Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

Answers to Written Questions on the National Report from Denmark

First Review Meeting, 3 – 14 November 2003

National Board of Health
National Institute of Radiation Hygiene
October 2003

Introduction

The Danish National Report for Denmark for the First Review Meeting to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management was published in April 2003. The National Report is available from the National Institute of Radiation Hygiene and also at the institute's Internet site: http://www.sis.dk.

Denmark has received written questions to the National Report from the following countries: Austria, Bulgaria, France, Germany, Hungary, Korea, Spain, Ukraine and United States.

The present report gives an anonymous compilation of the answers to the written questions. The order of questions/answers follows the order of the articles of the Joint Convention referred to in the questions and the Danish National report.

Answers to written questions

Article: 4-10, section G
Ref. page: 13
Question:
Risø has to manage a minimal amount of spent fuel from the research reactor DR1 as well as about 233 kg of spent fuel remaining from post-irradiation investigations. Is Risø taking into account the exportation option? If not, how will they be managed? What solutions are envisaged or considered for its future management?

Answer:
Various options for exportation of the 233 kg irradiated experimental fuel and the core-solution from DR1 have been or are still under consideration. No time schedule is available. Long-term storage awaiting possible future regional or bilateral solutions for such very small amount of wastes is not a technical problem.

Article: 4-10, section G
Ref. page: 13
Question:
What type of facility is used to store the remaining spent fuel at Risø?

Answer:
The core-solution from DR1 is stored in a special storage room for fissile materials in the DR 3 building complex.

The 233 kg irradiated experimental fuel is stored in the waste storage facility called 'Centralvejslageret'.

Article: 4-10, section G
Ref. page: 13
Question:
What are the plans in relation to the spent fuel from research reactor DR 1 that are not going to be sent to USA ?

Answer:
Various options for exportation of the 233 kg irradiated experimental fuel and the core-solution from DR1 have been or are still under consideration. No time schedule is available. Long-term storage awaiting possible future regional or bi-lateral solutions for such very small amount of wastes is not a technical problem.

Article: 4, 5, 8, 9, section G
Ref. page: 13
Question:
How is compliance with Joint Convention Articles 4, 5, 8, 9 ensured as regards the spent fuel in question?

Answer:
The spent fuel stored at Risø (very limited amounts) are covered by the Danish legislative and regulatory system and by that of the general authorisations of the nuclear installations at Risø and the Operational Limits and Conditions issued by the Nuclear Regulatory Authorities. The Operational Limits and Conditions contains specific requirements for the safe management of fissile materials.

Article: 7, section G
Ref. page: 13
Question:
How the safety is ensured in the storage of SF that has been used for post-irradiation examinations?

Answer:
The 233 kg of experimentally produced and irradiated spent fuel from post irradiation investigations are stored in welded cylindrical stainless steel tubes kept in criticality-safe configurations inside 30 litres stainless steel containers placed in holes in an underground concrete storage block providing the necessary shielding. The facility is under IAEA-safeguards control and provided with appropriate security features.

Article: 8, section G
Ref. page: 13
Question:
Have safety assessments been performed for storage of such type of SF?

Answer:
Safety assessments for the storage of this spent fuel have been performed as part of the safety assessments of the storage building called ‘Centralvejslageret’ and is described in the safety documentation prepared by the licence holder.

Article: 10, section G
Ref. page: 13
Question:
What are the plans for the future storage or disposal of such type of fuel?

Answer:
Various options for exportation of the 233 kg irradiated experimental fuel and the core-solution from DR1 have been or are still under consideration. No indications for a time schedule are available. Long-term storage awaiting possible future regional or bilateral solutions for such very small amount of wastes is not a technical problem.

Article: Section G
Ref. page: 13
Question:
What provisions have been made for the long-term storage or final management of the spent fuel generated in research reactors?

Answer:
The spent fuel from DR 2 and DR 3 have been transferred to USA's jurisdiction according to an agreement with the US Department of Energy. DR 2 was taken out of operation in 1975 and DR 3 in 2000 and all spent fuel from these two research reactors are by June 2002 transferred to USA.

The 15,8 litres of spent fuel solution from research reactor DR1 are stored under criticality- and otherwise safe conditions in four separate cylindrical stainless steel containers each placed inside a cylindrical locked steel container with appropriate radiation lead shielding. The containers are under IAEA-safeguards control and under appropriate security.

The 233 kg of experimentally produced and irradiated spent fuel from post irradiation investigations are stored in welded cylindrical stainless steel tubes kept in criticality-safe configurations inside 30 litres stainless steel containers placed in holes in an underground concrete storage block providing the necessary shielding. The facility is under IAEA-safeguards control and provided with appropriate security features.

Various options for exportation of the 233 kg irradiated experimental fuel and the core-solution from DR1 have been or are still under consideration. No indications for a time schedule are available. Long-term storage awaiting possible future regional or bilateral solutions for such very small amount of wastes is not a technical problem.

Article: 8, section G
Ref. page: 13
Question:
The DR1 spent fuel will be stored under specific conditions in the reactor. Could Denmark provide information on the regulatory process related to this modification of the initial purpose of the facility?

Answer:
The core-solution in DR 1 was removed from the DR 1 reactor in 2002 and is now stored in a special storage room for fissile materials in the DR 3 building complex. The 15,8 litres of spent fuel solution are stored under criticality- and otherwise safe conditions in four separate cylindrical stainless steel containers each placed inside a cylindrical locked steel container with appropriate radiation lead shielding. The containers are stored under IAEA-safeguards control and under appropriate security.

The transfer of the core-solution to steel containers and the subsequent storage of the spent fuel in the DR 3 building complex has been approved by the Nuclear Regulatory Authorities after application from Risø National Laboratory. The application included a safety assessment of the transfer and the subsequent storage of the spent fuel at DR 3.

Article: 11, section H
Ref. page: 13
Question:
Which are the main technical requirements on containers, treatment, conditioning and documentation?

Answer:
Requirements to containers, conditioning and documentation of the stored waste have developed over the years. Information comprise mainly origin and other administrative including safeguard information, external radiation and for most of the low-level drums results from gamma-scanning. Information about especially the older waste units is not up to standard and additional measurements may be necessary. The same is the case for a minor number of medium-level waste units.

Most of the waste is packed in 210 litre drums with an inner 100 litre drum and the annular space filled with cement mortar. Stainless steel containers are used for especially active waste (mainly alpha-waste from Hot Cells work). Bituminisation of low-level evaporator concentrate from water purification has been employed since 1970.

Article: 12, section H
Ref. page: 14
Question:
Is it expected that the existing conditioned waste be compatible with the projected disposal facility? What kind of conditioning requirements have been applied both for the waste produced at Risø and the waste received from small producers?

Answer:
The concept for a future Danish repository for low and medium level waste is not yet defined and formal waste acceptance criteria are therefore not available. Concrete containers supposed to be useable for various types of active waste under different conditions are under development. The presently employed waste conditioning methods comprise bituminisation for evaporator concentrates and low-pressure compaction of solid waste in drums (double drums with a layer of

cement mortar). Sources are not conditioned but stored in special drums, other containers or the original shielding. Part of the stored waste may have to be re-conditioned or over-packed before disposal.

Article: 12, section H
Ref. page: 14
Question:
Do you have a potential site for the L/ILW repository? In which type of matrix(rock) do you plan the repository?

Answer:
At present no design or a potential site for a Danish L/ILW disposal facility has been chosen. In 2000 a working group under the Danish Ministry of Science, Technology, and Innovation prepared a report on theoretical considerations of technical requirements for a Danish disposal facility. In this report three design concepts were considered: Near surface repository (on surface, unsatured, Near surface repository (20-50 m, saturated) and Geological repository (200-300 m, saturated). These design concepts could in principle be established in different types of matrix.

Article: 13, 15, section H
Ref. page: 14
Question:
Concerning the siting process for new facilities (spent fuel and radioactive waste), please provide more details on the process with respect to Environmental Impact Assessments.

Answer:
The Danish Parliament has in March 2003 agreed to start the work to establish a basis for decisions on a Danish disposal facility. This work will start with an assessment of the need for a revision of the legal basis including the question of an open and transparent decision process. The initial work should also propose fundamental principles and requirements for a disposal facility in accordance with national and international obligations and recommendations.

Prior to siting, construction and commissioning of a Danish disposal facility the project will be subject to and Environmental Impact Assessment with public participation according to the Planning Act (2002) with underlying legislation which implements European Council Directive 85/337/EEC and 97/11/EC. The assessment can be made either on a national level or on a regional level in the relevant counties. Alternatively it might be decided to make a specific project Act on the siting, construction and commissioning of the disposal facility in agreement with the Planning Act.

In all cases such an environmental impact assessment shall identify, describe and assess in the appropriate manner the direct and indirect effects of the project on the following factors:

- Human beings, fauna and flora
- Soil, water, air, climate and the landscape
- Material assets and the cultural heritage

- The interaction between the factors mentioned in the first, second and third indents

At this initial stage no specific details have been decided with respect to the Environmental Impact Assessment that has to be conducted according to the Planning Act for a disposal facility.

For the decommissioning project at Risø, including the construction of a new storage hall for concrete containers with decommissioning waste, a regional Environmental Impact Assessment has been made in 2002 by the Greater Copenhagen Authority (HUR), which is the planning authority covering the Greater Copenhagen Region. The assessment has been made by the Greater Copenhagen Authority in cooperation with Risø National Laboratory and the Nuclear Regulatory Authorities. The assessment report (in Danish) can be seen and downloaded from: http://pdf.hur.dk/pdf/dekommissionering_af_risoes_nukleare_anlaeg.pdf.

Article: 13, section H
Ref. page: 14
Question:
How are doses to the general public calculated in the siting process for the operational phase and for incidents / accidents?

Answer:
The Danish Parliament has agreed to initiate the process preparing a basis for decisions concerning a Danish disposal facility for low and medium level waste. In this very early state of initiating the process nothing has been decided regarding siting of a disposal facility and therefore no details regarding calculations of doses to the general public neither for an operational phase or for incidents /accidents have been decided for such facilities.

Regarding the decommissioning of the nuclear installations at Risø calculations of doses to the general public in the decommissioning phase and for reference accidents are presented in the report given the general data as called for under the Article 37 of the Euratom Treaty: Decommissioning of the Nuclear Facilities at Risø National Laboratory, Denmark, National Board of Health, National Institute of Radiation hygiene, 2003. The report (in English) can be seen and downloaded from http://www.sst.dk/upload/artikel_37_rapport_sis_lowres_001.pdf.

Article: 15, section H
Ref. page: 14
Question:
Could the wastes stored in Risø that are still unconditioned (4925 t) be conditioned at the existing radioactive waste management facilities or would it be necessary to build new facilities? Is it necessary to construct new treatment facilities for the radioactive wastes generated from decommissioning and demolition of existing nuclear installations? If the answers to these questions are yes, further questions arise under the Convention regarding safety assessment during construction and commissioning of the facilities.

Answer:
The unconditioned waste stored at Risø is mainly alpha-contaminated waste from the partial decommissioning of the Risø-Hot Cells carried out in the 90'ties. Similar materials will arise from final decommissioning of the concrete hot cells. Most of the waste can probably be repacked into the large concrete containers also intended for the more active part of the decommissioning waste from the reactors. Sectioning and packaging of decommissioning waste are supposed to be carried out as an integral part of the practical demolition projects and facilities needed for such purposes will be erected on site. Repackaging or overpacking of existing unconditioned Hot Cells waste will be part of the final Hot Cells decommissioning.

The existing waste management facilities will primarily be used for processing of secondary waste from the decommissioning work such as contaminated water, protective clothing etc. A need for changes or extension of the existing processing equipment at the Waste Management Plant is not expected, but a new storage hall for concrete containers with decommissioning waste and repacked old waste will be constructed after approval of the Nuclear Regulatory Authorities.

Article: 15, section H
Ref. page: 14
Question:
What are the legal bases for licensing radioactive waste management facilities? How does licensing proceed and what documents with which contents have to be submitted? Who checks submitted documents and compliance with licensing conditions?

Answer:
Concerning the establishment of a new storage facility for low and medium level waste arising from the decommissioning of the nuclear facilities at Risø the legal framework will be the Nuclear Installations Act from 1962 with underlying legislation, se annex A in the Danish National report.

Concerning the establishment of a Danish disposal facility for low and medium level waste the Danish Parliament has in March 2003 agreed to start the work to establish a basis for decisions on a Danish disposal facility. This work will start with an assessment of the need for a revision of the legal basis including the question of an open and transparent decision process.

Article: 15, section H
Ref. page: 14
Question:
Prior to construction of a radioactive waste management facility, is a check made of environmental impacts with public participation? What parameters are examined?

Answer:
The Danish Parliament has in March 2003 agreed to start the work to establish a basis for decisions on a Danish disposal facility. This work will start with an assessment of the need for a revision of the legal basis including the question of an open and transparent decision process. The initial work should also propose fun-

damental principles and requirements for a disposal facility in accordance with national and international obligations and recommendations.

Prior to siting, construction and commissioning of a Danish disposal facility the project will be subject to and Environmental Impact Assessment with public participation according to the Planning Act (2002) with underlying legislation which implements European Council Directive 85/337/EEC and 97/11/EC. The assessment can be made either on a national level or on a regional level in the relevant counties. Alternatively it might be decided to make a specific project Act on the siting, construction and commissioning of the disposal facility in agreement with the Planning Act.

In all cases such an environmental impact assessment shall identify, describe and assess in the appropriate manner the direct and indirect effects of the project on the following factors:

- Human beings, fauna and flora
- Soil, water, air, climate and the landscape
- Material assets and the cultural heritage
- The interaction between the factors mentioned in the first, second and third indents

At this initial stage no specific details have been decided with respect to the Environmental Impact Assessment that has to be conducted according to the Planning Act for a disposal facility.

For the decommissioning project at Risø, including the construction of a new storage hall for concrete containers with decommissioning waste, a regional Environmental Impact Assessment has been made in 2002 by the Greater Copenhagen Authority (HUR), which is the planning authority covering the Greater Copenhagen Region. The assessment has been made by the Greater Copenhagen Authority in cooperation with Risø National Laboratory and the Nuclear Regulatory Authorities. The assessment report (in Danish) can be seen and downloaded from: http://pdf.hur.dk/pdf/dekommissionering_af_risoes_nukleare_anlaeg.pdf.

Article: 15, section H
Ref. page: 14
Question:
On which regulations, codes, standards and guidelines are the safety and environmental assessments of radioactive waste management facilities based?

Answer:
Safety assessments were performed for the Waste Management Plant at Risø and approved by the Danish Atomic Energy Commission when the Waste management Plant were commissioned in the 50'es. The safety analyses have subsequent been updated in accordance with requirements in the Operational Limits and Conditions. Separate safety assessments have been performed for the storage buildings constructed after the primary commissioning and are described in the safety documentation by the licence holder.

Regarding a Danish disposal facility for low and medium level radioactive waste the safety assessments will be based on Nordic and other international recommendations from the International Commission on Radiological Protection

(ICRP), the European Commission (EU) and the Internal Atomic Energy Agency (IAEA). The Safety Standards published by IAEA will in particular be of importance, e.g. IAEA Safety Fundamentals No. 111-F, The Principles of Radiation Waste Management (1995), IAEA Safety Guide No. 111-G-3.1, Siting of Near Surface Disposal Facilities (1994), IAEA Requirements No. WS-R-1, Near Surface Disposal of Radioactive Waste (1999) and IAEA Safety Guide No.WS-G-1.1, Safety Assessment for Near Surface Disposal of Radioactive Waste (1999).

The Waste Management Plant at Risø existed before the Danish legislation implementing the Environmental Impact Assessment Directives came into force and as a consequence the present Waste Management Plant has not been subject to a formal Environmental Impact Assessment.

For the decommissioning project at Risø, including the construction of a new storage hall for concrete containers with decommissioning waste, a regional Environmental Impact Assessment has been made in 2002 by the Greater Copenhagen Authority (HUR), which is the planning authority covering the Greater Copenhagen Region. The assessment has been made by the Greater Copenhagen Authority in cooperation with Risø National Laboratory and the Nuclear Regulatory Authorities. The assessment report (in Danish) can be seen and downloaded from: http://pdf.hur.dk/pdf/dekommissionering_af_risoes_nukleare_anlaeg.pdf.

Prior to siting, construction and commissioning of a Danish disposal facility the project will be subject to and Environmental Impact Assessment with public participation according to the Planning Act (1999) with underlying legislation which implements European Council Directive 85/337/EEC and 97/11/EC. The assessment can be made either on a national level or on a regional level in the relevant counties. Alternatively it might be decided to make a specific project Act on the siting, construction and commissioning of the disposal facility in agreement with the Planning Act.

Article: 15, section H
Ref. page: 14
Question:
During the operating lifetime of the facility, could modifications for compliance with the state of the art and science be required?

Answer:
According to the Nuclear Installations Act (1962) modifications for compliance with the state of the art and science can be required by the Nuclear Regulatory Authorities during the operating lifetime of a waste management facility.

Article: 15, section H
Ref. page: 14
Question:
Which organization or governmental agency monitors compliance with the safety conditions foreseen in the submitted licensing documents during and after construction (who is the regulatory body)?

Answer:
Under the Nuclear Installations Act (1962) commission and operation of nuclear installations are subject to inspections by the Nuclear Regulatory Authorities, ensuring compliance with the safety conditions foreseen in the submitted licensing documents including the Operational Limits and Conditions. The Nuclear Regulatory Authorities are: The Nuclear Office under the Danish Management Agency and the National Institute of Radiation Hygiene under the National Board of Health.

Article: 15, section H
Ref. page: 14
Question:
To what extent is decommissioning considered during licensing?

Answer:
For the existing Waste Management Plant commissioned in the 50'es decommissioning has not been considered during licensing.

Article: 16.2, section H
Ref. page:
Question:
Have technical waste acceptance criteria (WAC) been defined for the storage of RAW and if so where have they been published and/or made available ?

Answer:
The concept for a future Danish disposal facility for low and medium level waste is not yet defined and formal waste acceptance criteria are therefore not available. For storage certain requirements on the radioactive waste and on drums and containers used for storage at Risø are given in the safety documentation and in the Operational Limits and Conditions for the Waste Management Plant issued by the Nuclear Regulatory Authorities.

Article: 18, section E
Ref. page: 20
Question:
What criteria are applied for the clearance of radioactive waste? And what is the management method for the waste after clearance?

Answer:
Clearance of radioactive materials from the regulatory system is regulated in the Ministry of the Interior and Health Order no. 192 of 2 April 2002 on exemptions from Act on use etc. of radioactive materials. According to this Order clearance of radioactive materials is subject to prior authorisation from the National Institute of Radiation Hygiene under the National Board of Health.

There are no general clearance levels established in Denmark for artificially produced radionuclides.

Radioactive substances or materials containing radioactive substances may be cleared from their regulatory control due to their radioactivity, when special radiation protection requirements regarding activity levels etc. are fulfilled as described in Annex C in the National Report The following dose criteria for materials containing man-made radionuclides are given in Annex C:

a) The effective dose expected to be incurred by any member of the public due to the cleared material is of the order of 0,01 mSv or less per year, and

b) Either the collective committed effective dose per year due to the clearance is of the order of 1 manSv or less or an assessment of the optimisation of protection shows that clearance is the optimum solution.

Cleared materials can be treated and handled as non-active materials. Clearance can include disposal as non-active materials, recycling and reuse of the materials in question.

Article: 19, section E
Ref. page: 6-7
Question:
Is any complete amendment of the regulatory framework planned?

Answer:
Concerning the decommissioning of the nuclear facilities at Risø the legal framework will continue to be the Nuclear Installations Act from 1962 with underlying legislation.

Concerning the establishment of a Danish disposal facility for low and medium level waste the Danish Parliament has in March 2003 agreed to start the work to establish a basis for decisions on a Danish disposal facility. This work will start with an assessment of the need for a revision of the legal basis including the question of an open and transparent decision process. The outcome of this preparatory work could be a recommendation to have a complete amendment of the regulatory framework in respect of the siting, construction, operation and closure of a disposal facility.

Article: 19, section E
Ref. page: 6-7
Question:
How is the structure of the regulatory framework beyond the act (hierarchy/contents/listing)?

Answer:
The structure of the regulatory framework consists of four levels: Acts – Ministerial Orders – Order of the Nuclear Regulatory Authorities – Operational Limits and Conditions issued by the Nuclear Regulatory Authorities. The level of details in the legislation increases going from the Acts to Operational Limits and Conditions. The list of all relevant legislation in force per 1 January 2003 for the management of spent fuel and radioactive waste is shown below (Annex A in the Danish National report).

Acts:
- Act no. 94 of 31 March 1953 on use etc. of radioactive materials.
- Act no. 170 of 16 May 1962 on nuclear installations.

Ministerial Orders:
- Ministry of the Interior (now Ministry of the Interior and Health) Order no. 278 of 27 June 1963 on protective measures against accidents in nuclear installations (atomic installations) etc. with amendments in Order no. 502 of 1 October 1974.
- Ministry of the Environment (now Ministry of the Interior and Health) Order no. 574 of 20 November 1975 on precautionary measures for the use etc. radioactive substances.
- Ministry of the Interior and Health Order no. 192 of 2 April 2002 on exemptions from Act on the use of radioactive substances.

Orders from the National Board of Health (National Institute of Radiation Hygiene):
- National Board of Health Order no. 308 of 24 May 1984 concerning industrial gamma radiography installations with amendments in Order no. 790 of 19 October 1999.
- National Board of Health Order no. 154 of 6 March 1990 on smoke detectors and consumer products containing radioactive materials with amendments in Orders no. 547 of 23 July 1993 and no. 793 of 19 October 1999.
- National Board of Health Order no. 546 of 23 June 1993 on transfer of radioactive materials.
- National Board of Health Order no. 969 of 13 December 1993 on international transfer of radioactive waste.
- National Board of Health Order no. 663 of 12 July 1994 on outside workers, who are exposed to ionizing radiation in a CE-country with amendments in Order no. 824 of 31 October 1997.
- National Board of Health Order no. 918 of 4 December 1995 on the use of sealed radioactive sources in industry, hospitals and laboratories etc. with amendments in Order no. 794 of 19 October 1999.
- National Board of Health Order no. 823 of 31 October 1997 on dose limits for ionizing radiation.
- National Board of Health Order no. 954 of 23 October 2000 on the use of unsealed radioactive sources in hospitals, laboratories etc.
- National Board of Health Order no. 993 of 5 December 2001 on transport of radioactive materials.

Operational Limits and Conditions issued by the Nuclear Regulatory Authorities:
- Operational Limits and Conditions for the site at Risø.
- Operational Limits and Conditions for the individual nuclear installations at Risø.

Article: 19, section E
Ref. page: 6-7
Question:
Are there any spent fuel elements from research reactors? If yes, where are the corresponding regulations?

Answer:
The spent fuel from DR 2 and DR 3 have been transferred to USA's jurisdiction according to an agreement with the US Department of Energy. DR 2 was taken out of operation in 1975 and DR 3 in 2000 and all spent fuel from these two research reactors are by June 2002 transferred to USA.

The core-solution from DR 1 is stored in a special storage room for fissile materials in the DR 3 building complex in accordance with the regulations described in the answer to question on page 11. The 15,8 litres of spent fuel solution are stored under criticality- and otherwise safe conditions in four separate cylindrical stainless steel containers each placed inside a cylindrical locked steel container with appropriate radiation lead shielding. The containers are under IAEA-safeguards control and under appropriate security.

Various options for exportation and the core-solution from DR 1 have been or are still under consideration. No indications for a time schedule are available. Long-term storage awaiting possible future regional or bilateral solutions for such very small amount of wastes is not a technical problem.

Article: 19, section E
Ref. page: 6-7
Question:
Which are the regulations for the final disposal of radioactive wastes?

Answer:
Concerning the decommissioning of the nuclear facilities at Risø the legal framework will continue to be the Nuclear Installations Act from 1962 with underlying legislation.

Concerning the establishment of a Danish disposal facility for low and medium level waste the Danish Parliament has in March 2003 agreed to start the work to establish a basis for decisions on a Danish disposal facility. This work will start with an assessment of the need for a revision of the legal basis including the question of an open and transparent decision process. The outcome of this preparatory work could be a recommendation to have a complete amendment of the regulatory framework in respect of the siting, construction, operation and closure of a disposal facility.

Article: 20, section E
Ref. page: 8
Question:
The discussion of the Regulatory body mentions Nuclear Regulatory Authorities such as the Danish Emergency Management Agency and the National Institute of Radiation Hygiene. These authorities are said to be empowered to have direct access to all premises, buildings, etc. for inspection purposes and to withdraw licenses and stop operations. Further discussion and elaboration is needed regarding the makeup and relative roles and responsibilities of these organizations, including how they interface with each other, particularly in areas where there may be some overlap or sharing of responsibilities.

Answer:
The Nuclear Installations Act from 1962 defines the two Nuclear Regulatory Authorities as being the Danish Emergency Management Agency (The Nuclear Office) and the National Institute of Radiation Hygiene under the National Board of Health. The Act do not specify different roles or responsibilities for the two authorities and in principle these are therefore identical for the two authorities. The Act empowers the Authorities to have access to nuclear installations at any time and to require information which is relevant to the exercise of the inspection. The Authorities are further empowered to issue such orders as are necessary to ensure compliance with the conditions stipulated for the recognition of the nuclear installation or otherwise deemed necessary for reasons of safety. In urgent cases they may also, for reasons of safety, order the use of the installation to be suspended for a certain period. Detailed rules on the exercise of inspection etc. can be laid down by the Minister of Interior and Health.

The Nuclear Regulatory Authorities have at present a staff of 10 in the Nuclear Office and 25 at the National Institute of Radiation Hygiene. With Risø being the only site in Denmark with nuclear research installations and the decision of the Danish Parliament in 1985 not to use nuclear energy, only a minor part of this staff is working with nuclear safety and waste related issues. This gives a close and direct co-operation between the staff of the two authorities and also with the Ministry of Interior and Health. Over the years a working-practice between the two authorities has evolved with the Nuclear Office being the lead-authority regarding 'nuclear safety' issues and the National Institute of Radiation Hygiene the lead-authority regarding 'radiation protection' issues. However, in practice all decisions and recommendations, e.g. Operational Limits and Conditions for the operation of the nuclear installations at Risø, are made in common and communicated to the operator, other authorities etc. as a common decision or recommendations from the Nuclear Regulatory Authorities. There are in this way no problems with overlap or sharing responsibilities.

Article: 20, section E
Ref. page: 8
Question:
Could Denmark provide some detailed information about the technical expertise and activities of the regulatory authority? E.g. Nature and extent of technical reviews performed on dismantling operations procedures and techniques proposed by licensee for DR2 and DR 3 dismantling?

Answer:
The technical expertise of the Nuclear Regulatory Authorities is primarily in the fields of radiation protection, nuclear safety, emergency preparedness and measurements technique of ionising radiation and radioactive materials. Before the dismantling operations can start for each nuclear facility at Risø, including DR 2 and DR 3, the licensee shall in accordance with the Operational Limits and Conditions provide the Nuclear Regulatory Authorities with a detailed specific decommissioning project plan for the facility in questions for approval. The Nuclear Regulatory Authorities will perform a technical review of the provided detailed specific decommissioning project plan before issuing an approval. External consultants with specific expertise in fields not covered by the authorities own expertises will be used where necessary.

Article: 20, section E
Ref. page: 8
Question:
Could Denmark provide data on human resources available for regulation and technical supervision of the nuclear facilities (independent from the licensee organization RISØ)?

Answer:
The Nuclear Regulatory Authorities have at present a staff of 10 in the Nuclear Office and 25 at the National Institute of Radiation Hygiene. With Risø being the only site in Denmark with nuclear research installations and the decision of the Danish Parliament in 1985 not to use nuclear energy, only a minor part of this staff is working with nuclear safety and waste related issues.

Article: 21, 28.1, section F and J
Ref. page: 8
Question:
Section F states it is the responsibility of a license holder to ensure that all radioactive waste produced under his license is handled in a safe manner and finally either returned to the manufacturer or send to the Waste Management Plant at Risø National Laboratory. How is safety, control and proper disposal assured for disused sources possessed by a license holder that is having financial troubles or is out of business? Are license holders for sealed sources required to provide financial assurance for the decommissioning of their facility and disposal of disused sources? Is such financial assurance required prior to receipt or use of the sealed source?

Answer:
When a company having a licence is out of business or is having financial trouble it is still the company or the bankrupt estates responsibility to handle radioactive sources and waste under his license in a safe manner. In the case where there is no money left for a safe handling the National Institute of Radiation Hygiene, that means the Danish State, will provide the necessary financial support for a secure transfer of the radioactive sources/waste to the Waste Management Plant at Risø. At present license holders are not required to provide financial assurance for the decommissioning of their facility and disposal of disused sources and there is no financial assurance required prior to receipt or use of sealed sources.

It is to be expected that a new EU Directive on the control of high activity sealed sources and orphan sources will enter into force by the end of the year 2003. EU Member States shall then bring into force the laws, regulations and administrative provisions necessary to comply with this Directive within a time frame of 2 years at latest. Article 3, 2. in this Directive states:

Member States shall ensure that before issuing authorisation adequate provision, by way of financial security or any other equivalent means appropriate to the source in question, have been made for the safe management of sources when they become disused sources, including the case where the holder becomes insolvent or goes out of business.

Denmark is for this purpose planning a system with financial security not only for the high activity sealed sources defined by this Directive but for all practices involving sealed radioactive sources.

Article: 22, section F
Ref. page: 8
Question:
Please describe the method the Danish Ministry of Science, Technology, and Innovation uses to ensure that resources will be available when needed to decommission the nuclear facilities.

Answer:
As mentioned in the National Report the Danish Parliament has in March 2003 agreed to the overall costs and the general decommissioning approach for all the nuclear facilities at Risø with the objective to decommissioning all nuclear facilities at Risø as soon as possible within a timeframe of 20 years. The ordinary budget (staff, running expenditures) for the licence holder, which have the responsibility for performing the decommissioning of the nuclear facilities at Risø, is part of the overall budget for the Danish Ministry of Science, Technology, and Innovation and is approved in the annual Finance Bill by the Parliament. In addition to this the Finance Committee of the Parliament has to give an appropriation for each individual decommissioning project (reactor DR 1, reactor DR 2 etc.). The draft appropriations will be prepared by the Danish Ministry of Science, Technology, and Innovation based on input from the licence holder.

Article: 22, section F
Ref. page:
Question:
Does exist a specific fund for clean-up and decommissioning of nuclear installations ? In its case, who manages and supervises the fund?

Answer:
In Denmark there do not exist a specific fund for clean-up and decommissioning of nuclear installations. However, the Danish Parliament has in March 2003 agreed to cover the total costs of the decommissioning of all the nuclear installations at Risø, the only nuclear installations ever build in Denmark.

Article: 23, section F
Ref. page: 9
Question:
Please elaborate on the steps taken to ensure QA programs for the safety of spent fuel management and radioactive waste management are established and implemented.

Answer:
QA programs are an essential part of the requirements set up by the Nuclear Regulatory Authorities and are part of the Operational Limits and Conditions for the site at Risø and for the individual nuclear installations which will include the safety of spent fuel management and radioactive waste management. QA programs will/are based on international Standards, including IAEA Safety Requirements and IAEA Safety Guides. The QA programs are under review at the moment and one objective is that the overall QA programs in addition to the approval of the Nuclear Regulatory Authorities shall be certified by an official ap-

proved certification body and that some parts (measuring laboratories etc) shall by accredited by the national accreditation body in Denmark (DANAK).

Article: 24, section F
Ref. page: 9-11
Question:
Has a permissible radiation dose limit been set for women of child-bearing age and pregnant women who work in the controlled area?

Answer:
The dose limits for workers are specified in National Board of Health Order no. 823 of 31 October 1997 on dose limits for ionizing radiation and are included in the Operational Limits and Conditions for the nuclear installations at Risø. The dose limits are in accordance with Council Directive 96/29/EURATOM and the 1990 Recommendation of the International Commission on Radiological Protection, ICRP Publication 60. The dose limits for workers (se answer to next question) applies also to women of child-bearing age and pregnant women with the important additional dose limit of 1 mSv equivalent dose to the child to be born during the remainder of the pregnancy after declaration of the undertaking.

Article: 24.1 (i) , section F
Ref. page: 9
Question:
The radiation exposure of the personnel is only very briefly referred to. What are the dose limits for the personnel, and what are the actual doses which they receive?

Answer:
The dose limits for workers are specified in National Board of Health Order no. 823 of 31 October 1997 on dose limits for ionizing radiation and are included in the Operational Limits and Conditions for the nuclear installations at Risø. The dose limits are in accordance with Council Directive 96/29/EURATOM and the 1990 Recommendation of the International Commission on Radiological Protection, ICRP Publication 60. The dose limits for exposed workers (over 18 years) are shown in table 1. The recorded effective doses for the personnel at the Waste Management Plant since 1995 are summarized in table 2.

Table 1. Dose limits for exposed workers

Category	Limit on effective dose mSv per year	Limit on equivalent dose mSv per year		
		Lens of the eye	Skin	Extremities
Exposed workers	20	150	500	500

Table 2. Effective doses to personnel including external contractors working at the Waste Management Plant, 1995-2002

Year	Number of persons	Number of persons in interval mSv							Collective dose mSv	Mean dose mSv
		< 0.1	0.1-0.5	0.5-1	1-5	5-10	10-20	>20		
1995	26	15	2	1	4	3	1		47,0	1,8
1996	26	15	2	1	7	1			30,8	1,2
1997	26	19	3	1	2	1			12,2	0,5
1998	25	16	5	1	2	1			14,8	0,6
1999	20	14	3		2	1			12,2	0,6
2000	33	27	3	1	2				9,9	0,3
2001	36	30	2		3	1			12,8	0,4
2002	39	30	3	1	5				12,9	0,3

Article: 25, section F
Ref. page: 11
Question:
Please further clarify and describe the roles and responsibilities for preparing emergency response plans, and the scope, requirements, and standard operating procedures required to be reflected in those plans.

Answer:
The Danish Emergency Management Agency, DEMA (Beredskabsstyrelsen), is responsible for the preparation and execution of emergency response plans. The same general plan and procedure will be used to protect and inform the public in case of other types of large accidents and terrorist events.

In case of a nuclear emergency the International Contact Point will contact the DEMA duty officer. He may also be alerted by other means, e.g. if one of the automatic monitoring stations detects an unexplained increase in the level of radiation.

The DEMA duty officer then decides on the level of response to the triggering events and its development:

- If the accident is not expected to cause contamination of the Danish territory or worry the population, he may just monitor the development of the situation himself.
- If the accident may at a later stage contaminate Danish territory or worry the Danish population, he may call in key staff to assist him.
- If information of the population is necessitated, the preparedness level may be increased to "Information Preparedness", where more staff is called in to monitor the situation and inform the government and the public, including nuclear experts from Risø National Laboratory, The National Institute of Radiation Hygiene, the Danish Meteorological Service, journalists from the national radio and wire services. Two call centres are manned to handle calls from the public. The questions raised by the public are used as one basis for the issuing of press messages.

- If minor contamination of Danish territory may be expected in the longer term - or if the situation may worsen, the preparedness level is increased further to "Staff preparedness". Further staff is called in to prepare for possible protective measures and measurements, as well as assisting with the abovementioned tasks.
- If contamination of Danish territory is imminent the preparedness level is increased to "Emergency preparedness". Further personel is called in to manage protective measures and handle measurements teams and to increase the staff for other tasks.

Information about the situation is distributed through:

- DEMA press messages,
- the journalists participating in the preparedness,
- the call centres,
- a public Internet server, and
- and a password protected Internet server for official exchange of information

The National Nuclear Emergency Contingency Plan (in Danish) can be seen and downloaded from: http://www.brs.dk/nuc/Plan-Master.pdf. A brochure (in English) about the Danish nuclear emergency preparedness can be seen and downloaded from: http://www.brs.dk/nuc/Pjece%20vedr%20atomberedskab%20-%20engelsk%20udgave.pdf.

Article: 25, section F
Ref. page: 11
Question:
Could Denmark provide information on the national emergency organization (involved entities, type and level of responsibility)? What are the envisaged procedures for disclosure of information to the public?

Answer:
The Danish Emergency Management Agency, DEMA (Beredskabsstyrelsen), is responsible for the preparation and execution of emergency response plans. The same general plan and procedure will be used to protect and inform the public in case of other types of large accidents and terrorist events.

In case of a nuclear emergency the International Contact Point will contact the DEMA duty officer. He may also be alerted by other means, e.g. if one of the automatic monitoring stations detects an unexplained increase in the level of radiation.

The DEMA duty officer then decides on the level of response to the triggering events and its development:

- If the accident is not expected to cause contamination of the Danish territory or worry the population, he may just monitor the development of the situation himself.
- If the accident may at a later stage contaminate Danish territory or worry the Danish population, he may call in key staff to assist him.
- If information of the population is necessitated, the preparedness level may be increased to "Information Preparedness", where more staff is called in to

monitor the situation and inform the government and the public, including nuclear experts from Risø National Laboratory, the national Institute of Radiation Hygiene, the Danish Meteorological Service, journalists from the national radio and wire services. Two call centres are manned to handle calls from the public. The questions raised by the public are used as one basis for the issuing of press messages.

- If minor contamination of Danish territory may be expected in the longer term - or if the situation may worsen, the preparedness level is increased further to "Staff preparedness". Further staff is called in to prepare for possible protective measures and measurements, as well as assisting with the abovementioned tasks.
- If contamination of Danish territory is imminent the preparedness level is increased to "Emergency preparedness". Further personel is called in to manage protective measures and handle measurements teams and to increase the staff for other tasks.

Information about the situation is distributed through:

- DEMA press messages,
- the journalists participating in the preparedness,
- the call centres,
- a public Internet server, and
- and a password protected Internet server for official exchange of information

The National Nuclear Emergency Contingency Plan (in Danish) can be seen and downloaded from: http://www.brs.dk/nuc/Plan-Master.pdf. A brochure (in English) about the Danish nuclear emergency preparedness can be seen and downloaded from: http://www.brs.dk/nuc/Pjece%20vedr%20atomberedskab%20-%20engelsk%20udgave.pdf.

Article: 25, section F
Ref. page: 12
Question:
Could Denmark provide information the content of the on-site and the off-site emergency plans for the Risø facility, (considered accidents triggering criteria and the emergency zones)?

Answer:
As all research reactors at the Risø National Laboratory are defuelled, no reactor accidents as such may happen any longer. Most fuel has been removed from the site, an the amounts left are in protected locations.

The licence holders at Risø has the responsibility to maintain an internal emergency preparedness system at the Risø site to ensure that knowledgeable people are always available to handle accidents involving radiation and radioactive materials. A health physicist with extensive knowledge of the nuclear facilities is available at short notice during working hours and with maximum 45 minutes delay outside this period. Health physicist assistants well versed in activity measurements and estimation of radiation risks participates in the 24-hour duty maintained at the DR 3.

Additional technical assistance will also be available on short notice. In case of larger accidents an internal control centre will be manned by technicians, management staff and communication specialists.

Equipment and technical facilities for radiation measurements and contamination control are available. Evacuation plans are maintained where needed. The road system is well developed and with high capacity. Alarms are given by sirens and an internal system of loudspeakers. Separate telephone lines ensure communication to the police and fire brigade at Roskilde. In addition there are mobile telephones and a local radio system covering up to 35 km.

The Danish Emergency Preparedness System for Nuclear Accidents under the responsibility of the Ministry for Interior and Health will be activated in any event at the Risø site requiring offsite responses including information to the public.

The operative organisation is based primarily on the Nuclear Office and the National Rescue Corps under the Danish Emergency Management Agency. The police, the armed forces, and a number of governmental authorities and institutes participate in the performance of the emergency tasks. Among these the National Board of Health with the National Institute on Radiation Hygiene, the Technical University of Denmark, the Danish Meteorological Institute, and the National Food Agency should be mentioned. They all contribute within their fields of responsibility with professional information, assessments and advice, and participate in the dissemination of information.

A service with a nuclear emergency officer from the Danish Emergency Management Agency on duty 24 hours a day is maintained. He is authorised to decide on the activation of the emergency response system. Even if it is considered unlikely that an event could cause radioactive contamination in Denmark, it may be decided to activate those functions that are needed in order to procure and assess information and to inform other authorities and the general public.

The only essential accident at the Risø that might cause radioactive spread of activity is a fire in one of the two storage facilities for low- and medium level waste, where a massive fire might cause release of activity. A prerequisite for a massive fire would be the presence of large amounts of combustible material. As the facilities are kept free from such materials to the extent possible, this would require military ordnance or a plane crash directly into the facility.

Possible radiological consequences from reference accidents during decommissioning of the nuclear facilities at Risø, including the storage of radioactive waste at the Waste Management Plant, have been evaluated and are presented in the report given the general data as called for under the Article 37 of the Euratom Treaty: Decommissioning of the Nuclear Facilities at Risø National Laboratory, Denmark, National Board of Health, National Institute of Radiation hygiene, 2003. The report (in English) can be seen and downloaded from: http://www.sst.dk-/upload/artikel_37_rapport_sis_lowres_001.pdf.

The reference accident for the storage of radioactive waste at Risø assumes a crash of an aeroplane into the storage facility for low-active waste. In the explosion and fire following the crash 1 % of the activity content in the drums is assumed to escape to the atmosphere, i.e. 10 GBq of ^{60}Co, 30 GBq of ^{90}Sr, 50 GBq of ^{137}Cs and 0,1 GBq of actinides. This accident can also be considered as representative for the storage facility ‘Centralvejslageret’ for waste requiring special shielding where the waste units are much better physically protected so that the

probability for significant releases from the relatively large activity inventory is very low. The planned new storage facility for decommissioning waste will contain the activity from the demolished nuclear installations. Also in this case there will be a certain risk for spread of activity in connection with a air plane accident. However, the waste will be contained in strong concrete containers and large releases, even under fire conditions is not likely. Possible releases should be amply covered by the above-assumed releases during demolition of the facilities.

Individual doses to critical groups in Denmark and Sweden from the reference accident releases to the atmosphere are shown in table 1. The doses are the sum of inhalation doses and ingestion doses from major foodstuff consumption, assuming that 10 % of the annual foodstuff consumption is contaminated to the calculated levels. Furthermore, it has been assumed in the calculations that the transfer factors and food habits in Denmark and in Sweden are similar. The ingestion doses are those accumulated by the critical groups from all future consumption of foodstuffs produced in areas with an initial surface contamination equal to the surface contamination immediately after the accident.

Table 1. Individual doses to members of critical groups close to Risø and in Sweden from atmospheric releases from the reference accident for the Waste Management Plant.

Reference accident	Doses in Denmark (μSv)		Doses in Sweden (μSv)	
	Children	Adults	Children	Adults
Waste Management Plant	$4.1 \cdot 10^{1}$	$3.4 \cdot 10^{1}$	$6.6 \cdot 10^{-2}$	$5.4 \cdot 10^{-2}$

There is no evacuation zone defined around the Risø National Laboratory as such, but in case of increased radiation levels, the neighbouring communities are alerted by sirens to seek shelter.

Article: 25, section G
Ref. page: 12
Question:
Which Danish team of experts will be called on to make an assessment of the radiological situation in the event of an emergency in a neighbouring country? How will the public be informed?

Answer:
The Danish Emergency Management Agency, DEMA (Beredskabsstyrelsen), is responsible for the preparation and execution of emergency response plans. The same general plan and procedure will be used to protect and inform the public in case of other types of large accidents and terrorist events.
In case of a nuclear emergency the International Contact Point will contact the DEMA duty officer. He may also be alerted by other means, e.g. if one of the automatic monitoring stations detects an unexplained increase in the level of radiation.

The DEMA duty officer then decides on the level of response to the triggering events and its development:

- If the accident is not expected to cause contamination of the Danish territory or worry the population, he may just monitor the development of the situation himself.
- If the accident may at a later stage contaminate Danish territory or worry the Danish population, he may call in key staff to assist him.
- If information of the population is necessitated, the preparedness level may be increased to "Information Preparedness", where more staff is called in to monitor the situation and inform the government and the public, including nuclear experts from Risø National Laboratory, the National Institute of Radiation Hygiene, the Danish Meteorological Service, journalists from the national radio and wire services. Two call centres are manned to handle calls from the public. The questions raised by the public are used as one basis for the issuing of press messages.
- If minor contamination of Danish territory may be expected in the longer term - or if the situation may worsen, the preparedness level is increased further to "Staff preparedness". Further staff is called in to prepare for possible protective measures and measurements, as well as assisting with the abovementioned tasks.
- If contamination of Danish territory is imminent the preparedness level is increased to "Emergency preparedness". Further personel is called in to manage protective measures and handle measurements teams and to increase the staff for other tasks.

Information about the situation is distributed through:

- DEMA press messages,
- the journalists participating in the preparedness,
- the call centres,
- a public Internet server, and
- and a password protected Internet server for official exchange of information

The National Nuclear Emergency Contingency Plan (in Danish) can be seen and downloaded from: http://www.brs.dk/nuc/Plan-Master.pdf. A brochure (in English) about the Danish nuclear emergency preparedness can be seen and downloaded from: http://www.brs.dk/nuc/Pjece%20vedr%20atomberedskab%20-%20engelsk%20udgave.pdf.

Article: 26, section F
Ref. page: 12
Question:
Please summarize the general decommissioning approach agreed upon by the Danish Parliament and the related regulatory infrastructure.

Answer:
The general decommissioning approach agreed to by the Danish Parliament includes an agreement on the total costs of the decommissioning of all nuclear facilities at Risø as soon as possible within a time frame of 20 years. The Parliament has also agreed on the establishment of a new independent state company ‘Danish Decommissioning’ under the Ministry of Science, Technology and Innovation being responsible for the fulfilment of the decommissioning in compliance

with the Operational Limits and Conditions set up by the Nuclear Regulatory Authorities.

Article: 26, section F
Ref. page: 12
Question:
The section on decommissioning makes reference to Section F of the report which only deals with nuclear installations after final shutdown or in the process of decommissioning, so the topics outlined in Art. 26 i – iii need not be repeated here. However, record keeping for decommissioning has not been addressed. How is it ensured that appropriate records are kept for decommissioning?

Answer:
Existing construction and operational records are maintained as separate collections of appropriately compiled documentation for each nuclear installation under decommissioning.

Article: 27, section I
Ref. page: 15
Question:
How is planned to implement the requirement established in the point 1. i) of this article in relation with the prior consent of the State of destination of a transboundary movement, taking into account that Directive 92/3/EURATOM does not consider this requirement for non-EU countries.

Answer:
Although it has not been mentioned separately in the Danish legislation implementing Council Directive 92/3/EURATOM the National Institute of Radiation Hygiene will require/ensure prior consent of a non-EU State of destination as well as required from EU-countries if the National Institute of Radiation Hygiene should ever receive an application for a transboundary movement of radioactive waste from Denmark as the country of origin to a non-EU country as the State of destination.

As stated in Section I in the National Report the National Institute of Radiation Hygiene has until now never received an application and consequently never issued any license for a transboundary movement of radioactive waste with Denmark as the State of origin or with Denmark as the State of destination.

Article: 27.3, section I
Ref. page:
Question:
Considering the importance of international cooperation in RAW management through bilateral and multilateral mechanisms, as stated in the Convention Preamble ix), which legislative restrictions, if any, govern the acceptance of foreign RAW for processing and/or storage ?

Answer:
At present there are no specific restrictions in the Danish legislation on the acceptance of foreign radioactive waste for processing and/or storage. However, as for all other radioactive materials the import into Denmark of such waste requires a licence from the Nuclear Regulatory Authorities (National Institute of Radiation Hygiene). Before a specific license will be issued it should be assessed and assured that the importation of the radioactive waste in question, among others, is in accordance with the overall Danish radioactive waste management policy.

Article: 28, section J
Ref. page: 15-16
Question:
Do you have information about orphan sources in your country?

Answer:
According to the Radioactive Materials Act (1953) production, importation, possessing etc. of radioactive materials are subject to prior authorisation by the National Institute of Radiation Hygiene under the National Board of Health. The National Institute of Radiation Hygiene is maintaining a database including all authorisations with detailed information on the sources registered.

In the ongoing process of updating the database the National Institute of Radiation hygiene do become aware of sources out of control, primarily because of companies that has gone out of business, lack of historical knowledge on some of the sources etc.

The National Institute of Radiation hygiene succeeds in finding and identifying most of theses sources. By October 2003 there is still no information on 11 gauges with radioactive sources with a level of activity exceeding the exemption levels listed in the Council Directive 96/29/EURATOM. These orphan sources include Co-60 with a maximum activity of 18,5 MBq, Cs-137 with a maximum activity of 370 MBq and Am-241 with a maximum activity of 1850 MBq.

Article: 28, section J
Ref. page: 15-16
Question:
Are there any radiation monitors for example at points of entry into or out of the Country to detect orphan sources?

Answer:
There are no stationary equipments with radiation monitors at points of entry into or out of Denmark to detect orphan sources. However, the National Institute of Radiation Hygiene can in cooperation with the Danish Emergency Management Agency decide to make campaigns at points of entry in and out of Denmark using one or two specially equipped vehicles with very sensitive measuring system for gamma and neutron sources.

Article: 28, section J
Ref. page: 15-16
Question:
Do you have control monitors to detect orphan sources before they may reach a foundry and be melted?

Answer:
At the two largest foundries in Denmark there are installed stationary control monitors in order to detect orphan sources before they may reach the foundry and be melted. At several smaller recycling industries in Denmark they regularly use handheld control monitors in order to detect orphan sources. Investments in control monitors in the recycling industry is voluntary, there are at present no requirements in Danish legislation regarding control monitors in the recycling industry. However, the National Institute of Radiation Hygiene has in 2002 published and widely distributed guidance on radioactive materials in scrap. The guidance is well illustrated with photos of all kinds of sealed sources and contains specific recommendations to perform appropriate monitoring for orphans sources and to include issues of monitoring for orphans sources and responsibilities in relevant contracts between commercial partners. The guidance (in Danish) can be seen and downloaded from http://www.sst.dk/faglige_omr/SIS/Radioaktivitet/Vejledning_radioaktivitet/Vejl_skrot_stor.pdf.

Article: 28, section J
Ref. page: 16
Question:
What financial sureties are requested for disused sealed sources? When a disused sealed source is sent to Waste Management Plant at Risø and when returned to the manufacturer? When the source is sent to the Waste Management Plant at Risø, is the ownership transferred to Risø? does the owner has to pay a fee?

Answer:
At present license holders are not required to provide financial assurance for disused sealed sources and there is no financial assurance required prior to receipt or use of sealed source.

It is to be expected that a new EU Directive on the control of high activity sealed sources and orphan sources will enter into force by the end of the year 2003. EU Member States shall then bring into force the laws, regulations and administrative provisions necessary to comply with this Directive within a time frame of 2 years at latest. Article 3, 2. in this Directive states:

Member States shall then ensure that before issuing authorisation adequate provision, by way of financial security or any other equivalent means appropriate to the source in question, have been made for the safe management of sources when they become disused sources, including the case where the holder becomes insolvent or goes out of business.

Denmark is for this purpose planning a fee system with financial security not only for the high activity sealed sources defined by this Directive but for all practices involving sealed radioactive sources.

When sources are sent to the Waste management Plant at Risø, it is the obligation of Risø according to Operational Limits and Conditions given by the Nuclear Regulatory Authorities to store these sources in a secure and safe way until a disposal facility for low and medium level waste is established in Denmark.

Article: 28, section J
Ref. page: 7, 8, 13,15,16
Question:
Is there any system of registration of disused sealed sources and what types of sources are registered ? If there is no registration system available, what are the future plans?

Answer:
The National Institute of Radiation Hygiene does maintain a database including all authorisations with detailed information on the sources registered. The database also includes information regarding transfer of sources either to another licence holder or to the Waste Management Plant at Risø.

Article: 32, section J
Ref. page: 1
Question:
Section B indicates the Danish Parliament agreed to start the work to establish a basis for decisions on a disposal facility for low and medium level waste. What progress has been made? According to the report Denmark is proceeding with decommissioning of research reactors, hot cells, and fuel fabrication to "green field" per Section D of the report. Denmark currently has no repositories for radioactive waste, but has 1100 m^3 of conditioned LILW-SL and an inventory of unconditioned LILW-LL waste (including some mill tailings and ore) in storage. What is Denmark's strategy for management of the radioactive waste from decommissioning until decisions regarding disposal are made? How is the schedule for waste management integrated into the decommissioning schedule?

Answer:
As mentioned in the National Report the Danish Parliament has in March 2003 agreed to start the work to establish a basis for decisions on a Danish disposal facility for low and medium level waste. This work will start with an assessment of the need for a revision of the legal basis including the question of an open and transparent decision process. The initial work should also propose fundamental principles and requirements for a disposal facility in accordance with national and international obligations and recommendations. The kick-off of this work is under planning by the Ministry of Interior and Health and the National Institute of Radiation Hygiene and is foreseen to begin late in 2003.

The strategy for management of the radioactive waste from the decommissioning of the nuclear facilities at Risø until decisions regarding disposal are made is to store the waste at Risø in new designed and approved concrete containers in a new storage hall.

As a basis for decisions on a Danish disposal facility for low and medium level waste is not in place yet, it is too early to integrate a schedule for waste management into the decommissioning schedule. One important consideration for the

decision to decommissioning all nuclear facilities at Risø as soon as possible within a time frame of 20 years has been to start the decommissioning while staff with experience from the operation of the research reactors still are present. It should be emphasized that the decommissioning project at Risø will be the only project of this kind to be conducted in Denmark.

Article: 32, section D
Ref. page: 2
Question:
The report states that spent fuel is stored in a radioactive waste storage facility. Does this mean that spent fuel storage is governed only by requirements for radioactive waste and safety aspects (subcriticality) relative to fissile isotopes are not incorporated?

Answer:
The core-solution from DR 1 is stored in a special storage room for fissile materials in the DR 3 building complex. The 15,8 litres of spent fuel solution are stored under criticality- and otherwise safe conditions in four separate cylindrical stainless steel containers each placed inside a cylindrical locked steel container with appropriate radiation lead shielding. The containers are under IAEA-safeguards control and under appropriate security.

The experimentally produced and irradiated spent fuel from post irradiation investigations are stored in the waste storage facility called 'Centralvejslageret'. The 233 kg of spent fuel are stored in welded cylindrical stainless steel tubes kept in criticality-safe configurations inside 30 litres stainless steel containers placed in holes in an underground concrete storage block providing the necessary shielding. The facility is under IAEA-safeguards control and provided with appropriate security features.

The storage of the spent fuel is covered by and the Operational Limits and Conditions issued by the Nuclear Regulatory Authorities, which contains specific requirements for the safe management of fissile materials.

Article: 32, section D
Ref. page: 2
Question:
Could Denmark provide information on the rules of clearance for radioactive waste?

Answer:
Clearance of radioactive materials from the regulatory system is regulated in the Ministry of the Interior and Health Order no. 192 of 2 April 2002 on exemptions from Act on use etc. of radioactive materials. According to this Order clearance of radioactive materials is subject to prior authorisation from the National Institute of Radiation Hygiene under the National Board of Health.

There are no general clearance levels established in Denmark for artificially produced radionuclides.

Radioactive substances or materials containing radioactive substances may be cleared from their regulatory control due to their radioactivity, when special radiation protection requirements regarding activity levels etc. are fulfilled as described in Annex C in the National Report The following dose criteria for materials containing man-made radionuclides are given in Annex C:

c) The effective dose expected to be incurred by any member of the public due to the cleared material is of the order of 0,01 mSv or less per year, and

d) Either the collective committed effective dose per year due to the clearance is of the order of 1 manSv or less or an assessment of the optimisation of protection shows that clearance is the optimum solution.

Cleared materials can be treated and handled as non-active materials. Clearance can include disposal as non-active materials, recycling and reuse of the materials in question.

Article: 32, section D
Ref. page: 13
Question:
Denmark has 15,8 litres of spent fuel solution from research reactor DR1 and 233 kg of experimentally produced and irradiated spent fuel from post irradiation investigations in safe storage, per Section D of the report. What storage conditions and operations demonstrate the safety of the DR-1 and experimental spent fuel? When is a decision expected on the final disposition of this spent fuel as indicated in Section G? What options under consideration at present?

Answer:
The 15,8 litres of spent fuel solution from research reactor DR1 are stored under criticality- and otherwise safe conditions in four separate cylindrical stainless steel containers each placed inside a cylindrical locked steel container with appropriate radiation lead shielding. The containers are under IAEA-safeguards control and under appropriate security.

The 233 kg of experimentally produced and irradiated spent fuel from post irradiation investigations are stored in welded cylindrical stainless steel tubes kept in criticality-safe configurations inside 30 litres stainless steel containers placed in holes in an underground concrete storage block providing the necessary shielding. The facility is under IAEA-safeguards control and provided with appropriate security features.

Various options for exportation of the 233 kg irradiated experimental fuel and the core-solution from DR 1 have been or are still under consideration. No indications for a time schedule are available. Long-term storage awaiting possible future regional or bilateral solutions for such very small amount of wastes is not a technical problem.

Article: 32.1, section D
Ref. page: 1-2, 16
Question:
Concerning the future L/ILW disposal facility, is there any design already chosen? What is the time schedule envisaged for the disposal facility and who will be responsible for its implementation?

Answer:
At present no design for a Danish L/ILW disposal facility has been chosen. In 2000 a working group under the Danish Ministry of Science, Technology, and Innovation prepared a report on theoretical considerations of technical requirements for a Danish disposal facility. In this report three design concepts were considered: Near surface repository (on surface, unsatured), Near surface repository (20-50 m, saturated) and Geological repository (200-300 m, saturated).

As mentioned in the National Report the Danish Parliament has in March 2003 agreed to start the work to establish a basis for decisions on a Danish disposal facility for low and medium level waste. This work will start with an assessment of the need for a revision of the legal basis including the question of an open and transparent decision process. The initial work should also propose fundamental principles and requirements for a disposal facility in accordance with national and international obligations and recommendations. It will not be possible to envisage a time schedule for a Danish disposal facility before this work has been concluded. It is expected that the newly formed state company Danish Decommissioning as “owner” of the radioactive waste will be responsible for the major part of the implementation.

Article: 32.1, section D
Ref. page: 1-2, 16
Question:
Will decommissioning of nuclear facilities at Risø be totally financed from State budget?

Answer:
As mentioned in the National Report the Danish Parliament has in March 2003 agreed to the overall costs and the general decommissioning approach for all the nuclear facilities at Risø with the objective to decommissioning all nuclear facilities at Risø as soon as possible within a timeframe of 20 years. The ordinary budget (staff, running expenditures) for the licence holder, which have the responsibility for performing the decommissioning of the nuclear facilities at Risø, is part of the overall budget for the Danish Ministry of Science, Technology, and Innovation and is approved in the annual Finance Bill by the Parliament. In addition to this the Finance Committee of the Parliament has to give an appropriation for each individual decommissioning project (reactor DR 1, reactor DR 2 etc.). The draft appropriations will be prepared by the Danish Ministry of Science, Technology, and Innovation based on relevant input from the licence holder. The decommissioning of the nuclear facilities will therefore as described above be financed from the State budget.

Article: 32.1, section D
Ref. page: 1-2, 14
Question:
What is the financial mechanism applied to the users of radioactive materials for the services rendered at Risø National Laboratory? Do prices consider all management costs, including future decommissioning costs?

Answer:
The price paid by external users of the Waste Management Plant at Risø covers transport, packaging, in some cases additional conditioning of the waste and storage of the resulting waste units. Low-level waste is paid on a per kg basis. Special waste, e.g. sealed sources, is paid on a case by case basis.

When based on the marginal cost of operating the plant the prices comprise a certain fee for future disposal. If total cost of running the plant are taken into account no fee for disposal (or decommissioning) is taken into account.

Article: 32.1 (ii), (iv) , section D
Ref. page: 1-2
Question:
What are the details concerning spent fuel management practices and radioactive waste management practices? The report states that spent fuel is stored in a radioactive waste storage facility. Does this mean that spent fuel storage is governed only by requirements for radioactive waste and safety aspects (subcriticality) relative to fissile isotopes are not incorporated?

Answer:
The core-solution from DR 1 is stored in a special storage room for fissile materials in the DR 3 building complex. The 15,8 litres of spent fuel solution are stored under criticality- and otherwise safe conditions in four separate cylindrical stainless steel containers each placed inside a cylindrical locked steel container with appropriate radiation lead shielding. The containers are under IAEA-safeguards control and under appropriate security.

The experimentally produced and irradiated spent fuel from post irradiation investigations are stored in the waste storage facility called ‘Centralvejslageret’. The 233 kg of spent fuel are stored in welded cylindrical stainless steel tubes kept in criticality-safe configurations inside 30 litres stainless steel containers placed in holes in an underground concrete storage block providing the necessary shielding. The facility is under IAEA- safeguards control and provided with appropriate security features.

Article: 32, section D
Ref. page:
Question:
What are the inventories of stored SF that has been used for post-irradiation examinations?

Answer:
The stored spent fuel that been used for from post irradiation investigations consists of 233 kg uranium oxide pellets containing 610 TBq fission products and 53 TBq actinides.