

# **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 Third Review Meeting, May 2009**

National Board of Health  
National Institute of Radiation Protection  
May 2009

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Article 4	What are the plans with respect of the management of high- and intermediate level waste generated during the reprocessing of Danish spent fuel in the USA?	The fuel from the research reactors DR 2 and DR 3 was originally produced in the USA and the spent fuel was transferred back to USA in accordance with an agreement with USA. USA has taken full responsibility for it.
Article 10 Section G Page 18	Denmark is commended for their continued pursuit of disposal options. The report states: "If an international solution cannot be found, the option for Denmark will be to dispose this spent fuel in the coming Danish repository for low and intermediate level waste. The minimal amount of spent fuel is therefore part of the overall waste volume, which is taken into account in the planning for establishing a final repository for Danish low and intermediate level waste." Considering that LILW-LL waste and spent fuel decay times are orders of magnitude different than short-lived waste, for what period of time is the safety case analyzed and what additional barriers are being made for disposal of the spent fuel and LILW-LL in the repository, considering the options for the repository or borehole are at most 100 meters from the surface and likely below the water table?	<p>On 29 January 2009 the Danish Parliament unanimously supported the continuation of the process to establish a final repository for LILW in Denmark.</p> <p>After this, an inter-ministerial workgroup started a series of desktop studies (one study that looks at the Danish geology, one study that looks at the safety and cost of the three conceptual designs, and one study that looks at the risk of transporting the waste to a repository). It is anticipated at this stage that the desktop studies will be completed within a timeframe of 2-2 ½ years.</p> <p>The results of the desktop studies are expected to point to approx. 20 potential areas, where a final repository may be established.</p> <p>Next step is to carry out more detailed desktop studies and environmental assessments for the approx. 20 selected areas on the basis of invited ideas and suggestions from local citizens and other stakeholders.</p> <p>These areas studies provide the basis for designating 5-10 sites. These sites are reserved for further field studies by a ministerial declaration in accordance with rules in the Spatial Planning Act.</p> <p>The results of the area studies and the selected sites are sent for public consultation for at least 8 weeks.</p> <p>The final decision to initiate field studies at specific sites (2-3 sites) will be taken by the Parliament. The field studies will consist of drilling, sampling and laboratory</p>

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		<p>analysis. The purpose of these field studies is to demonstrate whether the selected sites meet the safety and environmental requirements prescribed by the regulatory authorities.</p> <p>Based on the field studies and subsequent public hearings there will be a nomination of a site and a repository concept to the responsible minister.</p>
Article 10 Section G Page 18	Given the uncertainty surrounding the future management of a minimal amount of spent fuel from DR1, how has this affected the definition of design solutions for the disposal facility for LILW, considering that the co-disposal option is kept open.	<p>As the Danish waste comprises a small amount of spent fuel, the considered repository concepts include the possibility for medium deep disposal of this part of the waste. Small amounts of other long-lived alfa-emitters are thought to require a similar solution.</p> <p>The liquid spent fuel from DR 1 with a reasonable low activity, see table 1 in the National Report, is expected to be placed in the final repository after solidification.</p>
Article 10 Section G Page 18	<p>The report mentioned that the search for an international solution for the final storage of the small amount of spent fuel was unsuccessful until now. Could you provide some information on the policy for the future search to participate in an international solution?</p> <p>Has a decision been made when this search should be discontinued?</p> <p>Does this search have any influence on the efforts made to work out a national solution?</p>	<p>The Ministry of Science, Technology and Innovation and Danish Decommissioning will participate in international collaboration for an international solution being acceptable from a security, environmental and economically point of view.</p> <p>It is not decided for how long time the process of finding an international solution for the irradiated fuel is to be continued.</p> <p>This has no influence on the planning of a final disposal for LLW/ILW. The initiated desktop studies of three concepts for a final repository include concepts of medium level depth repositories to ensure the accommodation of the long-lived waste.</p>

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Article 11 Page 22	There were three conceptual designs for a LILW repository presented in your report. Did you estimate approximate costs for these three options based on the experience and practices from the countries where construction of this type of repository has recently been finished?	Approximate cost estimates will be part of the desktop studies initiated after the unanimous support in the Parliament on 29 January 2009 to continue the process to establish a final repository for LILW in Denmark. Experience and practices from other countries where construction of this type of repository has recently been finished will be taken into account when cost estimates for the three repository concept are considered.
Article 11 Section H Page 18	The plans for a disposal facility for low and intermediate level waste are in progress. Are there any recommendations or regulations for the conditioning or long-term storage of the waste?	Detailed requirements for the conditioning of the radioactive waste will be determined when the disposal concept is decided, e.g. the type of facility and whether the final repository will be located above or below the water table. Long-term storage of radioactive waste is not considered. The waste remains in the existing storage facilities until it can be placed in a final repository.
Article 11 Page 23	Is there any specific act or regulation in force, different from the European one, to regulate the participation of the stakeholders in the decision making process for the repository? Is it foreseen to make use of the principle of "volunteerism" for communities affected by the site selection process of the repository? Denmark had planned to have a public hearing of the "Basis for Decision" before its presentation to the Parliament. Could Denmark provide some results of this public hearing?	<p>In general terms the spatial planning in Denmark is governed by the Spatial Planning Act no. 813 of 21 June 2007, which implements the EU Directive providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment (Directive 2003/35/EC), including so called environmental impact assessments (EIA).</p> <p>The purpose of the Spatial Planning Act is to ensure that the overall planning integrates the various interests of society with respect to land use. Among other things spatial planning is intended to ensure that the whole country and the individual municipalities develop appropriately, based on both overall planning and economic considerations and that the public is involved in the planning process as much as possible.</p> <p>However, the plant design and siting of the disposal facility may be specified by a particular construction act which also will take account of the objectives of the directive, including EIA and public participation.</p> <p>In order to achieve broad agreement on the project stakeholders will be involved in</p>

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		<p>the project as much as possible. However, selection of a site does not necessarily depend on volunteerism for the local community.</p> <p>The "Basis for Decision" was presented to a broad group of stakeholders in January 2007. The report was very well received and the hearing resulted in only a number of minor clarifications and amendments to the document. These were:</p> <ul style="list-style-type: none"> <li>• Clarification of the difference between LILW and HLW</li> <li>• Clarification of the terms "high probability" and "appropriate period".</li> <li>• Including a specific section on reversibility.</li> </ul>
Article 12	<p>Are there any existing radioactive waste management facilities in Denmark for which a Safety Assessment consistent with current international guidance is not available?</p>	<p>The radioactive Waste Management Facility at Danish Decommissioning (DD) is the only facility of its kind in Denmark.</p> <p>In addition to the recommendations by the Nuclear Regulatory Authorities, the safety assessments of the nuclear facilities at the Risø-site were traditionally based on Nordic and US guidance, more specifically: Nordic Working Group on Reactor Safety, Publication 1, Safety Assessment Documents (NARS 1, 1975); USNRC Regulatory Guide 1.70, Standard Format and Content of Safety Analysis Report for Nuclear Power Plants (RG 1.70). As the scope of these guides were nuclear power plants some of the recommendations were adjusted in order to correspond to the significantly smaller activities handled at the research reactors at the Risø-site.</p> <p>The original safety assessments have been re-examined in the framework of the IAEA, Safety Assessment of Research Reactors and Preparation of the Safety Analysis Report" (Safety Series No. 35-G1, 1994). The original safety assessments were largely in line with the IAEA recommendations, the main difference being the lack of a central quality assurance system.</p> <p>In accordance with the requirements set by the Nuclear Regulatory Authorities, a quality assurance system for the entire process of decommissioning including all radioactive waste management has been put into operation. It is based on international standards, which at present, for the general Quality Assurance is DS/EN ISO 9001, version 2000. Furthermore, in 2007 the Clearance Laboratory was</p>

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		<p>accredited by the Danish Accreditation and Metrology Fund (DANAK) according to the ISO 17025 standard on general requirements for the competence of testing and calibration laboratories.</p> <p>The documentation is available to the relevant authorities.</p>
Article 13 Section H Page 23	The report gives a good overview of the planned procedure for the implementation of the LILW repository. Which timescale is foreseen for the three steps of site selection? Is there a date scheduled for the start of operation of the repository?	On January 29, 2009 the Danish Parliament unanimously supported the continuation of the process to establish a final repository for LILW in Denmark. Since then a series of desktop studies have been initiated. One of the studies includes a delineation of three repository concepts, including a conceptual safety analysis for each of the concepts. It is anticipated at this stage that the desktop studies will be completed within a timeframe of 2-2 ½ years. Detailed schedule for the three steps of site selection will be laid down together with finalizing the desktop studies.
Article 13 Section H Page 22 Seq. no.	It is stated that there is no HLW to be placed in the repository. Is this in line with the potential co-disposal option?	Denmark has only small amounts of experimentally irradiated fuel which is not classified as HLW. If an international solution for this waste is not found, the irradiated fuel is expected to be placed in the Danish repository with the consequently demands and requirements on the repository.
Article 13 Section H Page 23	Could Denmark specify the expected or planned timing for the main steps of the siting process ?	<p>On 29 January 2009 the Danish Parliament unanimously supported the continuation of the process to establish a final repository for LILW in Denmark.</p> <p>After this, an inter-ministerial workgroup started a series of desktop studies (one study that considers the Danish geology, one study that considers the safety and cost of the three conceptual designs, and one study that considers the risk of transporting the waste to a repository). It is anticipated at this stage, that the desktop studies will be completed within a timeframe of 2-2 ½ years.</p> <p>The results of the desktop studies are expected to point out approx. 20 potential areas, where a final repository may be established.</p> <p>Next step is to carry out more detailed desktop studies and environmental assessments for the approx. 20 selected areas taken into account invited ideas and suggestions from local citizens and other stakeholders.</p>

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		<p>These areas studies provide the basis for designating 5-10 sites. These sites are reserved for further field studies by a ministerial declaration in accordance with rules in the Spatial Planning Act.</p> <p>The results of the area studies and the selected sites are sent for public consultation for at least 8 weeks.</p> <p>The final decision to initiate field studies at specific sites (2-3 sites) will be taken by the Parliament. The field studies will consist of drilling, sampling and laboratory analysis. The purpose of these field studies is to demonstrate whether the selected sites meet the safety and environmental requirements prescribed by the regulatory authorities.</p> <p>Based on the field studies and subsequent public hearing there will be a nomination of a site and a repository concept to the responsible minister. The nomination will be sent to public consultation of 8 weeks before it is submitted to the Parliament for final decision.</p>
Article 13 Section H Page 23	Denmark is identifying approximately 20 sites for a potential repository. An Environmental Impact Assessment and Vicinity Study will be carried out for each site. What are some of the institutional challenges to such development (e.g. political, public concern, funding) already encountered or anticipated? What are the strategies for addressing these challenges?	<p>Challenges: On January 29, 2009 the Danish Parliament unanimously supported the “Basis for Decision” for establishing a Danish final repository for low and intermediate waste.</p> <p>Cooperation and communication with citizens, NGOs and other stakeholders will be one of the major challenges of the project.</p> <p>Strategy: The effort to find a suitable site must be conducted with as much transparency as possible. It is e.g. important to communicate the function of individual stakeholders (authorities, operators, etc.) clearly, ensuring that the process is not obscured due to misunderstandings.</p> <p>When an appropriate number of areas suitable for placement of a final repository are</p>

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		<p>identified, there must be public information and involvement of NGOs and local citizens.</p> <p>This is envisaged by putting all the material on a website, by inviting NGOs, citizens and other stakeholders to local meetings and implementation of public hearings.</p> <p>Funding: Funding for the project is granted stepwise by the Parliament.</p>
Article 13	What are the requirements for siting of a facility?	<p>For a final repository, the selected location must meet the requirements in Denmark's overall policy for the disposal of LILW, which is based on "IAEA, 1995. Safety Series no. 111-F. The Principles of Radioactive Waste Management":</p> <ol style="list-style-type: none"> <li>1. Protection of humans and the environment Radioactive waste shall be managed in such a way as to secure an acceptable level of protection for humans and the environment.</li> <li>2. Protection beyond national borders Radioactive waste shall be managed in such a way as to assure that possible effects on human health and the environment beyond national borders will be taken into account.</li> <li>3. Protection of future generations Radioactive waste shall be managed in such a way that predicted impacts on the health of future generations will not be greater than relevant levels of impact that are acceptable today. Likewise, radioactive waste shall be managed in such a way that it will not impose undue burdens on future generations.</li> <li>4. The legal framework Radioactive waste shall be managed within an appropriate national legal framework including clear allocation of responsibilities and provisions for independent regulatory functions.</li> </ol>

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		Specific requirements for siting a facility has not been established at this stage, but it will be based on the results of the up-coming desktop studies as well as on international recommendations, e.g. in IAEA Safety Standards.
Article 14 Section H Page 14	This report indicates the “Basis for Decision” will be endorsed by the Parliament in the fall of 2008 to start the process of locating a site for a final repository. Please elaborate in your May 2009 national presentation, Denmark’s progress in establishing a process to determine a location for a final repository for Low and Intermediate Level Waste.	<p>The “basis for Decision” was discussed in the Danish Parliament on 29 January 2009 at which point the Parliament unanimously supported the continuation of the process towards the establishment of a final repository. The only comment in relation to the “Basis for Decision” was a request for additional focus on the possibilities for a reversible repository.</p> <p>The inter-ministerial workgroup behind the “Basis for Decision” has now initiated three parallel desktop studies considering both the Danish geology and the safety/cost of the three conceptual designs, as well as the associated risks in relation to the transport of the waste from the present storage facilities to a final repository. The studies are expected to result in a list of approx. 20 areas that should be investigated further for the possible siting of a final repository.</p>
Article 15	Have detailed safety assessments and environmental assessments been performed?	Detailed safety assessments and environmental assessments have not been performed at this early stage. However, since the Parliament on the 29th of January 2009 unanimously supported the continuation of the process of establishing a final repository for LILW, a series of desktop studies have been initiated. One of these includes a delineation of three repository concepts, inc. conceptual safety analysis. It is anticipated at this stage that the desktop studies will be completed within a timeframe of 2-2 ½ years.
Article 15 Section H Page 21	A dose constraint for potential isolated incidents such as intrusion is set at 1 mSv/year. Doesn’t this criterion imply that the co-disposal of a minimal amount of spent fuel is excluded (see also question 1) ?	The proposed dose constraints will be valid irrespective of the chosen solution for the experimentally irradiated fuel. Thus, the repository design must ensure that the dose constraints will not be violated considering the actual composition of the waste and the relevant intrusion scenario.
Article 15 Section H Page 21	The general dose constraint for the phase after closure of the disposal facility is set at the level of a waste clearance criterion, i.e. 0.01	Closure of the repository is initially followed by a monitoring phase and subsequently after decision by the regulatory authority a passive phase, in which the repository is no longer subject to monitoring etc. by the license holder. The dose constraint for these phases corresponds to the dose constraint, which today is used

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	mSv/year. Does this imply that the disposed waste is considered to be cleared after closure of the disposal facility ?	for release (clearance) of solid materials from the nuclear facilities at the Risø site for which there is also no requirement of monitoring by the license holder after release. It does not imply that the disposed waste is considered to be cleared after closure of the disposal facility.
Article 18 Section E Page 13	It is mentioned in the report that the new Order introduces new requirements on security of sealed sources, based on the recommendations from the IAEA TECDOC-1355. Could you please explain more about the implementation of these recommendations? Which recommendations did you implement, and what kind of obligations are introduced for the licenseholders?	Measures implementing requirements on security of sealed sources based on the recommendations from the IAEA TECDOC-1355 are given in Order No. 985 of 11 July 2007 on sealed radioactive sources. A graduated approach is applied. Security groups A, B and C are introduced referring to the classification given in TECDOC-1355.  The strictest obligations are introduced to license holders of category A sources. A list of the obligations is provided below:  For category A sources a vulnerability assessment should be made. In addition a security plan must be drafted and implemented based on the approved vulnerability assessment including as a minimum the following:  1) Appointment of a person who is responsible for the security of radioactive sources. 2) Procedures for daily verification of the company's possession of the individual source. There must be records of each control. 3) Description and implementation of a system for access control. 4) Description and implementation of - as a minimum - two technical measures separating the sources from unauthorized persons. 5) Description an implementation of an alarm system to ensure that the intrusion of unauthorized persons is timely detected and immediately responded. 6) Procedures for ensuring trustworthiness of relevant staff. 7) Measures to ensure that sensitive information about the source and the security is not disclosed to unauthorized persons. 8) Procedures for getting a confidentiality statement from relevant staff.

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		The security plan must be approved by the regulatory authority before the transfer of a category A source to the license holder.
Article 18	What is national policy in Denmark for “disposal” of radioactive waste?	<p>Danish policy on the disposal of LILW is, that all radioactive waste, except sealed sources and spent fuel that is returned to the manufacturer, shall be stored at the governmental institution Danish Decommissioning for later disposal in Denmark in compliance with international obligations and recommendations, primarily relevant IAEA Safety Standards.</p> <p>Based on recommendations from the IAEA (IAEA, 1995. Safety Series no. 111-F. The Principles of Radioactive Waste Management), four main principles have been described:</p> <ol style="list-style-type: none"> <li>1. Protection of humans and the environment Radioactive waste shall be managed in such a way as to secure an acceptable level of protection for humans and the environment.</li> <li>2. Protection beyond national borders Radioactive waste shall be managed in such a way as to assure that possible effects on human health and the environment beyond national borders will be taken into account.</li> <li>3. Protection of future generations Radioactive waste shall be managed in such a way that predicted impacts on the health of future generations will not be greater than relevant levels of impact that are acceptable today. Likewise, radioactive waste shall be managed in such a way that it will not impose undue burdens on future generations.</li> <li>4. The legal framework Radioactive waste shall be managed within an appropriate national legal framework including clear allocation of responsibilities and provisions for independent regulatory functions.</li> </ol>

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Article 20 Page 14	How the process of granting a license and other regulatory functions (inspections) are split among the different Nuclear Regulatory Authorities (Danish Emergency Management Agency and National Institute of Radiation Protection)? How the work of these organisations is co-ordinated?	The Nuclear Regulatory Authorities are constituted by the National Institute of Radiation Protection under the National Board of Health and the Nuclear Division under the Danish Emergency Management Agency. The authorities issue the Operational Limits and Conditions for the nuclear facilities and revise them in accordance with the progression of the decommissioning. The authorities also carry the responsibility for special permits and inspections as required during the decommissioning process. In practice, specific considerations related to nuclear safety have been conducted and settled by the Nuclear Division after consulting the National Institute of Radiation Protection. Opposed to this, the considerations related to radiation protection have been conducted and settled by the National Institute of Radiation Protection after consulting the Nuclear Division. This practice has been going on successfully for more than 30 years. Denmark has not seen any conflicts related to the status of two Nuclear Regulatory Authorities sharing responsibilities.
Article 21 Section F Page 14	Financial resources: Is stated that the financial provisions for Danish Decommissioning is assured due to the subordination to the Danish Ministry of Science, Technology and Innovation. Is an annual sum, a percent from the ministry budget or is according to real needs? However, at page 19 are presented among the waste producers the industry and other sectors. Probably some of them are private companies; their wastes are managed from the ministry funds or based on the principle “the polluter pay”?	<p>The expenses for the management of radioactive waste are covered by the state budget, covering Danish Decommissioning that operates the Waste Management Plant. Danish Decommissioning is an institution under the Ministry of Science, Technology and Innovation. It is thus a governmental matter to provide adequate resources for the management of radioactive waste.</p> <p>Regarding disposal of disused sealed radioactive sources where the option for return to the manufacturer does not exist, the obligations of the license holder is to ensure the transfer of such sources to the Waste Management Plant of Danish Decommissioning at the Risø site. The license holder pays for the service; however, this payment does not fully cover Danish Decommissioning's handling of the waste.</p>
Article 21 Section F Page 14	Since Danish Decommissioning is subordinated to the Danish Ministry of Science, Technology and Innovation, financing needs are	Danish Decommissioning is an institution under the Ministry of Science, Technology and Innovation. It is thus a governmental matter to provide adequate resources for the management of radioactive waste.

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	<p>covered, as it is indicated in the Report.</p> <p>Could Denmark provide more details about the Danish Decommissioning dependence from this Ministry?</p> <p>Could Denmark explain how financing requirements (provisions according to a annual or multiannual programme) and interinstitutional arrangements are set up?</p>	<p>Danish Decommissioning's expenses for the management of radioactive waste are covered by the annual state budget, which is approved by the Parliament.</p> <p>Handling of waste coming from external parties (universities, industry etc.) is partly paid by these parties.</p> <p>Funding of specific decommissioning or repository projects are granted stepwise by the Parliament.</p>
<p>Article 24 Section F Page 15-16</p>	<p>Operational radiation protection: Is declared that the contractor level instructions are about three hours in total. Per month, at three months, per task or activity?</p>	<p>Instructions of contractors are conducted for each new task.</p>
<p>Article 25 Page 16</p>	<p>Could Denmark further explain the responsibilities of Danish Emergency Management Agency?</p> <p>Could you provide information about the relationship between this Agency and Danish Decommissioning?</p> <p>Are there plans to carry out emergency drills?</p> <p>If these emergency drills have already taken place, could Denmark summarize some of the lessons learnt which could be useful for other countries?</p>	<p>The Emergency Management Agency (DEMA) is a government agency under the Ministry of Defence. According to the Danish Preparedness Act, the principal task of the Emergency Management Agency is to manage the National Rescue Preparedness Corps, to supervise the national and municipal rescue preparedness and to advice the authorities on matters of preparedness.</p> <p>The Danish Emergency Management Agency is also in charge of the national nuclear emergency preparedness and response, in collaboration with other national authorities.</p> <p>Danish Decommissioning is an institution under the Ministry of Science, Technology and Innovation and is responsible for the decommissioning of the nuclear facilities formerly attached to Risø DTU - National Laboratory for Sustainable Energy. The Danish Emergency Management Agency and The National Institute for Radiation Protection are in conjunction the Danish Nuclear Regulatory Authorities, responsible for the regulatory control of Danish Decommissioning, as well as emergency preparedness on the national level.</p>

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		<p>The general plan calls for one or two command post exercises every year, involving the other authorities participating in the nuclear preparedness, when possible in connection with international exercises or national exercises in neighbouring states. In addition the plan calls for measurement training exercises by the persons appointed to carry out measurements in case of an emergency,. The relevant national authorities also participate, to the extent possible, in exercises held by nuclear emergency authorities in neighbouring countries as observers/players. This is a very efficient way to gain knowledge for organizing and handling emergencies. Furthermore exercises provide valuable ideas for improvement and for cooperation during real emergencies.</p> <p>Emergency drills are conducted regularly. Denmark has some general experiences that probably are common to all states:</p> <ul style="list-style-type: none"> <li>- It is absolutely essential that all authorities planned to participate in the emergency preparedness organisation during real emergencies also participate in exercises.</li> <li>- It is very useful to participate in exercises held by neighbouring states, as well as having joint exercises with neighbouring states having nuclear installations.</li> </ul>
Article 26	<p>Q1. What are the qualifications of staff?  Q2. What are the details of financial resources?  Q3. What are the details regarding emergency preparedness?  Q4. What are the details on record keeping?</p>	<p>On January 29, 2009 the Danish Parliament unanimously supported the “Basis for Decision” for establishing a Danish final repository for low and intermediate waste. As stated in the National Report the “Basis for Decision” establishes 4 principles that shall apply for all work related to construction and operation of the Danish final repository. No specific requirements on qualifications of staff, emergency preparedness and record keeping have been established at this early stage of the process. Adequate financial resources are a governmental matter and will be assured step by step by the Government after approval in the Parliament during the process leading to the final repository.</p>
Article 27 Section I Page 24	<p>The national reports indicates that Denmark expects to implement EU directive on the supervision and control of shipments of radioactive waste and spent fuel by 25 December</p>	<p>Order no. 1175 of 5 December 2008 on International Transfer of Radioactive Waste and Spent Fuel issued by the National Board of Health came into force 25 December 2008 and replaces Order no. 969 of 13 December 1993 on International Transfer of Radioactive Waste.</p>

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	2008. Has this been implemented and how does this implementation impact Denmark's compliance with the provisions of the joint Convention?	Order no. 1175/2008 ensures compliance with Article 27 of the Convention covering provisions for transboundary movement of radioactive waste and spent fuel.
Article 28 Section J Page 24	The report stated that re entry for storage of disused sources originally produced in Denmark will be considered on a case by case basis. What criteria are used to guide decision making in accepting or rejecting requests for re entry and return of sealed sources to Denmark?	Denmark has over the years exported a small number of devices mounted with radioactive sources. The devices were produced in Denmark and mounted with sealed sources produced abroad. Denmark has until now never received any request for re-entry of these devices. Due to the small number of devices no general criteria for accepting or rejecting a request has formally been made.
Article 28 Section J Page 24	Where are disposed the sealed radioactive sources and what are the technologies used for conditioning them?	Spent sealed sources are stored at the Waste Management Plant of Danish Decommissioning.  The sources with low activity are placed in designated drums – sorted with respect to decay time.  Larger sources are kept at the “Centralvejslageret” storage facility in the original container (no conditioning) until the concept and acceptance-criteria for a final repository are established.
Article 28 Section J Page 24	The report describes a preventive survey conducted on 7 scrap yards for radioactive sources. What plans does Denmark have to continue to monitor these and other scrap yards for radioactive sources?	Denmark is planning to initiate a survey during the summer of 2009. As in 2007 the survey will be conducted in cooperation between the National Institute of Radiation Protection, the National Board of Health and the Nuclear Division, Danish Emergency Management Agency.
Article 28 Section J Page 24	Can you clarify what financial security mechanism for the high activity sealed sources is proposed or has been implemented?	The requirement of Article 10 in EU Council Directive 2003/122/Euratom of 22 December 2003 on the control of high-activity sealed sources and orphan sources regarding financial security for high activity sealed sources is implemented by Denmark by an official note on financial provisions to the Finance Act approved by the Parliament.

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		<p>Finance Act, No.3. ad 11.11.40. (Unauthorized translation):            “The Minister of Health and Prevention is authorized in all cases of accidents involving radioactive material to cover all the costs of intervention, including all costs of providing assistance to other countries pursuant to the Convention on Assistance in the event of a nuclear accident or radiological emergency. In addition the Minister is authorised to cover all costs if uncontrolled radioactive sources are identified (see especially EU Directive 2003/122/EURATOM) and to cover all the cost to secure such sources.”</p>
Article 28	<p>What is national policy for management of disused sealed sources to ensure their safety and security and in a manner that does not impose an undue on future generations?</p> <p>What options exist or are planned for disposal of orphan and other disused sealed radioactive sources where an option for return to the manufacturer does not exist – including legacy radium sources?</p>	<p>The policy and practice for radioactive waste management has so far been to collect and store all Danish radioactive waste under safe and secure conditions at the Waste Management Plant at the Risø site. The Danish Parliament unanimously supported on January 29, 2009 the “Basis for Decision” for establishing the Danish final repository for low and intermediate waste. As stated in the National Report the “Basis for Decision” establishes 4 principles based on recommendations from the IAEA (“IAEA, 1995. Safety Series no. 111-F. The Principles of Radioactive Waste Management), that shall apply for all work related to establishing the Danish final repository:</p> <ol style="list-style-type: none"> <li>1. Protection of humans and the environment Radioactive waste shall be managed in such a way as to secure an acceptable level of protection for humans and the environment.</li> <li>2. Protection beyond national borders Radioactive waste shall be managed in such a way as to assure that possible effects on human health and the environment beyond national borders will be taken into account.</li> <li>3. Protection of future generations Radioactive waste shall be managed in such a way that predicted impacts on the health of future generations will not be greater than relevant levels of impact that are acceptable today. Likewise, radioactive waste shall be managed in a way that it will</li> </ol>

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		<p>not impose undue burdens on future generations.</p> <p>Consideration for future generations is of fundamental importance in the management of radioactive waste. This principle is derived from an ethical concern for the health and environment of future generations, as well as a principle that the generations that receive the benefits of a practice should bear the responsibility to manage the resulting waste.</p> <p>4. The legal framework Radioactive waste shall be managed within an appropriate national legal framework including clear allocation of responsibilities and provisions for independent regulatory functions.</p> <p>Regarding disposal of disused sealed radioactive sources where the option for return to the manufacturer does not exist, the obligations of the license holder is to ensure the transfer of such sources to the Waste Management Plant of Danish Decommissioning at the Risø site. The license holder pays for the service; however, this payment does not fully cover Danish Decommissioning's handling of the waste.</p> <p>Regarding orphan sources the Ministry of Health and Prevention is authorised to cover all costs associated with the retrieval and securing of such sources.</p>
Article 28 Section J Page 24	<p>How do the provisions of Order no. 985 of 11 July 2007 and Order no. 154 of 6. March 1990 ensure that disused sources are handled in a safe manner?</p> <p>Is there any requirement to return sources to the supplier?</p> <p>Are users required to store disused</p>	<p>According to § 7 and § 16 in Order no. 985 of 11 July 2007 each disused source shall immediately be returned to the supplier or to a recognised installation authorised by the National Institute of Radiation Protection for storage and/or disposal. For sealed sources categorized in security group A (IAEA), § 13 states that before an agreement on transfer can be authorized by the National Institute of Radiation Protection there has to be a binding agreement between the license holder and the supplier securing return of the source to the supplier, when it becomes a disused source.</p> <p>Concerning smoke detectors with radioactive sources it is stated in § 32 in Order no.</p>

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	<p>sources under particular conditions or are they stored by the Authority?</p> <p>Is there a register of disused sources in storage?</p> <p>How many disused sources are in storage?</p> <p>Are there any fixed radiation monitors at the gates of scrap metal facilities to detect any radioactive material being brought in?</p>	<p>154 of 6 March 1990 that disused smoke detectors shall be returned to the supplier or transferred to the Waste Management Plant of Danish Decommissioning at the Risø site.</p> <p>Disused sources are not stored by the regulatory authority.</p> <p>The disused sources stored by Danish Decommissioning are registered in the Waste Documentation System (WDS). The WDS is an electronic system based on bar-code registration and is particularly designed for the waste-flow at Danish Decommissioning. The WDS comprise decommissioning waste as well as conventional radioactive waste such as disused sources. Small sources like smoke detectors are registered in bulk by weight, whereas larger disused sources are registered singly.</p> <p>Several scrap metal facilities have fixed radiation monitors to detect radioactive material being brought in. The National Institute of Radiation Protection recommends scrap and reuse metal facilities to ensure that contracts are in place with the supplier including binding requirements on the supplier to ensure transfer of non-radioactive material.</p>
<p>Article 32 Page 9 and 12</p>	<p>The Report indicates that DR3 will be decommissioned to "green field". To this end, a comprehensive decommissioning plan for the entire DR3 is still in preparation. Could Denmark indicate what are the expected volumes of waste to be managed?</p> <p>Have these volumes been taken into account in the design of the LILW repository mentioned in Section H?</p>	<p>The total volume of waste resulting from the decommissioning of the nuclear facilities at the Risø site is estimated to be nearly 2000 cubic meters divided in four major parts:</p> <p>Graphite: 39 cubic meters Aluminium: 75 cubic meters Steel: 732 cubic meters Concrete: 1.129 cubic meters</p> <p>The estimated volumes are based on the conservative assumption that no concrete and steel from the research reactor DR 3 can be released due to levels of contamination in the waste above the prescribed clearance levels.</p>

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		The total volume of waste resulting from the decommissioning process is, as part of the total volume of radioactive waste estimated to be included and deposited in the Danish repository, presented in the “Basis for Decision”. Table 6, page 19, the Third National Report.
Article 32 Page 6-8	<p>Could Denmark provide some information about what kind of storage facility is "Mellemlageret"?</p> <p>Has the new facility for safe and secure storage of radioactive liquids already started to operate?</p> <p>Is it currently storing radioactive liquids?</p> <p>Is the Storage Facility currently storing Radioactive Waste?</p> <p>If so, is there any reason to not include it in tables 2 and 3?</p>	<p>“Mellemlageret” is a 735 square meter storage facility for radioactive waste constructed in the vicinity of the building named Waste Management Plant. The facility comprises two compartments: one which serves as buffer capacity for decommissioning material in line for the waste characterisation procedure, and one, which serves as a radioactive waste storage until a final radioactive waste repository has been established. The storage facility is constructed and located with due considerations to radiation safety, conventional safety and environmental and fire hazard analyses. The storage facility has been approved by the Nuclear Regulatory Authorities.</p> <p>The new facility for safe and secure storage of minor amounts of liquid radioactive waste started to operate in 2008. The facility is dedicated to short time storage of liquid radioactive waste awaiting conditioning. The facility serves as a buffer capacity for liquids in line for conditioning. The liquid waste is conditioned to solid state at the Waste Management Plant, either by distillation (inorganic solutions) or by evaporation (organic solutions). The radioactive contents of the liquid waste after conditioning are included in tables 2 and 3 in the National Report.</p>
Article 32 Section D Page 10	<p>According to Section D of the report, the research reactor DR 1 was cleared from the regulatory control in early 2006 after clearance measurement for 3 month.</p> <p>What are the final status survey procedure (e.g. sampling, measurement methods, etc.) for DR 1, and the release criteria for the buildings and the sites</p>	<p>A brief account of the final status survey procedure for DR 1, as well as the release criteria in general, is given below. Please find the detailed public report: “Decommissioning of DR 1 – Final Report”, which is approved by the Nuclear Regulatory Authorities, at the web-site of Danish Decommissioning (<a href="http://www.dekom.dk/publikationer/Decommissioning_of_DR1_-_Final_Report/">http://www.dekom.dk/publikationer/Decommissioning_of_DR1_-_Final_Report/</a>).</p> <p><b>SAMPLING AND MEASUREMENT METHODS</b></p> <p>Tools and other equipment that had not been subject to activation were cleared based on measurements of surface contamination, if all surfaces were accessible for</p>

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		<p>measurement with a contamination monitor. Items with a geometry not permitting direct measurement of all surfaces were transferred to the Clearance Laboratory for possible clearance on the basis of measurements of volume specific activity.</p> <p>Possibly activated items from which external radiation could be measured on-site, but where a possibility for clearance existed, were transferred to the Clearance Laboratory for possible clearance on the basis of measurements of volume specific activity.</p> <p>Material from the biological shield was cleared on the basis of measurements on drill-core samples taken, both as part of a characterisation project and during the decommissioning. The biological shield was cut into smaller blocks. Based on the drill-core measurements the thickness of the slabs to cut off from the inside of each block was determined with appropriate safety margin.</p> <p>In terms of clearance of the building, all measurements were made with a contamination monitor, a Ge-detector or a NaI-detector using gamma spectrometry. Ge-detectors were used in larger rooms as one or two measurements can measure the surface-contamination in the whole room.</p> <p><b>CLEARANCE</b></p> <p>For the clearance of materials the Danish nuclear regulatory authorities have prescribed the use of mass specific clearance levels given by the IEAE (IAEA, Safety Guide No. RS-G-1.7, Application of the Concepts of Exclusion, Exemption and Clearance). Averaging over 1000 kg is permitted. However, parts of an item that have identified activity concentrations above the clearance levels must be separated, if this is reasonably achievable.</p> <p>For clearance of buildings for re-use the Nuclear Regulatory Authorities have prescribed the use of the surface specific clearance levels given by the European Commission (Radiation Protection 113, Recommended radiological protection</p>

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		criteria for the clearance of buildings and building rubble from the dismantling of nuclear installations. The European Commission, 2000). These clearance levels also apply for the disposal, recycling and reuse of items. The surface specific clearance levels must be applied for the total activity on and below the surface divided by the area of the surface. Averaging over 1 square meter is permitted.
Article 32 Section D Page 9	<p>In Table 5 of the report, it is addressed that the research DR 2's reactor waste fully decommissioned, but the building will be used for storage DR 3 waste.</p> <p>When the DR 2 building is used for waste storage later, will it be regulated as a "reactor under decommissioning" or a "waste storage facility"?</p>	The DR 2 reactor is fully decommissioned and during the spring of 2008 the reactor building was cleaned and an extensive control measurement programme was completed. It has been reclassified to the lowest radiological classification, which means that the building can be refurbished without any radiological restrictions. In the future the building will serve as a handling and storage facility for radioactive waste produced by the remaining decommissioning projects, and it will be regulated accordingly.
Article 32 Section D Page 10	This section describes accurately how the DR1 was deommissioned. Could you please provide also information regarding the total costs of the decommissioning of DR1?	The total cost of the decommissioning of DR 1 was 5,4 M DKK or approximately 720.000 EUR.
Article 32 Section C Page 12	<p>It is mentioned in the report that residuals of fuel testing, á emitters and 60-Co pellets are still present in the Hot Cells.</p> <p>Is there any estimation made of the radioactive inventory within the Hot Cell facility?</p>	<p>The total inventory given below of isotopes in all the six cells in the Hot Cell facility is estimated from smear samples taken in 1990 before the cells were finally sealed:</p> <p>Co-60: 55GBq  Cs-137: 1.800GBq  Sr-90: 1.300GBq  Pu-238: 37GBq  Pu-239: 5,6GBq  Pu-240: 9,3GBq  Am-241: 37GBq  Am-243: 0,3GBq</p>

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		<p>Cm-244: 9,3GBq</p> <p>For Cell no. 3 with the highest activities the estimate is:</p> <p>Co-60: 21 GBq  Cs-137: 700 GBq  Sr-90: 500 GBq  Pu-238 14 GBq  Pu-239 2,1 GBq  Pu-240 3,5 GBq  Am-241 14 GBq  Am-243 0,1 GBq  Cm-244 3,5 GBq</p> <p>The reference year for the activities above is 1993 for Co-60, Cs-137 and Sr-90 and 2001 for the actinides.</p>
Article 32 Page 6	According to your report the focus is on decommissioning of research reactors and construction of LILW repository. There is no information on current national energy policy and possible role of nuclear energy in it. Does this mean the Government does not consider nuclear option (commercial NPP) as part of energy mix?	In 1985 the Danish Parliament made the decision that Denmark would not use nuclear energy. The Danish Government therefore does not consider nuclear option (commercial NPP) as part of energy mix.
Article 32 Page 22	According to the report the start of decommissioning process of hot cell facility was scheduled for late 2008 based on approved project plan by regulatory authority. Can you shortly describe the current activities on this	In addition to further radiological characterization and detailed operational planning such as sandblasting of the interior of the cells, the current activities primarily focus on various other planned tasks including: a) separation and sealing of the work areas from the remainder of the building complex, b) division of the facility into six physically separated main work areas, connected only by well defined access points, and finally c) construction of a single external access point (and handling area)

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	project and steps done on site so far?	<p>providing access to all the other classified areas in the facility. The access point will constitute an airlock for the entire facility and all entry of personnel will be via this point.</p> <p>Construction of a new ventilation system for the sealed facility has been initiated. The ventilation system is designed to prevent contamination of the surroundings by establishing and maintaining a lower air pressure in the entire work area compared to the surroundings. It will furthermore prevent transfer of contamination from work areas with a higher level of contamination to work areas with a lower level of contamination by ensuring that the lowest pressure is maintained in the work area with the highest level of contamination. The pressure gradient throughout the entire facility is to be kept as high as possible and will be maintained during the total decommissioning period. The exhaust air will be filtered by means of a HEPA-filter and monitored for its content of radioactive material.</p>
Article 32	<p>From the President's Report of the Second Review Meeting, the Contracting Parties agreed to make efforts to produce more focused but still self standing national reports. Denmark's report includes multiple references to their second report when information has not changed, such that it is not stand alone. Denmark has provided additional information on areas highlighted in the rapporteur's report. We suggest that for the next review cycle, Denmark not rely on citations to earlier reports, because these reports will be increasingly more difficult to obtain and read.</p>	<p>As stated in section A, (Introduction) in the National Report, and as described in the Guidelines regarding the Form and Structure of National Reports, (INFCIRC/604 rev. 1, 19 July 2006): Duplication within the reporting, including duplication from former reports, should be avoided.</p> <p>At the same time it is stated that the report should be a stand-alone report. Consequently, Denmark has in this report decided to focus on what is considered highlights and new developments since the National Report from the Second Review Meeting.</p> <p>However, the present situation has, if considered necessary from a stand-alone report point of view, been stated briefly under each paragraph, even if there has not been any development since the last meeting. For the reader who wishes a more detailed description of the Danish practices and understanding of the development before 2006, the former reports as well as the questions and answers can be found via the homepage for the Joint Convention.</p>

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Article 32 Section H Page 19	Page 19 indicates there are 100 liters of heavy water and 2,000 kg of unirradiated uranium planned to be disposed. Is the uranium depleted, natural, or enriched material? Although these are identified as waste, has there been any consideration of reuse within or outside of Denmark? If so please describe.	<p>After the national report was written the last 100 litres of heavy water have been exported for commercial re-use outside of Denmark.</p> <p>The 2000 kg of unirradiated uranium is a mixture of depleted, natural and a small amount of enriched material. There has been consideration on re-use outside of Denmark, but so far with limited success.</p>
Article 32 Section D Page 9	What is the management strategy for the used heavy water from DR3 Reactor?	In 2007 the majority of the heavy water from DR 3 was exported for commercial re-use as described in the National Report. The last 100 litres of heavy water have also been exported for commercial re-use outside of Denmark after the National Report was written.
Article 32 Section D Page 10	Please describe the management of irradiated graphite resulted from decommissioning of DR1 Reactor?	The graphite from DR 1 is placed in steel containers and stored at the "Mellemlageret" storage facility awaiting disposal in the final repository.
Article 32 Section D Page 7	Which are your practices about measurements of no homogeneous radioactive waste?	<p>From non homogeneous decommissioning waste representative samples are taken of the items and used to calculate the radioactive inventory. The sample selection is done by defining smaller zones within the waste item which is more homogeneous than the entire object. Within these zones the aim is to sample the area with the highest activity in order to achieve the more conservative estimate of the radioactive inventory.</p> <p>With respect to larger waste items supplementary on-site measurements are performed as well.</p>
Article 32 Section D Page 7	Which are the important parameters of radioactive waste that are used as criteria for classification (e.g.: radiological physical, chemical, biological).	<p>The overall classification: Waste which can be decontaminated, waste which can be cleared (has to be measured at the Clearance Laboratory) and waste which is radioactive waste.</p> <p>The radioactive waste is sorted depending on the material type, activity level, toxicity.</p>

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Article 32 Section D Page 6-7	Radioactive waste management facilities: As far as we understand, the management basically consists of storage of wastes in a safely manner. How many years are assumed to be the storage period?	The storage period will last until a Danish repository is in operation – the process towards a final repository has just started. The present timeframe is 2020 for Danish Decommissioning, including decommissioning of the storages facilities.
Planned activities Section K Page 25-26	As the information provided is related to past activities, some information on “planned” activities would be greatly appreciated.	<p>Continuous participation in international co-operation is seen as an important part of the planned activities in order to gain knowledge, seek international consensus and by that improve safety. Ongoing work in the most relevant international fora in which Denmark is represented is listed in Section K.</p> <p>In addition it is stated, that the Danish Nuclear Regulatory Authorities have jointly decided to set up a plan to undertake a self assessment, based on all or parts of the elements in the self assessment methodology used in the preparation of an IAEA International Regulatory Review Service (IRRS) mission. Such a self assessment will also constitute a part of the follow-up on the adopted working programme for the European High Level Group on Nuclear Safety and Waste Management.</p> <p>After deadline of the third National Report the Regulatory Authorities has decided to initiate a survey for orphan sources in the recycling industry during the summer of 2009. Similar to 2007, the survey will be conducted in cooperation between the National Institute of Radiation Protection, the National Board of Health and the Nuclear Division, Danish Emergency Management Agency.</p>