastes. Consequently, operators of nuclear facilities must plan and arrange for the proper disposal/management of the wastes resulting from their licensed activities.</p> <p>Currently, Canada does not have any disposal sites for low, intermediate, high level and/or spent fuel wastes. If and when such sites are proposed, they will require an application for a licence from the AECB. All radiological wastes resulting from the nuclear fuel cycle are currently either discharged to the environment or stored/managed, in both cases under conditions permitted by a licence issued by the AECB. This process guarantees that such facilities are inspected and regulated as nuclear sites.</p> <p>Radioactive waste materials resulting from decommissioning may be released for unrestricted use, conventional disposal, recycling, etc., in each case under conditions acceptable to the AECB.</p> <p>All of these routes have been used in decommissioning projects in Canada; e.g., the decommissioning of uranium mining facilities and the Atomic Energy of Canada Limited (AECL) Tunney's Pasture laboratory complex.</p>
CZECH REP.	<p>The Radioactive Waste Repository Agency, established by the Government, is responsible for the existence or planning appropriate waste facilities for management of decommissioning wastes. The waste storage facilities are licensed, inspected and regulated as nuclear sites, if the activity of the stored radioactive waste, containing alpha emitters with half-lives longer than 60 days, exceeds 10^{15} Bq.</p> <p>Our main strategy is the minimisation of the amount of radioactive wastes, which should also be achieved through segregation of decommissioning wastes in order to release unrestricted or recycling and reusable materials as much as possible, and to reduce the storage or disposal to a minimum as possible.</p>
FINLAND	<p>The decommissioning plan contains a waste management plan, including disposal. Waste storage and disposal facilities are licensed and regulated as nuclear facilities. It is envisaged that dismantling waste of very low activity will be cleared from regulatory control for recycling, reuse or conventional disposal; waste exceeding clearance levels will be disposed of in an on-site repository.</p>
FRANCE	<p>According to the French regulation, a utility that owns a nuclear facility undergoing dismantling is responsible for a) managing its waste exhaustively, properly and safely, and also b) keeping record of this management in an appropriate way. This statement implies that each category of waste should be dealt with from production to elimination according to a pre-assessed and controllable scheme. In particular, this approach excludes the practice of any unconditional clearance levels for very low level radioactive waste because such a practice would mean the loss of waste producer responsibility.</p> <p>The CSA and CSM are basic nuclear installations and are submitted to licence and inspections by DSIN and DRIRE. The future very low level waste repository will be a classified installation and submitted to licence and inspections by DRIRE (see question 6). The radioactive waste are stored in a nuclear waste facility or reused in nuclear industry, but the regulation authorises utilities to reuse the waste in conventional industrial facility after an authorisation, on a case-by-case basis, and after an impact assessment and public information.</p> <p>The non-radioactive waste can be reused or stored into conventional disposals.</p>

Waste Considerations	11. Who is responsible for ensuring that appropriate waste facilities exist or are planned in order to meet the needs of practical decommissioning? Are the waste storage facilities licensed, inspected and regulated as nuclear sites? What happens to radioactive waste material from decommissioning e.g. is the waste released for unrestricted use, conventional disposal, recycling or reuse for non-nuclear purposes, or is the waste stored in a site-based radioactive waste storage facility? Please give some examples.
GERMANY	<p>In Germany, the federation (Federal Government) is responsible for construction and operation of radioactive waste repositories. The Federal Office for Radiation Protection defines the waste acceptance criteria and requirements for a repository. The license for a repository - including the waste acceptance requirements in their final form - is issued by the competent state authority. Waste conditioning facilities and interim storage facilities are industrial plants under the responsibility of the waste generators. All final and interim storage facilities are nuclear plants licensed and inspected by regulatory authorities.</p> <p>Radioactive material from decommissioning may be cleared for unrestricted use, conventional disposal, recycling or reuse, if specified limits of radioactivity content and surface contamination are met. This applies to the bulk of the building material (concrete) and to a large amount of the metal scrap after decontamination. Only a small fraction of the total plant material, especially activated material and scrap which cannot be decontaminated economically and under the ALARA principle will be conditioned and disposed off as radioactive waste. The regulatory inspection authority of the federal state has to watch that minimising the arising of radioactive waste will not be in conflict with undue radiation exposure of the personnel.</p>
HUNGARY	<p>The responsibility for ensuring that appropriate waste facilities exist or are planned is shifted on to the Public Agency, financed from Central Nuclear Financial Funds, founded according to the CXVI./1996. Act about Nuclear Energy.</p> <p>Waste storage facilities are not licensed, inspected and regulated as nuclear sites. The CXVI./1996. Act about Nuclear Energy defines the nuclear facilities. There are different licensing authority for nuclear power plants, reactors for training and research (Hungarian Atomic Energy Authority) and for radioactive waste storage facilities (Ministry of Health).</p> <p>The release of waste for unrestricted use will be regulated by a ministry decree, practically depending on the radioactivity of the materials.</p>
ITALY	<p>A bill has been brought before parliament for establishing a National Agency (see answer to question 1) for management of waste coming from decommissioning and for the selection and operation of national disposal site. In meanwhile, the radioactive waste will be treated and conditioned in waste facilities already available or to be built at nuclear sites. The storage facilities are subjected to a license and inspection regime similar to the on applicable to nuclear sites.</p>

Waste Considerations	<p>11. Who is responsible for ensuring that appropriate waste facilities exist or are planned in order to meet the needs of practical decommissioning? Are the waste storage facilities licensed, inspected and regulated as nuclear sites? What happens to radioactive waste material from decommissioning e.g. is the waste released for unrestricted use, conventional disposal, recycling or reuse for non-nuclear purposes, or is the waste stored in a site-based radioactive waste storage facility? Please give some examples.</p>
JAPAN	<p>The licensee is required to ensure based on LRNR that appropriate waste facilities exist or are planned. Namely, the measures for disposition of spent fuels and contaminated materials are required to be written in the Notification of Dismantling Plan ⁽¹⁾, which must be submitted to regulatory authorities by the licensee. The regulatory authority evaluates those reports.</p> <p>The waste storage facilities are licensed, inspected, and regulated, as same as nuclear plants.</p> <p>1) The total amount of waste from the decommissioning of the JPDR was approximately 24,440 ton, 14.5% of which was radioactive waste. Among the radioactive waste, those with relatively high radioactivity, which were reactor vessel and a part of core internals, were contained in shielding vessels and transferred to a site-based storage facility. The other waste with very low radioactivity except for very-low-level waste concrete was contained in steel vessels and transferred to the storage facility. The very-low-level waste concrete was utilised for waste burial test conducted inside the site of Japan Atomic Energy Research Institute (JAERI).</p> <p>The clearance criteria for non-radioactive waste from nuclear facilities have not been established yet in Japan. Therefore, when the JPDR was decommissioned, a guideline shown by the Nuclear Safety Commission was applied to its non-radioactive waste. The total amount of non-radioactive waste concrete was 18,000 ton, a part of which was crashed and utilised as the material for burying the site of reactor building. The rest part is to be reused for non-nuclear purposes. Non-radioactive metal materials, 2,000 ton in the weight, were recycled.</p> <p>2) It is estimated that about 98% of the total amount of waste from a commercial nuclear power plant is the waste unnecessary to be dealt as radioactive one. The rest 2% is low-level radioactive waste. In case of a LWR plant with output of 1,100MWe, the total amount of waste has been calculated to be 500,000-550,000 ton, and its low-level waste to be about 10,000 ton. At present, the technical standards for disposition of high-β/γ low-level waste, low-level metal waste and very-low-level metal waste, and their clearance criteria are being developed in the Atomic Energy Commission and the Nuclear Safety Commission.</p>
NETHERLANDS	<p>In the Netherlands only one waste storage facility is allowed, the COVRA (see question 6). In principle the COVRA and the licensee of the decommissioned NPP have to come to an agreement how (and at what costs) the radioactive waste shall be stored. When this will be done in a non standard way approval (and in certain cases a new license) is needed from the Regulatory Body.</p> <p>The COVRA is regarded as a nuclear site; licensing and inspections procedures are the same as at a NPP. A Safety Analysis Report and Technical Specifications are present.</p> <p>On this moment the waste is divided into two categories:</p> <ul style="list-style-type: none"> • Non radioactive waste implying unrestricted use or conventional disposal (for criteria see question 12) • Radioactive waste. <p>There are plans to introduce a third category which allows restricted use of (classified) radioactive waste.</p>

Waste Considerations	<p>11. Who is responsible for ensuring that appropriate waste facilities exist or are planned in order to meet the needs of practical decommissioning? Are the waste storage facilities licensed, inspected and regulated as nuclear sites? What happens to radioactive waste material from decommissioning e.g. is the waste released for unrestricted use, conventional disposal, recycling or reuse for non-nuclear purposes, or is the waste stored in a site-based radioactive waste storage facility? Please give some examples.</p>
SPAIN	<p>The Ministry of Industry and the CSN are responsible for ensuring that appropriate waste facilities are approved.</p> <p>There is a waste repository for low and intermediate radioactive level wastes approved by the Ministry. ENRESA is the licensee of this repository and the licensing process for this facility is the same as other nuclear facility in Spain.</p> <p>The regulations on nuclear and radioactive facilities from 1972 states the licensing process for all nuclear facilities (nuclear power plants, nuclear fuel facilities and waste disposal facilities are considered “nuclear facilities” at this point).</p> <p>Only the spent fuel and the operational radioactive wastes have been transported out of Vandellos site. No decommissioning radioactive wastes have been released until now.</p> <p>There is not yet a general standard approved by the Government about unrestricted use, clearance criteria, recycling or reuse for non-nuclear purposes. The Electric Industry Law from 1997 states a definition of radioactive waste but a Radioactive Waste Act must be developed. Until now, the criteria for clearance of very low activity materials have been stated case by case by the Ministry and the CSN.</p>
SWEDEN	<p>The reactor owner is responsible. Future costs are covered by a funding system. If the funds do not cover the costs there is an additional system, a system of securities, to cover unforeseen costs. The waste storage and disposal sites are nuclear facilities and the requirements in the Act on Nuclear Activities (that regulates all types of nuclear facilities) are applied. Radioactive waste can be released for unrestricted use etc. according to regulations by SSI.</p>
SWITZERLAND	<p>The Federal Act on the Atomic Energy Law establishes that those producing waste are responsible for its disposal (following the principle that “the polluter pays”). Dismantling of large facilities makes sense only if final disposal facilities are available for the waste arising from decommissioning.</p> <p>Interim storage and final disposal facilities are nuclear facilities, and are treated as such.</p> <p>In order to reduce the generation of radioactive waste, one should decontaminate as much waste as practicable for clearance as non-radioactive waste. The remainder must be conditioned and disposed of as radioactive waste.</p>

Waste Considerations	<p>11. Who is responsible for ensuring that appropriate waste facilities exist or are planned in order to meet the needs of practical decommissioning? Are the waste storage facilities licensed, inspected and regulated as nuclear sites? What happens to radioactive waste material from decommissioning e.g. is the waste released for unrestricted use, conventional disposal, recycling or reuse for non-nuclear purposes, or is the waste stored in a site-based radioactive waste storage facility? Please give some examples.</p>
UNITED KINGDOM	<p>Any installation to be used for the storage of bulk quantities of radioactive matter (except for VLLW) which has been produced or irradiated in the course of the production or use of nuclear fuel has to be licensed. The licence is issued by NII with the same licence conditions as for an operational or decommissioning site. NII regulates and inspects stores of radioactive waste on licensed sites in the same way as for operational sites. It is for licensees to obtain a licence from NII for the storage of radioactive waste.</p> <p>In practice, subject to appropriate licensing requirements being met, NII allows radioactive waste to be stored on existing licensed sites. For new sites, such as a site for a final repository of HLW or ILW, NII would follow the procedure outlined in the HSE publication "Nuclear Site Licences under the Nuclear Installations Act 1965 (as amended) - Notes for Applicants" before granting a licence. The provision of final repositories is currently under review by the UK Government.</p> <p>Waste from decommissioning falls into various categories, but for reactor plant it is principally solid VLLW, LLW and ILW. HLW in the form of fuel is generally sent to a reprocessing plant. Generally waste is strictly segregated to enable material which is probably inactive to be monitored and cleared for free release (based on the lower limits for registration and waste set by the Radioactive Substances Act 1993 (RSA93) via the radioactive Substances (Substances of Low activity) Exemption Order 1986 (RSE086). (See response to Question 12). Below these values items can be "free released" for unrestricted use. Examples of items that have been decontaminated for free release or reuse (the active portion being removed for disposal as LLW) are concrete with a contaminated face and lead bricks with contaminated surfaces.</p> <p>The disposal of radioactive material is not permitted without the explicit authorisation of the Environment Agency (the Scottish Environment Protection Agency in respect of disposal in Scotland).</p>

Waste Considerations	<p>12. Briefly describe the radiation and contamination clearance criteria and clearance procedures for the release of waste material for unrestricted use, conventional disposal recycling or reuse for non-nuclear purposes. How have these criteria been developed? Do they take account of the proposed IAEA, EU or other international clearance criteria?</p>
BELGIUM	<p>Clearance criteria are not (yet) defined in the regulation.</p> <p>Clearance is carried out in the nuclear facilities, under the responsibility of the section head of the Health Physics department supervised by the licensed organisation (see question 1).</p> <p>Clearance procedures have been approved; they foresee surface contamination measurements, specific activity or total activity measurements depending on the nature of the material and its history in the facility.</p> <p>Criteria take account of the proposed IAEA and EU clearance criteria.</p>

Waste Considerations	12. Briefly describe the radiation and contamination clearance criteria and clearance procedures for the release of waste material for unrestricted use, conventional disposal recycling or reuse for non-nuclear purposes. How have these criteria been developed? Do they take account of the proposed IAEA, EU or other international clearance criteria?
CANADA	<p>The AECB has issued several Regulatory Policy Documents which provide guidance for licensees to propose, on a case-by-case basis, release criteria for materials from licensed control. These policies are based on meeting an individual annual dose limit of some 10's of micro-Sievert resulting from such releases.</p> <p>Alternatively, licensees have been permitted to release materials meeting the criteria for the release of solid materials recently proposed by the IAEA.</p> <p>The AECB is currently developing an integrated approach to the assessment of all proposals by licensees to release materials via all routes and pathways from licensed activities. This integrated approach will take into consideration the international clearance criteria currently proposed.</p>
CZECH REP.	<p>The radiation clearance criterion for the release of materials for unrestricted use is the derivable effective dose less than 10 $\mu\text{Sv/a}$ for the critical group of population, whereas the collective effective dose does not exceed 1 Sv/a. The corresponding contamination clearance criteria for release of materials into the environment are radionuclide specific (five groups, according to importance, and for the most important first group of radionuclides is amounting to 0.3 kBq/kg and 3 kBq/m², respectively). Based on the permission of the regulatory authority, radioactively materials containing radionuclides or being contaminated by them can be recycled and reused or released into the environment, if the average effective dose for the critical group of population does not exceed 250 Sv/a from this release. Radioactively more contaminated materials are considered as radioactive wastes and have to be disposed by storage or by disposal into the appropriate repository. The aforementioned criteria have been developed by the use of the IAEA Basic Safety Standards, 1996 (Safety Series No. 115).</p>
FINLAND	<p>Clearance regulations and routines currently exist for operational waste; they are based on the IAEA/NEA/EU recommendations. For unconditional clearance, an activity concentration constraint of 1Bq/g is defined for beta-gamma nuclides and one tenth of that for alpha nuclides. Clearance constraints for surface contamination are basically the same as those included in transport regulations. For conditional clearance, higher constraints, based on case-by-case evaluation, can be accepted.</p>
FRANCE	<p>There are no clearance criteria and procedure for the release of radioactive waste materials in France (see question 11).</p>
GERMANY	<p>On 23 April 1998, the Commission on Radiological Protection (SSK) has issued a recommendation on "Clearance of Materials, Buildings and Sites with Negligible Radioactivity from Practices subject to Reporting or Authorisation". It combines a number of recommendations and drafts of recommendations which were updated and presented in a consistent manner (see also question 20). The recommendation from 23 April can be expected to be of great relevance in all matters of clearance, e.g. for decommissioning projects. The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety has sent this recommendation to the responsible <i>Länder</i> authorities on 12 June 1998 and asked for its application.</p> <p>This recommendation is based, among other things, on the de-minimis-concept as suggested in IAEA Safety Series No. 89, i.e. an individual radiation exposure of the order of 10 $\mu\text{Sv/a}$ was considered acceptable. In addition to the surface contamination limits prescribed in the Radiation Protection Ordinance (e.g., 0.5 Bq/cm² for Co-60), specific activity values for specified nuclides are given. For example, for Co-60 these values are 1 Bq/g for clearance for general melting of scrap, and 0.1 Bq/g for unconditional clearance. For recycling of metal scrap, the EU Recommendation 89 "Recommended radiological protection criteria for the recycling of metals from the dismantling of nuclear installations, recommendations of the group of experts set up under the terms of Article 31 of the Euratom Treaty (1998)" has been incorporated into the SSK-recommendation to a large extent. The EURATOM 96/29 directive, containing release criteria, will be incorporated into the Radiological Protection Ordinance. (see also answer to question 20)</p>

Waste Considerations	12. <i>Briefly describe the radiation and contamination clearance criteria and clearance procedures for the release of waste material for unrestricted use, conventional disposal recycling or reuse for non-nuclear purposes. How have these criteria been developed? Do they take account of the proposed IAEA, EU or other international clearance criteria?</i>
HUNGARY	<p>The criteria and procedures for the clearance will be regulated by Decree of Ministry of Health according to the requirements of radiohygiene. The Appendix of Welfare Ministry (current name: Ministry of Health) Decree No. 23/1997 (VII.18) contains the clearance levels for materials.</p> <p>The criteria and procedures take account of proposed international clearance criteria.</p>
ITALY	<p>As far as the present state of Italian radiation protection legislation is concerned, the release of waste coming from nuclear facilities is subject to licensing procedures with ad-hoc specifications laid down in the licensing acts. Technical specifications for release are established on a case by case basis, taking relevant EU recommendations into account. However, legislation does not apply to disposal into the environment of radioisotopes with a half life less than 75 days or activity concentration less than 1 Bq/g.</p> <p>The matter is currently under review in the context of EU Directive 96/29 transposal into national legislation.</p>
JAPAN	<p>The clearance criteria for commercial power plants (BWR, PWR, GCR) were developed in the Nuclear Safety Commission. It has determined the exposure dose limit to the public at 10μSv/y and is to establish clearance criteria specifically for burial disposition and for unrestricted reuse within the limit. The limit was made with consideration for the proposals of IRCP Publ.46 and the IAEA.</p>
NETHERLANDS	<p>On this moment waste is regarded as radioactive waste when the activity is more than 100 Bq/g. It is planned to introduce the EC-criteria (nuclide specific) in the year 2000.</p>
SPAIN	<p>As mentioned above there is not yet general standards for this subject. The criteria stated until now have been given case by case, taking account the radiological criteria for clearance of material stated in the European Union Directive 96/29/EURATOM.</p> <p>The CSN is reviewing the regulations on Sanitary Protection against Ionising Radiation (Royal Decree 53/1992) to accomplish the 96/29/EURATOM directive. The clearance radiological criteria and the considerations about radioactive wastes will follow the above mentioned European directive.</p>
SWEDEN	<p>Radioactive waste can be released for unrestricted use etc. according to regulations by SSI.</p>
SWITZERLAND	<p>The Swiss Radiological Protection Ordinance (StSV) defines, in Article 1 and Appendix 2, the domain of application of the legislation. For a material to be cleared, it must fall outside of this domain of application. The values given in this ordinance deviate from the clearance criteria of the IAEA and the EU. Modifications to attain conformity are planned.</p> <p>Material clearances are supervised by the regulatory authority. The procedure for clearance is based, at present, on work instructions; it will be regulated in an Inspectorate guideline, which is currently in preparation.</p>
UNITED KINGDOM	<p>Generally clearance criteria are based upon the requirement to demonstrate that the material is effectively inactive, i.e. below the definition of radioactive material of RSA93/RSE086. (See response to Question 11). Re-use of materials on site is based on safety justification prepared by the licensee and where appropriate accepted by NII.</p>

Waste Considerations	13. When is radioactive waste transferred from site-based waste storage facilities to the intermediate or final national repository?
BELGIUM	The radioactive waste is transferred from site-based waste storage facilities to the national intermediate repository depending on the filling of the site facility and on the transport organisation.
CANADA	As mentioned above, Canada currently does not have a licensed final repository/disposal site for radioactive waste. There are some licensed facilities which can act as intermediate storage sites, but none of them is obliged to accept waste from another licensee unless it chooses to and its licence permits it to.
CZECH REP.	The radioactive waste is transferred from site-based waste storage facilities to the intermediate or final national repository. This is done according to the licence on the radioactive waste management granted by the regulatory authority as well as on the basis of the contract between radioactive waste repository agency (waste operator) and the licensee (waste generator).
FINLAND	The decommissioning plans are based on an approach that dismantling waste is transferred immediately after conditioning into a final repository.
FRANCE	Waste are transferred from the site-based repository to the final storage during decommissioning operations, as soon as possible to avoid saturation. The decree licensing dismantling includes such a prescription to avoid that the installation becomes a final repository. Any interim storage in-site longer than two years needs a special authorisation.
GERMANY	This depends on the availability and the waste acceptance requirements of the repositories. Timing is subject to project specific optimisation. Radioactive waste from decommissioning has been transferred to the ERAM repository (see question 6) until September 1998. Some decommissioned plants have stored their waste material on-site awaiting the start of operation of a final repository. There are some interim storage facilities in operation. In particular at the Greifswald site, a big facility for interim storage and waste treatment is recently licensed and in operation to take the waste from the decommissioning of the five Greifswald power reactors.
HUNGARY	When the decommissioning of nuclear facilities becomes due, the final repository for low and intermediate level wastes will have been erected, so the planned transport will be possible. The spent fuel will be storage in Temporary Spent Fuel Storage Facility.
ITALY	The waste has to remain at nuclear sites until a national disposal site is available.
JAPAN	Radioactive waste should be transferred from site-based storage facilities to intermediate or final repository by the time when the licensee submits the Notification of Completion of Decommissioning ⁽²⁾ to the regulatory authorities. More detailed requirements will be made by the authorities in the future. ⁽²⁾ Notification of Completion of Decommissioning must be filed within 30 days after whole decommissioning process terminates. (stipulated in Article 65-1, LRNR)
NETHERLANDS	It is the policy in the Netherlands to transfer radioactive waste as soon as possible to the COVRA and not allow intermediate storage at a site. In the licenses of all nuclear facilities it is (i.e. will be) stated that within 2 years the produced waste shall be transferred.
SPAIN	The radioactive wastes are transferred from nuclear sites to final repository by ENRESA, taking into account the waste acceptance criteria for this facility (El Cabril, radioactive waste repository).
SWEDEN	According to SKB's plans there will be a repository for decommissioning waste in operation already when the dismantling of the reactors start. This repository is planned to be constructed as an expansion of the existing SFR facility (repository for low and intermediate level waste from reactor operation). A full licensing process is required. No intermediate storage facility for decommissioning waste is planned.
SWITZERLAND	The Swiss strategy with respect to nuclear power plants is that waste from decommissioning should be brought straight to the final repository.

Waste Considerations	13. When is radioactive waste transferred from site-based waste storage facilities to the intermediate or final national repository?
UNITED KINGDOM	The only national repository is the LLW disposal facility at Drigg in Cumbria. Material is despatched from waste producers (or in a few cases via intermediary handlers) in accordance with tight specifications, limitations and quality control arrangements set down by the facility operator (BNFL). These specifications etc. have been prepared in consultation and with the agreement of NII and the Environment Agency. Producers are encouraged by the NII to transfer LLW for disposal in preference to its retention on the site. Because of the current lack of a final repository for ILW this material is in general currently stored at the site at which the waste has arisen.

Safe Store	14. If decommissioning is significantly delayed with use of the safe enclosure concept, what are the time spans or goals in terms of allowance for the decay of contaminated and activated material? Is the duration of a safe enclosure phase limited by the regulatory body and what happens after that phase?
BELGIUM	No answer (no experience in Belgium).
CANADA	<p>The goals and time spans are proposed and justified by the proponent in its application for licensing. So far, all actual decommissioning projects and conceptual decommissioning proposals for non-uranium mining nuclear facilities in Canada have been for safe enclosure periods of less than 100 years.</p> <p>As mentioned above in answers to several similar questions, the AECB will assess each proposal on its own technical merits with respect to maximising safety, minimising impacts and maintaining exposures ALARA.</p> <p>The decommissioning plan accepted by the AECB will detail the activities planned by the licensee after the safe enclosure period expires. Nationally, this could only be for some sort of in-situ waste management/disposal, or it could be for green-fielding. If the licensee wishes to propose other than currently permitted arrangements, these proposals would have to be submitted for review and approval by the AECB.</p>
CZECH REP.	<p>The supposed time span in the case of delayed decommissioning of a facility with nuclear reactor using the safe enclosure option is about 50 years. This is substantiated by the fact that the most extensive decrease in the activity of the major contributor to radiation burden of the environment of the reactor, i.e. Co-60, is between 30-50 years after shutdown.</p> <p>The regulatory authority according to the status of the nuclear safety and radiation protection can limit the duration of the safe enclosure phase. After that phase the facility shall be decontaminated and dismantled.</p>
FINLAND	A dominating nuclide in decommissioning waste, considering exposure of personnel, is Co-60 with half-life of about five years. Consequently, safe storage of a few tens of years reduces significantly exposure from that nuclide. That has been one reason for the safe storage phase in the decommissioning plan of our BWRs. (see also answer to question 3)
FRANCE	<p>(see question 3). The duration of the safe enclosure phase is not limited by DSIN, but DSIN considers that a better justification of this strategy should be provided as any delay will lead to an ageing of the structures that can have an impact on the safety of the facility. DSIN also requires the utility to demonstrate its ability to keep the facility under appropriate surveillance and to keep a good level of record (see question 9). For DSIN, keeping in mind that experience showed that interim situations tend to become definitive, a good balance has to be found between the benefits and the drawbacks of delaying the shutdown and the dismantling phase.</p> <p>In this respect, in 1996, DSIN requested CEA to produce before the end of year 1999 a joint study with EdF assessing the possibility to shorten the planned 50 years delay for total dismantling.</p>

<i>Safe Store</i>	14. <i>If decommissioning is significantly delayed with use of the safe enclosure concept, what are the time spans or goals in terms of allowance for the decay of contaminated and activated material? Is the duration of a safe enclosure phase limited by the regulatory body and what happens after that phase?</i>
GERMANY	Safe store has been licensed for the Lingen NPP (KWL) and for the Hamm-Uentrop NPP (THTR-300) both for forty years. According to these licences, a concept for consecutive decommissioning steps (dismantling) has to be submitted to the regulatory authority in due time before the end of the safe store period. As already done in the past, no licences for safe store will be granted for future decommissioning plans without such a requirement for continued decommissioning or dismantling after a defined time span. It is common understanding in Germany, that longer time spans than approximately 40 years do not offer any advantages, neither technically nor economically. Recent decisions of licensees of industrial NPPs went in favour of immediate dismantling because of cost considerations, social aspects and retaining the knowledge of the personnel.
HUNGARY	
ITALY	The Safe Enclosure is a step of decommissioning activity whose duration is discussed in the Overall Decommissioning Plan. Many subjects (local authorities, ministries ..) give advise and arguments during the approval of such a plan, in such a way that all the pro and contra of the different strategies are taken into account. Consideration is always given to the decay of contaminated or activated material in identifying such time span. The Safety Authority is charged to verify that the duration of such phase does not exceed the planned time. After that phase the major dismantling activities start according to the above mentioned plan.
JAPAN	In Japan, the standard duration of safety store during decommissioning process is being considered by MITI to be 5 to 10 years with some different factors concerning decommission process, such as radiation hazards to workers, demand for the site to be reused, public acceptance for decommissioning. This standard duration is now used as a model to calculate the cost of decommissioning.
NETHERLANDS	See also question 3. On this moment there is a discussion between the NPP and the regulatory body about the period (40 years is suggested) to allow the decay of contaminated and activated material. After that period the whole site must be cleaned in such way that no restrictions in use of that site exists.
SPAIN	The Ministry of Industry has granted a licence to ENRESA for a period of 5 years. In this period decommissioning level II should be reached. After that, the reactor building decommissioning should be delayed at least 10 years. The Ministry and the CSN have not yet a final decision about the following steps.
SWEDEN	There are no plans for delayed decommissioning. On the contrary, decommissioning is planned to start within a few years after shut down of the reactors. SKI supports this view by SKB. Even if decay of radionuclides is a positive aspect in delaying the dismantling there are also negative aspects (people with knowledge of the facilities will not be available, the long term existence of the funds may be at risk etc.).
SWITZERLAND	There is no general rule here. The decommissioning and dismantling of the research reactor at Lucens lasted about 24 years with periods of safe enclosure. A similar timetable is applied to the research reactor DIORIT. The duration of the decommissioning with safe enclosure of the research reactor SAPHIR is not yet fixed but will be more than 8 years.

<i>Safe Store</i>	14. <i>If decommissioning is significantly delayed with use of the safe enclosure concept, what are the time spans or goals in terms of allowance for the decay of contaminated and activated material? Is the duration of a safe enclosure phase limited by the regulatory body and what happens after that phase?</i>
UNITED KINGDOM	<p>The "Safestore" concept has been suggested by UK power station licensees but UK regulators (including NII) have yet to form a view as to whether it is an appropriate strategy for use with redundant reactors. A Government White Paper by the previous Administration in 1995 did not dismiss the concept but stated that "the decommissioning of nuclear power plants should be undertaken as soon as is reasonably practicable to do so, taking account of all the relevant factors". It required licensees to ensure funding provision for each decommissioning option and stated that there are a number of potentially feasible and acceptable decommissioning strategies for nuclear power stations including "Safestore" which would require regulatory approval on a case-by-case basis.</p> <p>It has been suggested by certain UK licensees that, following a period of 35 years, in which time the plant can be de-fuelled and reduced in size and prepared for its decay period, the reactor will be allowed to decay for a further 100 years before final dismantling and clearance of the site takes place. Whether this proposal is accepted, accepted with modification or rejected, and whether the suggested periods are accepted, will be judged by NII based on a case presented by the licensee. The acceptability of the state of the facility and its inspection and management will continue to be reviewed by NII during the storage period.</p>

<i>Safe Store</i>	15. <i>What technical criteria have to be satisfied before redundant plant, systems and components can be placed in a safe enclosure? Does a safety case have to be prepared for each safe enclosure phase covering all credible faults, and ageing? How are the safety cases, subsequent modifications, systems and structures regulated for safe enclosures? How does the regulatory authority ensure that necessary maintenance, care and surveillance are carried out?</i>
BELGIUM	<p>No answer (no experience in Belgium).</p> <p>In Nuclear Power Plants, a new license for decommissioning is required.</p> <p>It is probable that:</p> <ul style="list-style-type: none"> • a safety case should be prepared (see question 7) • conditions and technical specifications will be introduced in the license • inspection by the regulatory authority should continue, to ensure that necessary maintenance, care and surveillance are carried out (see question 8).
CANADA	<p>The criteria will be established on a site/licensee-specific basis and a safety case will have to be made for each safe enclosure phase covering all credible faults including the effects of ageing,</p> <p>All safety cases, modifications, etc. are regulated by the comprehensive licensing process of the AECB. The AECB will have licence conditions in place to require the necessary maintenance and surveillance and will provide for an appropriate schedule of inspections by its own staff.</p>
CZECH REP.	<p>Technical criteria concerning the safe enclosure following the removal of spent fuel (from nuclear reactors) and other nuclear materials, are: the inventory and location of radioactive and other hazardous material; radiation dose and contamination survey; shielding facilities; protective barriers, systems, structures and components; preliminary decontamination techniques; preliminary dismantling techniques; surveillance and maintenance tools and procedures; personal, workplace and environmental monitoring aids, engineering support, etc.</p> <p>The safety cases have to be prepared for each safe enclosure phase. The anticipated safety cases are reported by a licensee in the safety report submitted to and approved by the regulatory authority. The regulatory authority ensure that necessary maintenance, care and surveillance were carried out by the on-site inspection and/or on the basis of appropriate expertise.</p>

<i>Safe Store</i>	15. <i>What technical criteria have to be satisfied before redundant plant, systems and components can be placed in a safe enclosure? Does a safety case have to be prepared for each safe enclosure phase covering all credible faults, and ageing? How are the safety cases, subsequent modifications, systems and structures regulated for safe enclosures? How does the regulatory authority ensure that necessary maintenance, care and surveillance are carried out?</i>
FINLAND	No specific plans or requirements exist yet.
FRANCE	(see questions 2-6). A decree licensing dismantling, even in the case of a partial dismantling leading to safe enclosure, is requested to start such operations (phase 3, sub-phase 1). The regulatory procedure involves a safety case assessment including maintenance and surveillance aspects.
GERMANY	A safety case (Safety Analysis Report) has to be prepared for each safe store phase. In this safety case, all preparatory and modification work to immobilise the remaining radioactive inventory and to transfer the plant into the safe store condition has to be described, taking into account the environmental conditions within the plant, ageing of structures and possible radioactive emissions. A set of recurrent inspections, testing and regular plant walkdowns as well as maintenance activities will be necessary to control the safe condition of the enclosed plant. These maintenance activities will be required by licence conditions and are subject to regulatory inspection.
HUNGARY	The first possible phase of Safe Enclosure as a decommissioning conception included in the regulation, but there are not exact orders, yet.
ITALY	A safety case has to be prepared for each decommissioning phase, including analysis of the consequences of all credible faults and effects of ageing. Licenses, including the identification of constraints and of technical binding documents, are issued according to the applicable law. Inspections are regularly performed by the Safety Authority.
JAPAN	The technical criteria which have to be satisfied before safe store is initiated are being developed by the regulatory authority (MITI) at present. The MITI is also discussing the measures to ensure that necessary maintenance, care and surveillance are carried out.
NETHERLANDS	A nuclear facility must have a license before decommissioning can take place and a Safety Analysis Report / Technical Specifications (TS) valid for the new phase has to be set up. Aspects of electricity supply, heating, controlled ventilation, regular inspections of structures/needed components, controlled access, document storage conditions, QA, etc. will be described in the new license/TS.
SPAIN	There is not yet a general criteria on this phase. The decommissioning licence of ENRESA has a condition to submit to the Ministry an Overview Surveillance Programme for this period. This programme should be prepared 1 year before the end of the decommissioning level II. Then, all the authorities involved in this subject have to reach an agreement about appropriate rules and standards. Spain is in contact to regulatory bodies and agencies in other countries to follow the international development in this field. There is a general opinion that this subject needs an international consensus and common understanding about rules, standards and technical criteria.
SWEDEN	There are no plans for delayed decommissioning. On the contrary, decommissioning is planned to start within a few years after shut down of the reactors. SKI supports this view by SKB. Safety reports including all aspects of safety in decommissioning and dismantling have to be presented and reviewed by SKI. SKI can issue conditions to the reactor owner. SKI will supervise the decommissioning phase in the same manner as during the operational phase. The funds "guarantee" that the costs for dismantling etc. can be covered.

<i>Safe Store</i>	15. <i>What technical criteria have to be satisfied before redundant plant, systems and components can be placed in a safe enclosure? Does a safety case have to be prepared for each safe enclosure phase covering all credible faults, and ageing? How are the safety cases, subsequent modifications, systems and structures regulated for safe enclosures? How does the regulatory authority ensure that necessary maintenance, care and surveillance are carried out?</i>
SWITZERLAND	Safe enclosure represents an important modification to the facility and is subject to licence. The licensee has to prepare a safety report for this and submit it to the regulatory body for acceptance. Transition to safe enclosure after the licence has been granted takes place in the framework of a stepwise procedure which involves permits of the regulatory body in the context of the normal supervisory process.
UNITED KINGDOM	HSE requires, where it is practical and cost-effective to do so, that radioactive waste is stored in a passively safe form and in a manner which facilitates retrieval for final disposal. The policy for redundant plant, systems and components within a safe store would be similar. In practice HSE will expect to see that components to be placed in a safe store are chemically and physically stable, that the store has appropriate containment and that the components are placed in the store in a manner which minimises the need for safety mechanisms, maintenance, monitoring and human intervention, but also in a manner which facilitates retrieval for final disposal. The regulatory regime for a safe store would be no different to that for an operational plant. The licensee has to prepare safety justifications covering all credible faults and ageing. Modifications of systems and structures by licensees, periodic safety reviews and maintenance, care and surveillance etc. would all be regulated under the standard conditions attached to the nuclear site licence.

<i>Safe Store</i>	16. <i>How does the regulatory body ensure that the licensee retains adequate knowledge about the remaining plant structures, systems and components during the safe enclosure phase?</i>
BELGIUM	No answer. This point should be addressed in the decommissioning license, to be foreseen in the future regulation (see question 20).
CANADA	The AECB cannot directly ensure the retention of such knowledge. The AECB will assess proposals by the licensee to provide appropriate mechanisms to retain such knowledge, and will require that licensees demonstrate the existence of adequate measures to preserve the necessary knowledge and information. In the worst case, if these measures prove inadequate, it will be possible for the CNSC to require final decommissioning to be carried out under its control, using the funding established in a financial guarantee for that purpose.
CZECH REP.	The licensee is obliged to monitor, measure, evaluate, verify and record values, parameters and facts. Further maintain and keep records on radiation sources, systems, components and processes important from the viewpoint of nuclear safety, radiation protection, physical protection and emergency preparedness and submit the registered information to the regulatory authority in manner as determined by implementing regulations. Empowered by the Atomic Law and its implementing regulations, inspectors of the regulatory authority perform inspections at persons granted the licence. Among others, they also verify personal competence and special professional qualification of the licensees.
FINLAND	Adequate documentation will be required, but no specific requirements exist yet.
FRANCE	(see question 9). The record keeping that the utility has to ensure to complete DSIN requirements must include information about remaining structures, systems and components to facilitate the final dismantling.

<i>Safe Store</i>	16. <i>How does the regulatory body ensure that the licensee retains adequate knowledge about the remaining plant structures, systems and components during the safe enclosure phase?</i>
GERMANY	The complete documentation of the plant, especially the plant description as enclosed in its safe store condition is of great importance and will be assessed by the regulatory authority prior to approve the "operation" of the safe store condition. Also, the physical location and the maintenance of this documentation and records have to be such, that decommissioning work can be resumed after the safe store phase. A change of the ownership as licensee of the enclosed plant also requires a licence. In such case, the handing over of all relevant documentation will be inspected as well. It will be the responsibility of the licensee, to provide for adequately trained and qualified personnel as required for the licence to finally dismantle the plant.
HUNGARY	According the present orders the licensee have to retain the documentation of systems, which have safety importance, till the end of lifetime of facility. In the licensing procedure for License of Decommissioning the licensee have to prepare a material about the lifecycle of facility and the technical information needed for decommissioning. Appropriate quality assurance program must be operate, included the adequate long storage of documents originated from operating and decommissioning phase of the nuclear facility.
ITALY	This is a problem that has already been singled out but not completely solved. It is an element that will be heavily taken into account in verifying the timing of Decommissioning Plans and its organisation.
JAPAN	The licensee must file the Notification of Dismantling Plan and the Alteration of Technical Specification (Self Safety Regulations) to the regulatory authorities whenever the condition of decommissioning changes. The authorities can ensure the adequacy of licensee's knowledge about not only the remaining plant structures, systems and components but also organisation, training during the safe store by reviewing those reports.
NETHERLANDS	The IAEA safety code and guides are applied in the Netherlands. In the guide about Quality Assurance, 50-SG-Q2 (Document control and records) Annex 3, a list of documents is mentioned with recommended retention times. This list will be used for the period in which the NPP is allowed to decay the radioactive material. The safety guide gives also the requirements for proper storage conditions.
SPAIN	During the safe enclosure phase the licensee is responsible for the current condition of residual plant structures. The licensee has to ensure that he retains adequate knowledge and personnel according to plant conditions. This situation is controlled by the regulatory body and the Ministry of Industry as for any other licensee.
SWEDEN	This is regulated in SKI regulations.
SWITZERLAND	This is achieved by appropriate requirements that comprehensive documentation be maintained on the components undergoing safe enclosure and the associated circumstances.
UNITED KINGDOM	The regulatory system outlined in the answer to Question 15 should ensure that the licensee is aware of the current condition of residual plant structures, systems and components and, to the extent which is necessary, the material held in a safe store. This information, together with relevant records from the operational phase which the licensee has to keep, will inform decisions about future decommissioning activities which will usually start with a radiological survey as stated in the answer to Question 9.

<i>Future Use or Restoration of the Site</i>	17. Will the site remain a controlled nuclear site forever or will it eventually be released for other purposes?
BELGIUM	No answer. The purpose of future decommissioning of nuclear site will probably be the release.
CANADA	That will depend on whether the licensee has met the established criteria for the release of the site from regulatory control by the AECB. One can postulate many different acceptable proposals from complete green-fielding to perpetual institutional control of an entombed nuclear reactor.
CZECH REP.	This control is dependent on the release condition of the site. If the site is released unrestricted for other purpose, no further control is anticipated. Otherwise, continual institutional control shall be applied.
FINLAND	Our decommissioning plans assume the release of the site after decommissioning has been completed.
FRANCE	At the end of the dismantling operations (level 3), if there is no longer radioactive materials, the site can be released for other purposes and is no longer a nuclear site.
GERMANY	It is the goal to release the site without any restrictions due to radiological hazards either with remaining buildings for other purposes or completely restored (green-field) for other uses as defined in the state land developing plan. Decommissioning can also be finalised if the remaining plant structures will be used as a nuclear facility under a different licence.
HUNGARY	
ITALY	It is stated by the applicable law that the final goal of decommissioning is to release the site for uncontrolled use.
JAPAN	In principle, the site used for a commercial nuclear power plant will be continuously used as a controlled nuclear site after decommissioning of the plant.
NETHERLANDS	After the period of safe store the whole site must be cleaned in such way that no restrictions in use of that site exists.
SPAIN	There is not a final decision on this subject and several alternatives are on discussion at this moment, taking into account the kind of facilities and sites involved with different geographical and environmental aspect to assess.
SWEDEN	According to SKB the site will be restored to "green fields". Parts of the site may need to be under institutional control for some period of time.
SWITZERLAND	The aim is to clear the site from the applicability of the Atomic Energy Law. In this context the site should either be released for other use or returned to Greenfield conditions.
UNITED KINGDOM	The site will remain licensed (i.e. directly regulated by NII) and the licensee will remain responsible for safety until NII is satisfied that there is no danger from ionising radiation from anything on the site. Once NII is satisfied the site can be released for other purposes. (See answer to Question 18). It is also possible for part of a licensed site to be used for other purposes whilst remaining part of the licensed site. However, the licensee is then required to retain control over all activities on the site.

<i>Future Use or Restoration of the Site</i>	18. When and with what conditions will the responsibility of the licensee be terminated? Who releases the licensee from the period of responsibility and imposes conditions, if any?
BELGIUM	No answer. This point should be addressed in the decommissioning license, to be foreseen in the future regulation (see question 20).
CANADA	The conditions for licence termination will be established by the AECB on a licensee/site-specific basis. The AECB, or its successor the CNSC, has the responsibility to approve the conditions for release and/or continued control. These decisions will be based on safety/impact considerations. The conditions for release may in some cases include arrangements for the establishment and funding of institutional controls under the auspices of a provincial or other level of government.
CZECH REP.	The responsibility of the licence is terminated after the licensee reports that the decommissioning has been processed and completed in accordance with the licensed documentation, containing at the program of decommissioning, approved by the regulatory body before the start of the decommissioning. It can be bound to some conditions, if the site is released restricted. The regulatory authority releases the licensee from the responsibility and imposes relevant conditions.
FINLAND	The responsibility of the licensee will be terminated after the completion of decommissioning. If the licensee is incapable to implement decommissioning, the responsibility can be transferred to the State in an earlier phase, but the financial liability still rests with the licensee. Based on STUK's statement, the Ministry of Trade and Industry decides on the termination of responsibility.
FRANCE	The responsibility for the site of the licensee is terminated after the compliance of the removing of all the radioactive materials. This compliance is checked on the basis of a completion report and a thorough visit of the DSIN. The operator is responsible for the management of the radioactive waste produced during dismantling operations until the elimination of the waste.
GERMANY	The responsibility of the licensee will be terminated when all requirements and conditions stated in the decommissioning licence have been met and the documentation of the radiological survey of the site has been handed over and assessed by the regulatory authority. The responsibility of the licensee terminates completely when the last term for keeping the radiation protection documentation (30 years) has expired, according to regulations of the Radiation Protection Ordinance.
HUNGARY	
ITALY	The responsibility remains on the licensee up to site release (see answer to question 17). As the decommissioning goes on, some conditions for the license are no longer applicable, according to the technical documents attached to Decommissioning License.
JAPAN	Upon acceptance of Notification of Completion of Decommissioning ⁽²⁾ from the licensee, the responsibility of licensee is terminated. Prior to submitting the Notification, the licensee has to complete the measure such as transfer of nuclear fuel materials, removal and disposal of contamination and then report to authorities. No condition is imposed for termination of the licensee's responsibility. ⁽²⁾ Notification of Completion of Decommissioning must be filed within 30 days after whole decommissioning process terminates. (stipulated in Article 65-1, LRNR)
NETHERLANDS	An exact juridical answer cannot be given. One of the conditions to terminate the responsibility of the licensee will be that all radioactive waste/material is stored at the COVRA and the (cleaned) site can be used without any restrictions..

<i>Future Use or Restoration of the Site</i>	18. <i>When and with what conditions will the responsibility of the licensee be terminated? Who releases the licensee from the period of responsibility and imposes conditions, if any?</i>
SPAIN	When the Ministry of Industry grants the decommissioning license to a NPP the responsibility of the licensee is transferred to ENRESA which is a public company in charge of radioactive wastes in Spain. Then, the new license is granted really to ENRESA and this company is the responsible licensee of the facility by Law. For details of this procedure see answer to question 1.
SWEDEN	The law puts a general long term responsibility on society. However the actual lifting of responsibility from the reactor owner to society is not yet fully regulated.
SWITZERLAND	This question has not yet been resolved legally, but will be covered by the future Law on Nuclear Energy (KEG). According to this, clearance from the applicability of Nuclear Energy Law after completion of decommissioning will be established by a decree.
UNITED KINGDOM	When a licensee wishes to surrender a licence NII requires the licensee to undertake sufficient monitoring to demonstrate that there has ceased to be any danger from ionising radiation from anything on the site. NII assesses the monitoring results and, when satisfied, will issue a Notice of no danger from ionising radiation from anything on the site. It is at this point when NII releases the licensee from the period of responsibility.

<i>Future Use or Restoration of the Site</i>	19. <i>How does the regulatory body ensure that the site can be released for unrestricted use? What kind of documentation is kept, and by whom, to describe the former nuclear activities and the checks that have been made to determine that there has ceased to be any danger from ionising radiation from anything on the site?</i>
BELGIUM	No answer.
CANADA	The AECB will establish through an audit inspection by its own staff whether the site has met the agreed criteria and consequently can be released for unrestricted use. All documentation during the licensed period is the responsibility of the licensee. After the release of the licensee from responsibility for the site/activity, the records required by the regulator would be kept using appropriate government archive mechanisms.
CZECH REP.	The regulatory authority ensures the possibility of the unrestricted release of the site by reviewing the documents reporting the course of the decommissioning, on-site inspections and on the basis of independent radiological survey made by an appropriate contractor.
FINLAND	The licensee has the primary responsibility for making radiological survey and documentation while STUK inspects those activities. However, STUK can make or engage a third organisation to make independent monitoring.
FRANCE	The utility will have to check that there is no longer ionising radiation on the site. These checking is evaluated by DSIN. There are no special requirements, at moment, to keep the information about the checking and about the former installation, after the end of the dismantling operations at level 3.
GERMANY	The radiological survey of the site stating that all radioactive inventory has been removed, all relevant conditions are met and no hazards remain will be presented by the licensee and assessed by experts of the regulatory authority. For control own measurements of the regulatory body will be performed. The documentation of this survey and the assessment will be kept by the state authorities.
HUNGARY	This is not regulated in detail, the Nuclear Safety Regulations launched as Appendix of Gov. Decree No; 108/97(VI.25) estimates the unlimited use of site after decommissioning of the NPP.

<i>Future Use or Restoration of the Site</i>	19. <i>How does the regulatory body ensure that the site can be released for unrestricted use? What kind of documentation is kept, and by whom, to describe the former nuclear activities and the checks that have been made to determine that there has ceased to be any danger from ionising radiation from anything on the site?</i>
ITALY	No specific position has been still issued on this matter.
JAPAN	<p>The rule is now considering as follows:</p> <p>The regulatory authorities ensure that the site can be released for unrestricted use by sampling inspection of remaining radiation. The documentation which proves that the site is free from the danger of ionising radiation is maintained by the licensee.</p> <p>As reference, the main items recorded in the documentation of JPDR were as follows:</p> <ul style="list-style-type: none"> • Calibration results of radiation measuring instruments and other instruments which are directly related to the safety of reactor facilities. • Radiation equivalent rate at the shielding walls of the reactor, spent fuel storage facility and radioactive waste disposal facility. • Average concentration of radioactive materials at vents and drains. • The following items in controlled area: <ul style="list-style-type: none"> – Radiation equivalent; – Average concentration of radioactive materials in the air; – Density of radioactive contaminants on the surface of contaminated materials. • History of each worker's radiation exposure. • Quantity of nuclear fuels transferred outside the site, date and route of the transfer, and kind of container used for the transfer. • Kind, quantity and specific gravity of disposed radioactive waste. • Date, place and method of waste disposal Condition of reactor facilities observed through patrol and check, and names of workers who conducted the patrol/check. • Condition of repair and alteration of reactor facilities, and names of workers who observed it. <p>The items required to be included in the documentation of commercial plants are in preparation by the MITI.</p>
NETHERLANDS	By checking the conditions (see question 18) and the documentation dealing with measurements of the radioactivity of the environment the regulatory body will be ensured that the site can be released for unrestricted use.
SPAIN	No answer at this moment. This point should be addressed in the final decommissioning license, to be foreseen in the future regulation.
SWEDEN	This matter will be reviewed by the relevant authorities (SSI and SKI).
SWITZERLAND	The facility must no longer represent any source of radiological risk. This requires that the remaining areas are decontaminated and the waste transferred to a suitable disposal site. The regulatory authority carries out measurements to check on this.
UNITED KINGDOM	Although licensees are expected to keep adequate records to the extent and for timescales which NII considers to be appropriate (typically 30 years), NII will also keep details of the radiological checks which are made and its assessment of these checks that lead up to NII's issuance of a Notice of no danger from ionising radiation, in relation to a site or part of a site which is to be delicensed. UK currently intends to keep this information as a permanent record with records being initially kept by NII and subsequently by the Public Records Office.

Future Regulatory Developments	20. Are there any regulatory developments that are likely to occur in the near future?
BELGIUM	Different regulatory developments are likely to occur in the near future: <ul style="list-style-type: none"> • to take into account the directive 96/29 Euratom, • to adapt the regulation to the creation of the Federal Nuclear Agency, • to complete the regulation in different domains: <ul style="list-style-type: none"> – clearance criteria – decommissioning license.
CANADA	It is expected that the AECB will be replaced by the CNSC within several months, when the NSC Act comes into effect. This will give the regulator an improved legal basis, including the capability to require financial guarantees to be established to cover the costs of decommissioning in the event that a licensee becomes unable to carry out its responsibilities.
CZECH REP.	An implementing regulation to the Atomic Law is under preparation by the regulatory authority based on the international recommendations.
FINLAND	The updated decommissioning plans, submitted by the utilities at the end of 1988, will be reviewed by the regulators during this year. Otherwise, no major regulatory developments are foreseen within the next five years or so.
FRANCE	The administrative note, issued on 9th November 1990, has to be modified to take into account the experience that was collected during the Chinon A3-EL4 and Chooz A dismantling regulatory procedures and to take into account the dismantling of research laboratories and industrial facilities.
GERMANY	The Atomic Energy Act has been amended to allow for privatisation of construction and operation of radioactive waste repositories. At present, no detailed plans are in place to implement privatisation. Nevertheless, waste repositories remain to be nuclear facilities under the supervision of the governmental regulatory authorities. The EURATOM Basic Safety Standards from 13 May 1996 have to be reflected in national regulations within four years. The scope of the Basic Safety Standards has been extended to include the concept of clearance, relying widely on IAEA Safety Series No. 89 as a basis. The clearance criteria set out in the recommendation by SSK (see question 12) will be incorporated in the corresponding revision of the German Radiation Protection Ordinance according to the EURATOM directive 96/29. This revision is in an advanced state.
HUNGARY	In the close future (in 4-5 years) - during elaboration of new regulating system - the licensing points of decommissioning will be regulated by the Regulatory Authority. The new regulating system have to contain the decommissioning policy, too.
ITALY	In Italy the envisaged institution of a National Agency for the operational management of radioactive wastes and for the operational decommissioning of nuclear installations will require some changes in the applicable laws. Detailed positions and regulations are going to be settled on several aspect related to decommissioning (waste management, site release ...).

Future Regulatory Developments	20. Are there any regulatory developments that are likely to occur in the near future?
JAPAN	<p>The present regulatory procedure for decommissioning will be maintained in the future. The regulatory authority (MITI) is, however, considering that it is necessary to revise and specify the notification items required for being included in the Notification of Dismantling Plan⁽¹⁾ and Alteration of Technical Specification in order to improve the regulatory procedure.</p> <p>At the same time, the MITI is developing standards/guidelines concerning the following items:</p> <ul style="list-style-type: none"> • System decontamination; • Safe store; • Dismantling and demolition; • Measures for safety evaluation of decommissioning; • Equipment to be maintained during decommissioning; • Execution of administrative order concerning specification of dismantling method; • Release of the nuclear site; • The standards/guidelines above will be necessary for examining the Notification of Dismantling Plan⁽¹⁾ and Alteration of Technical Specification. <p>The MITI is also going to develop the standards/guidelines for the following items which are related to disposition of low-level waste resulting from the decommissioning of commercial power plants:</p> <ul style="list-style-type: none"> • High-β/γ low-level waste; • Low-level metal waste; • Very-low-level metal waste; • Clearance criteria. <p>⁽¹⁾ Notification of Dismantling Plan is required to be filed to the regulatory authorities for approval 30 days before the start of system decontamination for the first time. During decommissioning process, it must be also submitted whenever the dismantling methods and procedure that have been notified are altered. (stipulated in Article 38, LRNR)</p>
NETHERLANDS	<p>a) Introduction of the EC-criteria in the year 2000 (see question 12)</p> <p>b) Agreement between Regulatory body and licensee about the timing of the final decommissioning (40 years; see question 3).</p>
SPAIN	<p>The Regulations on Sanitary Protection against Ionising Radiation, reviewed according to 96/29/EURATOM directive should be approved in 1999.</p> <p>The new Regulations on Nuclear and Radioactive Facilities including the decommissioning licensing process and the enclosure authorisation requirements might be approved in 1998. This regulation will consider the above directive in aspects like non regulated activities and materials.</p> <p>The Parliament is studying a Radioactive Waste Act to cover the new activities related to final repository to spent fuel and high level activity wastes, according to international practices and standards.</p>
SWEDEN	<p>Both SSI and SKI are developing competence in this area. Also new regulations may be needed. It is however too early to give details about future regulations.</p>
SWITZERLAND	<p>The next step will be elaboration and ratification of the planned Law on Nuclear Energy (KEG). On the basis of this, it is possible that more precise requirements will be provided in an accompanying ordinance. New regulatory guidelines will be prepared as required. A new category of radioactive waste (very low level waste VLLW) could be defined.</p>

<i>Future Regulatory Develop- ments</i>	20. <i>Are there any regulatory developments that are likely to occur in the near future?</i>
UNITED KINGDOM	<p>EU Directive 85/37/EEC as amended by 97/11/EC on "The Assessment of the Effect of Certain Public and Private Projects on the Environment" is planned to being brought into UK legislation by town and country planning and other regulations currently being prepared. The specific regulations relating to decommissioning of reactor plant are to be in force by March 1999. They are provisionally titled "The Nuclear Reactors (Assessment of Environmental Effects of Decommissioning) Regulations 1999". These are expected to require a full environment impact assessment to be made before reactor decommissioning work commences and to require licensees to obtain NII's formal Consent before decommissioning commences.</p> <p>EC "Basic Standards" Directive 96/29/Euratom requires member governments to implement its requirement by May 2000. To bring the requirement into UK legislation it is proposed to introduce new Ionising Radiation Regulations. These have been drafted and are now subject to public consultation. A number of changes in the regulatory requirements are expected to be introduced including a different definition of the justification requirements to that in the existing Directive.</p>

Annex 2 Information on Decommissioning programmes in the contributing countries

Belgium

Two nuclear facilities are under decommissioning in Belgium:

- BR3, a small pressurised water reactor,
- Eurochemic, a reprocessing plant.

Germany

Currently there are 16 nuclear power plants and prototype reactors, 29 research reactors and critical assemblies as well as 6 fuel cycle facilities permanently shut down. Two of the power reactors, 18 of the research reactors and critical assemblies and one of the fuel cycle facilities have already completed decommissioning. The sites of these two power reactors (KKN Niederaichbach and HDR Großwelzheim) were cleared, released and restored to green-field condition after complete dismantling of the entire plants. Two of the power reactors and three research reactors are in the safe store state. For the other power reactors dismantling is in progress. Mostly, the green-field condition is the planned goal.

Italy

All the Italian NPPs are at present shut down and, at different levels, under decommissioning. The Garigliano power station, a BWR unit (160 MWe), started its commercial operations in the year 1964, and was permanently shut down in the year 1978.

The present status is the following:

- all spent fuel removed from the site (mostly sent to reprocessing at foreign plants);
- 322 elements stored AFR (Away From Reactor) at Saluggia-Avogadro storage pool);
- radwaste treatment and conditioning under completion;
- mapping of contamination fully carried out;
- “easy” decontamination performed;
- first phase of decommissioning programme (“safe storage”) under way.

The Latina power station, a MAGNOX type unit (210 MWe initially, then reduced to 160 MWe), started its commercial operations in the year 1964, and was permanently shut down in the year 1986. Such a decision was later on definitively confirmed by a resolution of CIPE.

The present status is the following:

- all spent fuel removed from the site (all reprocessed at foreign plants);
- radwastes treatment and conditioning underway;
- mapping of contamination fully carried out;
- “easy” decontamination performed;
- first phase of decommissioning programme (“safe storage”) under way.

The Trino power station, a PWR unit (270 MWe) started its commercial operations in the year 1965 and was permanently shut down in the year 1987, just after the 9th refuelling (just before starting the 10th cycle). Such a decision was later on definitively confirmed by a resolution of CIPE.

The present status is the following:

- all the fuel permanently removed from the core (mostly sent to reprocessing at foreign plants);
- 96 elements stored AFR, of which 47 in the storage pool at the same Trino site, and the remaining 49 at Saluggia-Avogadro storage pool);
- radwastes treatment and conditioning under way;
- first phase of decommissioning programme (“safe storage”) is under way as a licence modification.

The Caorso power station, a BWR unit (882 MWe), started its commercial operations in the year 1981 and was permanently shut down in the year 1986, just after the 4th refuelling (before the 5th cycle starting). Such a decision was later on definitively confirmed by a resolution of CIPE.

The present status is the following:

- all the fuel still stored in the reactor building: 560 elements in the reactor vessel (160 of which as fresh elements) and 632 in the storage pools;
- the operation for removal of the fuel from the core to the storage pools is going to start and its completion is foreseen for the end of this year (1998);
- radwastes treatment and conditioning under way;
- decommissioning programme under evaluation by the Regulatory Authority.

Japan

- A test reactor, Japan Power Demonstration Reactor (JPDR) was decommissioned and its dismantling was completed in March 1996.
- Reprocessing Test Facility (JRTF) of the Japan Atomic Energy Research Institute (JAERI) started to be dismantled since December 1996.
- Tokai-1, which permanently ceased power operation on March 31, 1998, is the first commercial reactor to be decommissioned in Japan. It is in preparation for decommissioning process at present. Technical Standards for decommissioning of commercial reactors are being developed by the government.

Regulatory Authorities for Nuclear Facilities in Japan:

- The Science and Technology Agency (STA) regulates test reactors.
- The Ministry of International Trade and Industry (MITI) regulates commercial reactors.

Netherlands

On October 3, 1996, the Board of Directors of SEP (an alliance of Dutch utilities which is the sole shareholder of the utility which operates the Dodewaard Nuclear Power Plant) decided to permanently shut down the Dodewaard reactor in the near future. The shut-down became effective as of March 26, 1997. This decision was taken for two main reasons; (1) the SEP felt that there was no longer any prospect of the Dutch government giving the go-ahead to the further development of nuclear energy in the Netherlands in the foreseeable future. (2) the Dodewaard NPP had been built primarily as a means of gaining experience with nuclear energy. It was never ‘economic’ in the sense that revenues were higher than costs, and the situation was likely to be exacerbated by the impending deregulation of the European electricity market.

Regarding the decommissioning Dodewaard has clearly indicated its intention to prepare the plant for a safe enclosure of about 40 years followed by a complete dismantling. The sole reason for this waiting period of 40 years is the financial benefit due to the fact that for the necessary allocation of money, a real rate of interest can be included in the decommissioning costs.

Spain

- One Nuclear Power Plant (Vandellos I- 480 MWe) has started the decommissioning process. Vandellos has a gas- graphite reactor and the fuel was natural uranium. After a fire incident occurred in 1989 the plant was shut down.

The Ministry of Industry did not decide to ultimately close the plant. The requirements imposed by the CSN to start up the plant again would have led to costly investments. The owner decided on financial reasons not to bring the plant back on line. Then, the Ministry decided that the owner had to remove the spent fuel and to clean up different areas (e.g., the spent fuel pool) during several years before the transfer of the licensee to ENRESA could take place. The owner has been working with ENRESA to clean up the plant until they accomplished the transfer conditions. The defuelling process was finished in 1994.

At the end of 1995, CSN and the Ministry stated that the transfer conditions were fully accomplished. ENRESA submitted a decommissioning plan and related safety studies. These documents were approved in 1998 by CSN and the Ministry of Industry. In January 1998 the Ministry of Industry transferred the license from HIFRENSA (owner company) to ENRESA. From this moment ENRESA took over the sole responsibility for decommissioning and dismantling Vandellos NPP.

For the transfer of responsibility and the licence see Annex 1 question 1.

A decommissioning license was granted for 10 years to carry out decommissioning of the plant to level 2. After that, a latent period of 30 years will follow to go to level 3.

- Two uranium mining facilities are under decommissioning at this moment. Three small research reactors are in safe enclosure situation (without fuel assemblies) but the decommissioning activities have not been started yet.

Switzerland

In Switzerland, to date, only research reactors (Lucens, Diorit) but no power reactors have been decommissioned.