Sundhedsstyrelsen

April 2015

JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

Answers to Written Questions to the Fifth National Report from Denmark

Fifth Review Meeting, 11 - 22 May 2015

Danish Health and Medicines Authority (Sundhedsstyrelsen)
National Institute of Radiation Protection
Knapholm 7
2730 Herlev
Denmark

URL: http://www.sis.dk

Subject: Joint Convention, Radioactive Waste, Danish Repository, Intermediate storage, Answers to Questions and Comments posed to the Fifth National Report from Denmark

Language: English

Category: Faglig rådgivning

Version: 1.0

Version date: 17.04.2015

File format: pdf

Published by the Danish Health and Medicines Authority (April 2015).

Foreword

In October 2014 Denmark submitted the Fifth National Report under the obligation of JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WATE MANAGEMENT[1]. Subsequently, the submitted National Report was circulated to Contracting Parties of the Joint Convention and to the observers invited under Article 33(2) of the Convention for reviewing.
This document presents answers to the questions and comments resulting from the review of the Fifth National Report from Denmark. Questions are presented in such a way as to preserve the anonymity of the Contracting Party posing the question. The answers were prepared by the National Institute of Radiation Protection under the Danish Health and Medicines Authority in co-operation with the Danish Ministry of Health, Danish Decommissioning and the Danish Emergency Management Agency.

[1] Fifth National Report from Denmark to the Joint Convention

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (11-12 May, 2015):
Answers to Written Questions to the Fifth National Report from Denmark (Oktober 2014[1])

Section Page	Question	Answer
Section D.3.3 Page 11	In December 2011 the Nuclear Regulatory Authorities approved the decommissioning of DR 3 reactor. Were there any conditions put on this approval regarding timeframes for disposal, given there was no final waste management disposal facility in operation?	The Nuclear Regulatory Authorities approved the decommissioning plan for the DR 3 reactor in December 2011, and decommissioning works are ongoing. The approval included no conditions regarding timeframes for disposal, since the waste management plant at Danish Decommissioning is tasked with all waste management and storage related to decommissioning prior to disposal. All decommissioning waste will be managed there until a long term management solution has been decided upon.
Section K Page 41	There is no mention of the Fukushima accident in the national report. Are there any safety evaluations or planned efforts to improve safety resulting from Fukushima that can be reported by Denmark?	All nuclear installations in Denmark are located on the Risø peninsula, and there are no active reactors there any longer; only one reactor under decommissioning, waste management facilities and storages remain. After the Fukushima accident the Danish nuclear regulatory authorities evaluated the risks associated with natural phenomena, which, at this location, mainly would be an estimation of the risk of storm-induced flooding. In 2011 the estimated maximum flooding level was more than 1 meter below the ground level around all nuclear installations, and thus the conclusion was that there was no risk of flooding threatening the integrity of the nuclear installations, nor did any other natural phenomena. However, in December 2013 a storm caused water levels exceeding the previously estimated maximum flooding levels, and a reevaluation of safety of the installations was initiated by the nuclear regulatory authorities, based on the water levels registered in December 2013 with an additional safety margin. Investigations are ongoing with a target date for potential changes to be implemented early fall this year (before the next fall storm season).

[1] Fifth National Report from Denmark to the Joint Convention

Section Page	Question	Answer
Section K Page 41	Name of Section K should be "General efforts to improve safety", according to decision taken in May 2014 in Vienna (INFCIRC/604/Rev.3 Draft 3). This section should also indicate the following: - provisions implemented to answer suggestions and challenges identified during the previous examination session; - peculiarities in implemented practices, possible improvements and challenges identified by the contracting parties, treatment of these challenges; - description, plans and schedules of future peer reviews as well as provisions taken to make the reports of the past peer review open to public; - description of actions implemented to improve transparency with regard to requirements associated to the Joint Convention. This section should be less succinct in order to fully comply with these requirements. In particular, the list of actions should be completed and associated to a schedule covering the short-term period.	The comment is correct. The majority of the requested information is provided in the body of text of the 5th National Report, and below directions to relevant sections of text as well as supplementary comments are given: The challenges identified from the 4th review meeting are listed in Section A and addressed in the body of text of the 5th National Report (Sections D 3.3. and D 3.4), outlining how the demands for maintenance of competence and for furthering progress in the decommissioning of the Hot Cell and DR3 were met by the introduction of external contractors for specialized lifting operations, upgrades of the Hot Cell ventilation system and by design and testing of the method and equipment for decontamination of the Hot Cell interiors. As stated in section G, the efforts towards finding an international disposal solution for the 233 kg of experimentally produced and irradiated spent fuel have been ongoing since the last review meeting, but until now the matter remains unresolved. In section H, the outcomes of the public involvement and participation during the process of establishing of a repository for LILW are described in some detail, explaining the course of events leading to the present pursuit of a multi-track approach. As a strong feature of an implemented practice, the national data integration interface combines data for relevant individuals in Denmark with the Danish Central Business Register (CVR), and registered radioactive sources in the NIRP source database. This is at the core of the national strategy on management of disused sealed sources, and provides a simple countermeasure of sources getting out of the regulatory control system (section J). The national strategy is supplemented by an effort to create increased awareness of the risk of the occurrence of disused sealed sources at scrap metal yards. Contact information for all (nearly 1500) Danish scrap metal dealers has been compiled in order to allow for the forthcoming distribution of revised guidance material on the handling of disused sealed sources in scrap.

Section Page	Question	Answer
		An ongoing challenge is the public involvement and participation in the process of siting and establishing a long-term management solution for radioactive waste in Denmark. As described in Section H, one outcome of the extensive public and local political debate which followed after the announcement of 6 potential host areas for a repository was the adoption of a multi-track approach, described in further detail in the subsections of Section H. Since the last review meeting, a Strategic Environmental impact Assessment (SEA) of the plan proposal for establishing a final repository was carried out (Section H). The SEA included several public hearing phases, and will upon finalization be subject to a public consultation. The outcomes of the efforts in relation to examination of an intermediate storage solution as well as an international solution have been made publicly available primo 2015. In compliance with Council Directive 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste, Article 14. 3, Denmark shall arrange for self-assessments, including peer reviews, of the national framework, competent regulatory authority, national programme etc. as specified in the directive text. At present, no plans for peer reviews have been scheduled. Denmark is presently preparing the planning phase for the IAEA IRRS mission. Two chief advisers have completed the IAEA IRRS courses in order to acquire a detailed understanding of the process prior to planning. Throughout the text of the 5th National Report, references are made to previous Danish review reports which are publicly available along with previously asked questions and answers given. Also, since the last review meeting, the 'Operational Limits and Conditions' for Danish Decommissioning have been made publicly available. Relevant links to these publications are given in the 5th National Report from Denmark.

Section Page	Question	Answer
General Overview matrix	According to the new Guidelines regarding the Form and Structure of National Reports (INFCIRC/604/Rev.3 Draft 3), Denmark's National Report should include an overview matrix to be used by the Rapporteur during the Country Group review.	The comment is correct. An overview matrix has been supplied as a separately uploaded file on the Joint Convention website (Appendix A this document).
Section K Page 41	The publication entitled:"Protective Measures in Early and Intermediate Phases of a Nuclear or radiological Emergency. Nordic Guidelines and Recommendations" includes practical criteria for early protective measures as well as for actions after contamination events and in addition addresses criteria for lifting measures. It is noticed that this publication is not quoted by all Nordic National Reports except by Finnish and Danish National Report. Does that mean that only Finland and Denmark agree on these guidelines? Do these guidelines address the issue of the management of large amounts of waste in post-accident conditions?	The Nordic guidelines and recommendations were established in cooperation and collaboration between all the Nordic countries and were approved for publication as a Nordic consensus document by the chiefs of the Nordic radiation protection and nuclear safety authorities at a meeting in Stockholm August 27, 2013. Chapter 13 deals with radioactive waste, including the management of large amounts of waste.
Section D Page 11	What is the plan to manage the D2O stock of DR3?	The D2O stock of DR3 was, as stated in Denmarks 3rd National Report to the Joint Convention, exported to Canada in 2007 for reuse.

Section Page	Question	Answer
Section G Page 29	Denmark has continued the search for an international solution for management of 233 kg of spent fuel designated as waste. Has Denmark approach specific member states to propose an international solution and if so, which states?	As part of the revised scheme for defining a long term management solution for the Danish radioactive waste, the options for an international solution for all of the Danish radioactive waste have been investigated. As part of the investigation, the Ministry of Foreign Affairs of Denmark has through the Danish embassies in 23 OECD countries investigated the options for final disposal of all the Danish radioactive waste (including the 233 kg spent fuel designated as waste). The outcome of this investigation has shown that it is considered unlikely that an international solution for all of the Danish radioactive waste can be found. However, in regard of the small quantities and special requirements for disposal of the 233 kg spent fuel, efforts to find an international solution for this part of the Danish waste inventory will persist. Accordingly, Danish Decommissioning participates in the European project "ERDO-Working Group" looking for a multinational solution for long lived waste. In view of the nature of this ongoing process, no details regarding potential contacts to other countries can be disclosed at this point in time.
Section H Page 36	What were the results of the public hearings performed regarding the site selection of the repository?	The public hearings held for the 6 localities, all appointed on the grounds of geological criteria, were held in preparation of the Strategic Environmental Impact Assessment (SEA) to be conducted. The public hearings had the purpose of providing local communities with a possibility to raise area-specific subjects to be considered in the later conducted SEA. The public hearings were not aimed at the site selection process itself. At the public hearings, a number of subjects were raised, concerning preservation of local cultural heritage sites and artifacts, protection of biological habitats as well as socio-economic consequences, such as house price development, housing marked development, and employment situation etc. Overall, the hearings reflected a general skepticism in the public towards having a nearby repository.

Section Page	Question	Answer
Section D Page 6	Could you provide more information about the activities performed in the Radiological Characterization Lab (A-Lab)? It is mentioned that waste prior to storage is measured in gamma content. Are scaling factors used for alpha and beta content estimation? How often are those scaling factors validated?	The activities performed at the Radiological Characterization Lab (A-Lab) consist of measuring the content of gamma-emitting radioactive isotopes. This takes place by measuring the waste item itself, a sample or a package of a few waste items. The measuring techniques are gamma spectroscopy using ISOCS software from Canberra. Afterwards the waste is transported out of A-Lab for packaging and storage elsewhere. Samples are saved in an archive in the basement of the Lab for the future. Samples can either be taken at the Lab or be sent to the lab from elsewhere. The capabilities and procedures for cold extraction of samples and sample preparation using liquid Nitrogen are available at A-Lab, however measurements of hard to detect isotopes or nuclides such as beta-emitters cannot be measured at A-Lab. A few times the cold extraction techniques have been used and samples have been sent to another lab nearby for liquid scintillation counting. These results have been incorporated into the scaling factors for characterization of the stored waste from the decommissioning of the nuclear facilities on site. This has not been a thorough approach for all generated waste types and scaling factors but for a few selected individual waste types. The criteria for selecting these are very much Ad Hoc but mainly centers around the knowledge of (mostly) beta emitters H-3 or C-14 present in the waste. Normally characterization of alpha and beta emitting isotopes takes place with scaling factors. These are kept up to date once a year (to correct for half-life) but are not validated. The reason for not keeping the scaling factors validated on the basis of sample measurements are that the nuclear facilities are not in operation anymore. In theory the scaling factors should not change much after the half- life correction.

Section Page	Question	Answer
		This year, generation of waste with a higher C-14 and H-3 content is anticipated, and parts of this waste will likely dominate the future H-3 and C-14 inventory. On this basis samples for characterization of beta-emitters will probably be done for these waste types in the future. The extent and scope have not been decided upon yet. Similarly it hasn't been decided to use the results as a basis for validation of the scaling factors.
Section G Page 29	Denmark has been searching for an international solution regarding the 233kg of irradiated spent fuel. Please provide some additional information on the efforts that Denmark has taken for a long-term solution.	The relevant Danish authorities have investigated the possibilities for an international solution for the 233 kg of irradiated fuel by contacting some OECD-countries directly. Furthermore, Danish Decommissioning participates in the European project "ERDO-Working Group" looking for a multinational solution for long lived waste.
Section H Page 30	The results of the preliminary studies for the establishment of a Danish disposal facility for LILW were presented in May 2011 to stakeholders. What kinds of material and documents were presented to the various groups? For example, were concept designs presented to these groups?	In 2009, the Danish Parliament supported initiation of three preliminary studies; a technical survey of disposal concepts, a radiological risk assessment for transport of radioactive waste in Denmark and a geological siting survey to identify potential disposal areas. The studies were completed and presented to the public in May 2011. The study of disposal concepts presented design solutions and generic construction concepts found to be consistent with pre-specified safety requirements. The transport study demonstrated that assessed radiological risks associated with transport place no constraints on the selection of a site. The findings of the geological siting survey pointed out 22 potential areas in Denmark for a future repository, of which 6 areas were identified as geologically more suitable for hosting a repository.
Section A Page 2-3	Danish 5th National Report should include an Executive Summary.	The comment is noted. However, in the absence of an executive summary, a significant (albeit not exhaustive) amount of information relevant for an executive summary is presented in the second half of the Section A: Introduction.

Section Page	Question	Answer
Section H Page 31	Many actions related to the Danish radioactive waste management are in progress with three lines of efforts: a) Danish repository, b) establishing intermediate storage and c) the option for international solution. As noted in the report, progress was expected to be presented by the end of 2014. Please provide an updated status and the main conclusion.	In early 2015, the status of the three lines of effort was presented to the political parties of the Danish Parliament and subsequently to the public. For option a): a Danish repository, the SEA and associated ESPOO notification of the plan for establishing a repository in Denmark was completed, and a draft Summary Report for the Plan and SEA of the plan for establishment of a permanent repository in Denmark has been published. For option b) an intermediate storage facility, the cross ministerial working group has presented a high-level research report on the possibility of establishing an intermediate storage facility for all radioactive waste in Denmark. The report concludes that a storage facility can be established in compliance with all stated safety criteria, and specifies three studies to be carried out: One study regarding the principles for siting, one study on the comparative levels of safety for a repository and for a storage facility and finally, a study of estimated overall costs for establishing, operating and decommissioning a storage facility. Option c) an international solution. As part of the investigation, the Ministry of Foreign Affairs of Denmark has via the Danish embassies in 23 OECD countries investigated the options for final disposal of all the Danish radioactive waste (including the 233 kg spent fuel designated as waste). The outcome of this investigation has shown that it must be considered unlikely that an international solution for all of the Danish radioactive waste can be found. However, efforts to find an international solution, which can fulfill the special requirements for disposal of the small quantities of spent fuel will continue. The political decision following the presentation of outcomes from the three lines of effort was to suspend work for establishing a Danish repository until the results of the three suggested studies for the intermediate storage option can be presented. Hereafter, a final political decision will be taken regarding either implementing a disposal or an intermediate storage solution.

Section Page	Question	Answer
Section A Page 2-3 and Section H Page 30-38	Since the spring 2012 meeting, the plan to establish a Danish repository for Low and Intermediate Level Waste (LILW) has been supplemented with two additional lines of effort: a survey of the basis for, and implications of, establishing a long term storage solution for the Danish LILW, and an effort to explore the options for an international solution for all of the Danish LILW. The three lines of work are conducted in parallel so as to ensure a minimum delay in the efforts to establish a long term solution for management of radioactive waste in Denmark. Could Denmark present the current progress of these three lines of effort, indicate if one line is distinguished and specify the chosen lines to pursue if choice is already made?"	In early 2015, the status of the three lines of effort was presented to the political parties of the Danish Parliament and subsequently to the public. For option a): a Danish repository, the SEA and associated ESPOO notification of the plan for establishing a repository in Denmark was completed, and a draft Summary Report for the Plan and SEA of the plan for establishment of a permanent repository in Denmark has been published. For option b) an intermediate storage facility, the cross ministerial working group has presented a high-level research report on the possibility of establishing an intermediate storage facility for all radioactive waste in Denmark. The report concludes that a storage facility can be established in compliance with all stated safety criteria, and specifies three studies to be carried out: One study regarding the principles for siting, one study on the comparative levels of safety for a repository and for a storage facility and finally, a study of estimated overall costs for establishing, operating and decommissioning a storage facility. Option c) an international solution. As part of the investigation, the Ministry of Foreign Affairs of Denmark has via the Danish embassies in 23 OECD countries investigated the options for final disposal of all the Danish radioactive waste (including the 233 kg spent fuel designated as waste). The outcome of this investigation has shown that it must be considered unlikely that an international solution for all of the Danish radioactive waste can be found. However, efforts to find an international solution, which can fulfill the special requirements for disposal of the small quantities of spent fuel will continue. The political decision following the presentation of outcomes from the three lines of effort was to suspend work for establishing a Danish repository until the results of the three suggested studies for the intermediate storage option can be presented. Hereafter, a final political decision will be taken regarding either implementing a disposal or an intermediate storage solution.

Section Page	Question	Answer
Section H.1.3.1 and H 1.3.3 Page 33-35	In H.1.3.3 the resluts from a preliminary study pointed out 22 areas in Denmark in which a disposal site could be established. From this 22 areas 6 areas of particular interest has been chosen and the rationals for this is described in the report. For these 6 areas, public hearings have been held and the preparation of a Strategic Environmental Impact Assessment and a notification process according to Espoo Protocol has been initiated. If the descion will be to continue the efforts to establish a repository DE plan to make more detailed field investigations at 2-3 of the 6 areas. What are the critieras for the choice of the final 2-3 areas? Will all three design options for the repsoitory as described in H.1.3.1 be evaluated for all the remaining 2-3 sites?	In continuation of the preliminary studies, further area specific (vicinity) studies were carried out in the 6 designated areas, mainly to establish documentation for more detailed geological features and to clarify, which local area plans, cultural heritage and nature preservation schemes are to be considered. If the political decision to pursue the option of disposal is chosen, this publicly available information will be used in supplement of the findings from the preliminary studies to facilitate the decision of selecting 2-3 sites for further detailed investigation. All relevant repository concepts will be evaluated for each site, as the preliminary study of disposal concepts have not addressed the specific geological settings in relation to each locality.
Section D Page 16	"Cutting of the upper rim of RAT was conducted in August 2014 (figure 7), and removal of TSR is expected to take place in October 2014 after approval of safety assessments, work plans and health physical assessments by the Nuclear Regulatory Authorities" Please provide a status update on this.	The removal of TSR was done on October 14th 2014. A test lift of the empty shielding container from the reactor top to the basement level was performed a few days before the lift. The removal of TSR went as planned with very low doses to the involved personnel. The calculated radiation levels were confirmed during the operation.

Section Page	Question	Answer
Section H.1.4-H.3 Page 36-38	The report states that Denmark is considering three options for management of LILW- in country disposal at a location with favorable site characteristics, intermediate storage and extraterritorial disposal. Regarding Option 1, please describe what incentives are being considered for host communities. Regarding Option 3, please elaborate on what assurances would Denmark require from a host country to ensure safe managment of exported waste and indemnification from liability.	Option 1: No direct incentives have been considered for the host communities of a potential future repository. Option 3: Council Directive 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste, Article 4, item 4. states that radioactive waste shall be disposed of in the Member State, except if an agreement has entered into force between the Member State and another Member State or a third country to use a disposal facility in one of them. Prior to a shipment to a third country the exporting Member State shall take reasonable measures to be assured that: 1. The country of destination has concluded an agreement with the Community covering spent fuel and radioactive waste management or is a party to the Joint Convention 2. The country of destination has radioactive waste management and disposal programmes with objectives representing a high level of safety equivalent to those established by Council Directive 2011/70/EURATOM 3. The disposal facility in the country of destination is authorised for the radioactive waste to be shipped, is operating prior to the shipment, and is managed in accordance with the requirements set down in the radioactive waste management and disposal programme of that country of destination. The efforts made in relation to option 3, have so far been of such a preliminary nature, that issues of liability have not yet been addressed in any detail.

Section Page	Question	Answer
Section E Page 23	What skills or expertise have been lost through staff reductions at the Nuclear Regulatory Authorities?	In Denmark, nuclear regulatory oversight is jointly managed by the National Institute of Radiation Protection under the Danish Health and Medicines Authority and the Nuclear Division under Danish Emergency Management Agency. The present number of staff at NIRP is 30 (including an unfilled vacancy) and 11 at the Nuclear Division of the Danish Emergency Management Agency. The staff reductions experienced were founded in general cutbacks in the government sector, and mainly presented a challenge in transferal of knowledge to the remaining organisation. However, as of January 2015, filling of vacancies has led to a staff/resource situation in the nuclear regulatory authorities at the level of status for the previous review meeting.
Section H Page 31	"Majority of special waste is classified as intermediate level waste, and consists of 233 kg of irradiated uranium…" Please clarify, how this RW activity concentration allow to be classified as ILW	The inventory of the 233 kg of experimentally irradiated spent fuel is listed in Table 1 of the 5th Danish National report to the Joint Convention. As stated in section G, p. 29, the radionuclide inventory occurs with activity concentrations of less than 104 TBq/m3 and heat production from the waste in its originally designed waste packages is less than 1 kW/m3. Storage of this material requires no special precautions regarding heat dissipation. In accordance with IAEA guidance, the regulatory authority may, for the purposes of communication determine that certain waste constitutes ILW or HLW on the basis of generic safety cases. The Pre-feasibility study for final disposal of radioactive waste - Disposal concepts, described in section H.1.3.1. presented a generic evaluation of safety for disposal of all Danish radioactive waste, listing options of either separate (deep borehole) disposal of the special waste or a combined intermediate depth disposal option for all Danish radioactive waste. Regardless of this outcome, a final disposal solution for all Danish radioactive waste cannot be established before compliance with safety requirements is demonstrated in the safety case and supporting safety assessment for an actual waste disposal facility at a specific locality.

Section Page	Question	Answer
Section H Page 30	Denmark carries out three lines of work for radioactive waste management. The results of these studies would be presented by the end of 2014. Is there at present any political decision regarding which line to pursue is expected to be made?	In early 2015, the status of the three lines of effort was presented to the political parties of the Danish Parliament and subsequently to the public. For option a): a Danish repository, the SEA and associated ESPOO notification of the plan for establishing a repository in Denmark was completed, and a draft Summary Report for the Plan and SEA of the plan for establishment of a permanent repository in Denmark has been published. For option b) an intermediate storage facility, the cross ministerial working group has presented a high-level research report on the possibility of establishing an intermediate storage facility for all radioactive waste in Denmark. The report concludes that a storage facility can be established in compliance with all stated safety criteria, and specifies three studies to be carried out: One study regarding the principles for siting, one study on the comparative levels of safety for a repository and for a storage facility and finally, a study of estimated overall costs for establishing, operating and decommissioning a storage facility. Option c) an international solution. As part of the investigation, the Ministry of Foreign Affairs of Denmark has via the Danish embassies in 23 OECD countries investigated the options for final disposal of all the Danish radioactive waste (including the 233 kg spent fuel designated as waste). The outcome of this investigation has shown that it must be considered unlikely that an international solution for all of the Danish radioactive waste can be found. However, efforts to find an international solution, which can fulfill the special requirements for disposal of the small quantities of spent fuel will continue. The political decision following the presentation of outcomes from the three lines of effort was to suspend work for establishing a Danish repository until the results of the three suggested studies for the intermediate storage option can be presented. Hereafter, a final political decision will be taken regarding either implementing a disposal or an intermediate storage solution.

Section Page	Question	Answer
Section D Page 19	Has the decommissioning of the Fuel Fabrication Facility already finished?	The current status of the decommissioning of the Fuel Fabrication Facility is that all the work at the facility and all the clearance measurements have been carried out and completed by the end of February 2015. At the moment we are writing the final report for the Nuclear Regulatory Authorities to approve. After this approval we will return the building to its owner to be used for other purposes with no restrictions. The project was delayed a couple of months due to the finding of uranium spots on the concrete floor beneath the linoleum in the room where the uranium powder was handled. Three larger areas of the floor were cut away with a dry concrete saw to remove the spots. The dry sawing method was chosen to minimize the risk for cross contamination. Afterwards the clearance measurements performed by area showed no contamination left above the limits.
Section D.2 Page 6	Radioactive waste management: Corroded and old drums are going to be repackaged in the conditioning facility. What is the monitoring programme to identify older drums? What is the frequency of inspections of the stored waste and how many older drums were identified where repackaging was necessary? What is the envisaged storage period prior to disposal? Have the main reasons for corrosion been identified? How will these be avoided in the future?	The way the Danish drums are stacked and the size of the facility makes it impossible to inspect each drum visually without moving the drum. Drums in the outer parts of the stacks are formally inspected for corrosion on a yearly basis, but drums are identified during daily operations as well. In 2009 96 drums were repackaged, 1 drum was repackaged I 2011, 48 drums were repackaged in 2012, 6 drums were repackaged in 2014. The Danish Ministry of Health is in charge of a long term solution for the waste. Currently long term storage, disposal and export is considered. A final decision is expected within the next year. Kindly also refer to the answer to question 12. The main reasons for corrosion are exposure to atmospheric air and dampness due to condensation as room temperature varies. The storage building is not heated, but it is equipped with a humidity control. Due to the building design it is not possible to avoid temperature variations indoors when outside temperature varies.

Section Page	Question	Answer
Section D.3.4 Page 18	The report states that the decommissioning of the Hot Cells will be undertaken with the use of a manually operated arm to sandblast the interior steel clad walls. The 2011 report indicated "The process of acquiring the remotely operated grit blasting equipment has resulted in extensive delays to the project due to legislative complications associated with EU public tender regulations." The 2014 report does not indicate whether the equipment has been acquired yet. Please provide the status on the procurement and testing of the equipment to decontaminate the hot cells.	In mid-2012 a new strategy for the Hot Cell project was chosen and the sandblasting operations were put back into planning phase. An option analysis for remote cleaning of the cells was carried out. As a result of this work the method for lowering the dose rate for manual entry in the cells was chosen: To construct two sets of mechanical arms for remote blasting and for extraction. These arms are now constructed and undergoing tests before use. The overall strategy described in the project proposal for decommissioning of the Hot Cells and approved by the Nuclear Regulatory Authorities in 2008, was not affected by this decision, and therefore the adopted approach did not need renewed approval from the Nuclear Regulatory Authorities.
Section E Page 25	Could it be elaborated what efforts are taken or planned to mitigate the effects of decreasing resources?	In Denmark, nuclear regulatory oversight is jointly managed by the National Institute of Radiation Protection under the Danish Health and Medicines Authority and the Nuclear Division under Danish Emergency Management Agency. The present number of staff at NIRP is 30 (including an unfilled vacancy) and 11 at the Nuclear Division of the Danish Emergency Management Agency. The staff reductions experienced were founded in general cutbacks in the government sector, and mainly presented a challenge in transferal of knowledge to the remaining organisation. However, as of January 2015, filling of vacancies has led to a staff/resource situation in the nuclear regulatory authorities at the level of status for the previous review meeting.

Section Page	Question	Answer
Section I and F	Could you provide a short description of the procedure when a radioactive material in scrap metal is detected across the border?	On the national level; radioactive material found in scrap must be handled in agreement with the provisions of the National Institute of Radiation Protection (NIRP). For sources in scrap detected upon entrance into Danish territory; if possible, the scrap load must be returned to sender in the country of origin. For sources in scrap detected upon leaving Danish territory; the source must be transferred to the Danish Decommissioning, Waste Management Plant at Risø for storage until final disposal. Guidance on the handling of sources in scrap (2002) is available on the NIRP website, and among other things recommends that companies that purchase scrap metal ascertain that it is contractually guaranteed that the supplier is a) responsible for ensuring that transferred scrap does not contain radioactive sources and b) economically liable if so. In the specific case; The NIRP must be contacted for assessment and agreement on further action. Upon notification, the NIRP follows a graded approach, that often most involves the following measures: The relevant local staff must be instructed to cease work and avoid unnecessary stay in the vicinity of the radioactive source. If the source is localized – and depending on the registered dose rates and the competence of the local scrap yard - the local staff may be allowed to follow an approved standard procedure, in order to store the source under safe and secure conditions. If deemed necessary a radiation protection professional/expert is directed to the incident point for identification and further characterization of the source, in order to ensure safe handling of the source until transferal to safe storage at Danish Decommissioning, Risø. To address the problem on a broader scale the EU community has issued COUNCIL REGULATION (EU) No 333/2011, of 31 March 2011, “establishing criteria determining when certain types of scrap metal cease to be waste

Section Page	Question	Answer
		under Directive 2008/98/EC of the European Parliament and of the Council". In accordance with this, scrap producers/importers must issue a Statement of Conformity with the so-called end-of-waste criteria. This includes a certificate confirming that a given scrap consignment has been tested and declared free of radioactivity. To ensure this; qualified staff shall ensure the monitoring of radioactivity of each consignment prior to transfer.
Section E Page 23	Could you please give more information about the staff reduction at the regulatory body. Some numbers maybe and what are the consequences that can be foreseen? What are the reasons for the reduction?	In Denmark, nuclear regulatory oversight is jointly managed by the National Institute of Radiation Protection under the Danish Health and Medicines Authority and the Nuclear Division under Danish Emergency Management Agency. The present number of staff at NIRP is 30 (including an unfilled vacancy) and 11 at the Nuclear Division of the Danish Emergency Management Agency. The staff reductions experienced were founded in general cutbacks in the government sector, and mainly presented a challenge in transferal of knowledge to the remaining organisation. However, as of January 2015, filling of vacancies has led to a staff/resource situation in the nuclear regulatory authorities at the level of status for the previous review meeting.
Section F.2 Page 27	It is said that revised nationwide emergency plan was set in force in 2014. What were the major changes in the revised plan? Did they include lessions learned from FD-accident. Could examities be given?	The revised plan implemented new national guidelines and structures for emergency planning. This revision made nuclear preparedness planning for Denmark an integral part of the overall national preparedness planning. As the new Danish nuclear preparedness plan implements the new general nationwide preparedness concept in Denmark, which i.a. addresses issues like availability of resources, coordination between authorities and handling of simultaneous events, it also addresses lessons learned from the Fukushima Daiichi-accident. In addition to the new Danish nuclear preparedness plan, new procedures for information exchange, use of video-conferencing and prepared templates for fast public communication – also through social medias – have been compiled.

Section Page	Question	Answer
Section F Page 28	Dose limit control: The report says: “The maximum individual and collective doses cannot be accounted for on the basis of each facility. This is because several workers are involved in multiple projects and hence accumulate doses from working in more than one facility.” Do the workers have personal dosimeters for each facility or only one for all facilities? In the latter case, how can the doses collected at the individual facility be determined? Is there a central monitoring institution in Denmark?	In addition to personal TL dosimeters, all workers at Danish Decommissioning have individual electronic dosimeters for all facilities. Allthough workers engaged in decommissioning of a specific facility are not engaged in decommissioning of other facilities, they may receive doses from other facilities as part of their work. The cumulative doses are registered on TL dosimeters, while facility specific doses are recorded on electronic dosimeters. The TL dosimeters are supplied and handled by a dosimeter laboratory at Risø-DTU. Electronic dosimeters are supplied and handled by Danish Decommissioning. All TL dosimeter monitoring results for workers occupationally exposed to ionizing radiation (including staff at Danish Decommissioning) are reported to the Danish Health and Medicines Authority, National Institute of Radiation Protection (NIRP). The combined results of these reportings are made publicly available by NIRP.
Section D.3 Page 10	The report states "The plan for decommissioning of the Fuel Fabrication Facility was approved by the Nuclear Regulatory Authorities in August 2013 and decommissioning is expected to be completed by the end of 2014.” please provide the current status for the decommissioning of the Fuel Fabrication Facility.	The current status of the decommissioning of the Fuel Fabrication Facility is that all the work at the facility and all the clearance measurements have been carried out and completed by the end of February 2015. At the moment we are writing the final report for the Nuclear Regulatory Authorities to approve. After this approval we will return the building to its owner to be used for other purposes with no restrictions. The project was delayed a couple of months due to the finding of uranium spots on the concrete floor beneath the linoleum in the room where the uranium powder was handled. Three larger areas of the floor were cut away with a dry concrete saw to remove the spots. The dry sawing method was chosen to minimize the risk for cross contamination. Afterwards the clearance measurements performed by area showed no contamination left above the limits.

Section Page	Question	Answer
Section D.3.4 Page 18	Text describes the decontamination with sand blasting. Just out of curiosity, what is the activity of the blast material, and could it be possible to have a release to he environment?	The activity of the sand blast material depends on the degree of contamination on the waste items being decontaminated. We measure the dose rate and contamination level of the used blast media after it has been dried. The maximum dose rate measured is 10 µSv/h and the maximum beta and alpha contamination levels are 100 Bq/cm2 and 10 Bq/cm2 respectively with the lowest values lying close to the background level. Our total amount of waste from this process is only around 3 ton. Because of this and the difficulty in determining if a batch of used blast medium is suitable for free release, we have concluded that it is not economically viable to attempt release measurements on the used blast medium.
Section I Page 39	On which version of the IAEA Regulations for the Safe Transport of Radioactive Material (TSR1 or SSR-6) is based the national policy for trans boundary movements?	The transport specific provisions applicable to national and international transport under the Danish legislation are all based on the IAEA Regulations for the Safe Transport of Radioactive Material. For transport by road, Denmark is obliged to follow the European Agreement ADR-2015 concerning the International Carriage of Dangerous Goods by Road, which declare that dangerous goods may be carried internationally in road vehicles subject to compliance with internationally agreed (in the EU) provisions. These are based on the current version of the IAEA Regulations for the Safe Transport of Radioactive Material (SSR-6). With respect to supervision and regulatory control, trans boundary transfer/shipments of nuclear fuel and radioactive waste are governed by the EU Council Directive 2006/117/EURATOM, of 20 November 2006. Trans boundary transfer of other radioactive material in general is governed by the EU Council Regulation (Euratom) No 1493/93 of 8 June 1993 on shipments of radioactive substances between [EU] Member States. The Council Directive and the Council Regulation both concerns the regulatory notification, registration and control of radioactive material entering, transiting or leaving national territory.

Section Page	Question	Answer
Section F.3.1 and F.3.2 Page 27-28	It is noted in the report that the decommissioning of DR 1 resulted in a collective dose to staff from Danish Decommissioning slightly above 1 mmanSv and no doses were recorded for external contractors who carried out the concrete demoliation. It is also stated that the decommissioning of DR 2 resulted in a collective dose of 1.6 mmanSv to staff from Danish Decommissioning and 3.2 mmanSv to external contractors carring out the concrete demolition. What are the reason for the much higher collective doses for the externals workers carrying out the demolition of concrete from DR 2?	The reason for the higher doses to the external workers is that during demolition of the concrete the external workers occasionally had to enter the reactor tank where the dose rate was considerable higher than outside the tank.
Section D.3.2 Page 11	It is stated that "The building (for DR-2(5 MW research reactor)) now serves as waste handling area. The building will remain under regulatory control until this use is terminated" - What is the future plan for this building and for radioactive waste from the decommissioning of the building?	The former DR-2 reactor building will remain a waste handling area until the need for such an area is no longer present. The remaining contamination in the building structure is primarily situated in concrete flooring and brick wall. This will be removed before the regulatory control is terminated. Handling of this waste has not been planned yet, but if necessary it can occur inside the building.

Section Page	Question	Answer
Section J Page 40	Please elaborate on the national strategy for the management of disused sealed sources, the framework for returning them to a foreign manufacturer, the national tracking system and the licensing process.	National Strategy and Framework for the Management and Disposal of Sealed Sources: Purchase and use of radioactive sources requires a license from the National Institute of Radiation Protection (NIRP). In addition; all users of radioactive sources, all sealed radioactive sources and all permanent sites of use or storage are registered in a database at the NIRP. Only a few types of radioactive sources with very limited amounts of activity, e.g. sources for calibration and educational purposes as well as smoke detectors for domestic use, are exempted from individual registration in the database. Presently, 780 users of sealed sources and about 2500 sealed radioactive sources are recorded in Denmark. If a licensed user plans to dispose of a radioactive source, NIRP must be informed in writing and disposal must take place either by returning the source to the supplier or by transferring the source to the Danish Decommissioning, Waste Management Plant at Risø for storage until final disposal. Sources with an activity exceeding the IAEA D-value with a factor 1000 (so-called IAEA category 1 source), may only be purchased in the first place, if there is an authenticated take-back agreement with the supplier/manufacturer. The National Tracking System: Besides the registration of all sites of use or storage, a standard computerized procedure is running business data (Danish Central Business Register) and personal data (Civil Registration System) up against businesses and persons registered as owners/users of radioactive sources in the NIRP source database. This, to a certain degree ensures that NIRP is promptly informed in case of deaths, bankruptcies or company discontinuations among owners and users of sources - and thus enables the establishing of simple countermeasures to avoid sources getting out of the regulatory control system.

Section Page	Question	Answer
		The Licensing Process: Permission regarding sources must be given by NIRP in the following cases: 1) Acquisition, storage or use of sources, 2) Use of facilities, 3) Assembly and disassembly of sources in appliances, 4) Removal and installation of fixed appliances with sources, 5) Inspection of sources, containers, equipment and plants, 6) Preparation and testing of sources, and 7) Transfer of sources outside the EU. Authorization is provided in most cases in the form of a so-called framework license. The license specifies the specific application it covers. It may, for example, be for the acquisition, storage and use of sources or for the inspection of sources. The license must be granted before sources can be acquired. If the license should include storage of sources in the company or at an external storage location, a description of the storage location and address of any external storage sites should be enclosed in the application. Specific provisions apply to high activity sealed sources; requiring approval of storage sites, vulnerability assessments and security plans in the licensing phase, prior to the acquisition of the sources.
Section D.2 Page 9	Who are the external waste producers and what type of waste do they produce?	The external waste producers include hospitals and other parts of the health sector, industry and research institutions. Danish Decommissioning is not considered and external waste producer. The types of waste from external producers can be divided into two groups: the liquid waste and the solid waste. The liquid waste is primarily from the nearby Risoe and DTU facilities, in the form of water bearing radioactive material. The solid waste include operational waste such as gloves, towels and pipettes as well as larger pieces of disused equipment, smoke detectors, and closed and open radioactive sources.

Section Page	Question	Answer
Section D Page 6	What is the procedure and practice for inspection and compliance of waste packages stored at waste storage facilities regarding degradation and integrity of various waste packagings?	The way the drums and waste containers are stacked and the size and the construction of the four storage facilities makes it impossible to inspect each waste package visually without moving the waste packages. In one facility, the drums in the outer parts of the stacks are formally inspected for visible corrosion on a yearly basis; in another facility, the inspection of waste containers are performed on a quarterly basis. The waste packages in the last two facilities are stored in closed compartments with no option for visible inspection. Corroded drums and waste containers are also identified during daily operations. Humidity drains in storage facilities are regularly inspected. 'Operational Limits and Conditions' stipulates conditions for the safe and secure storage of waste units at the premises of Danish Decommissioning. Compliance with these conditions is verified through regular inspections by the Nuclear Regulatory Authorities.
Section D Page 15	The report states that Danish Decommissioning submitted detailed technical documentation for safety features of the Movable Top Shield (MTS) and its intended mode of operation for approval by the Nuclear Regulatory Authorities. "The approval for a limited range of operation was granted in May 2014". Please provide a response to the following questions: a) what is meant by 'limited range of operations'? b) what other operational modes of the MTS exist? c) why were they not approved yet?	Question a) The term 'limited range of operations' refers to the procedures deemed necessary for carrying out the removal operations of the TSP and TSR, after which time the seal of the reactor tank of DR3 is provided by the MTS. The specific operations involved sliding the MTS over the open reactor tank and lowering it to provide a seal after removal of the TSP. A similar operation was conducted in connection with removal of TSR. Question b) The planned future use of the MTS is to form a platform for operations during removal of the reactor tank structure and surrounding graphite. The planned mode of operation will include remote controlled dismantling through an opening in the central part of the MTS. For this purpose a superstructure will be placed on the MTS to provide space for safe handling and packaging of items extracted from the reactor interior. Question c) The detailed design and construction of the superstructure on the MTS is not fully completed. Therefore the full envelope of operations for the MTS has not yet been described and submitted for approval by the nuclear regulatory authorities.

Section Page	Question	Answer
Section H	Text describes the 3 track for the management of RW in Denmark. Has the government set a deadline by which a final decision on the direction (domestic repository, intermediate storage or international solution) will be taken?	In early 2015, the status of the three lines of effort was presented to the political parties of the Danish Parliament and subsequently to the public. For option a): a Danish repository, the SEA and associated ESPOO notification of the plan for establishing a repository in Denmark was completed, and a draft Summary Report for the Plan and SEA of the plan for establishment of a permanent repository in Denmark has been published. For option b) an intermediate storage facility, the cross ministerial working group has presented a high-level research report on the possibility of establishing an intermediate storage facility for all radioactive waste in Denmark. The report concludes that a storage facility can be established in compliance with all stated safety criteria, and specifies three studies to be carried out: One study regarding the principles for siting, one study on the comparative levels of safety for a repository and for a storage facility and finally, a study of estimated overall costs for establishing, operating and decommissioning a storage facility. Option c) an international solution. As part of the investigation, the Ministry of Foreign Affairs of Denmark has via the Danish embassies in 23 OECD countries investigated the options for final disposal of all the Danish radioactive waste (including the 233 kg spent fuel designated as waste). The outcome of this investigation has shown that it must be considered unlikely that an international solution for all of the Danish radioactive waste can be found. However, efforts to find an international solution, which can fulfill the special requirements for disposal of the small quantities of spent fuel, will continue. The political decision following the presentation of outcomes from the three lines of effort was to suspend work for establishing a Danish repository until the results of the three suggested studies for the intermediate storage option can be presented. Hereafter, a final political decision will be taken regarding either implementing a disposal or an intermediate storage solution.

Section Page	Question	Answer
Section D.3.5 Page 21	Decommissioning of the fuel fabrication facility: The Fuel Fabrication Facility provided fuel elements for the research reactors DR2 and DR3 as well as prototypes of fuel elements for power reactors until 2002, when it was permanently shut down. The plan for decommissioning of the facility was approved by the Nuclear Regulatory Authorities in August 2013. How far has the decommissioning of the Fuel Fabrication Facility progressed so far? What are the most challenging issues?	The decommissioning of the Fuel Fabrication Facility has been completed in February 2015. All clearance measurements have been completed as well. At the moment the final project report is in preparation. When ready it will be submitted to the Nuclear Regulatory Authorities for approval. When the report has been approved the building will be released for unrestricted use. In this decommissioning project there were two challenging issues: The first one was diffusion of uranium into metals. A vacuum oven which has been used for uranium showed no contamination when measured by a surface contamination monitor. That was very surprising to us as we did classify this oven as contaminated based on the history of its use. When measuring a sample from this vacuum oven in a gamma spectrometer afterwards it showed to be contaminated. So it turned out that the uranium had diffused into the metal and thereby was shielded. Another issue was that uranium has penetrated the concrete floor below the linoleum flooring. This was due to a spillage of water many years ago in the room where the uranium powder was handled. To clean this it was necessary to cut away a relatively large part of the concrete floor.
Section E Page 23	How many employees are working in the Nuclear Regulatory Authority nowadays? How many perform tasks related to radioactive waste management control? How the staff reduction mentioned in this section affected those tasks?	In Denmark, nuclear regulatory oversight is jointly managed by the National Institute of Radiation Protection under the Danish Health and Medicines Authority and the Nuclear Division under Danish Emergency Management Agency. The present number of staff at NIRP is 30 (including an unfilled vacancy) and 11 at the Nuclear Division of the Danish Emergency Management Agency. The staff reductions experienced were founded in general cutbacks in the government sector, and mainly presented a challenge in transferal of knowledge to the remaining organisation. However, as of January 2015, filling of vacancies has led to a staff/resource situation in the nuclear regulatory authorities at the level of status for the previous review meeting.

Section Page	Question	Answer
Section E Page 23	Human resources: According to the report, the Nuclear Regulatory Authorities have undergone staff reductions and loss of staff, and efforts to mitigate the effects of this ongoing development are needed. What are the reasons for losing staff in the regulatory body? How does Denmark face this challenge?	In Denmark, nuclear regulatory oversight is jointly managed by the National Institute of Radiation Protection under the Danish Health and Medicines Authority and the Nuclear Division under Danish Emergency Management Agency. The present number of staff at NIRP is 30 (including an unfilled vacancy) and 11 at the Nuclear Division of the Danish Emergency Management Agency. The staff reductions experienced were founded in general cutbacks in the government sector, and mainly presented a challenge in transferal of knowledge to the remaining organisation. However, as of January 2015, filling of vacancies has led to a staff/resource situation in the nuclear regulatory authorities at the level of status for the previous review meeting.

Appendix A:

Denmark – Overview matrix
5th review meeting of the Joint Convention

Type of Liability	Long-term management policy	Funding of liabilities	Current practice/facilities	Planned facilities
Spent fuel	Since 2003 an international solution has been sought. The matter remains unresolved. Alternative solutions; intermediate storage or disposal, are under consideration.	The Danish state carries the financial liability of an ultimate management solution.	Spent fuel from DR 1 and the experimentally irradiated spent fuel is stored under safe and secure conditions by the operator Danish Decommissioning (DD)	Pending the outcome of investigations into an international solution. Alternatively a long term management policy will include provisions for managing the Danish inventory of spent fuel
Nuclear fuel cycle wastes	Not applicable	Not applicable	Not applicable	Not applicable
Non-power wastes	Intermediate storage or disposal is under consideration.	Waste producers pay a management fee upon delivery of waste to DD. The Danish State carries the financial liability of an ultimate management solution.	DD receives, handles and stores non-power wastes produced by hospitals, industry and research intuitions in Denmark.	Pending a decision on long term management policy
Decommissioning	Following the unanimous decision of the Danish Parliament in March 2003, Denmark has adopted a policy of immediate dismantling and decommissioning to be carried out by the operator, DD.	DD is government property under the administration of the Ministry of Higher Education And Science. As such, DD is funded by the Danish state.	DD is responsible for the decommissioning of the nuclear facilities at Risoe.	Decommissioning works are in progress and should according to the parliamentary decision of 2003 be completed no later than 2023
Disused sealed sources	Return to the manufacturer or management by DD	The management of disused sealed sources is funded by the Danish state through DD.	DD receives, handles and stores disused sealed sources, which cannot be returned to the manufacturer.	Pending a decision on long term management policy

Sundhedsstyrelsen

sundhedsstyrelsen.dk