



Joint convention on the safety of spent fuel management and on the safety of radioactive waste management

Questions and Comments to the

NATIONAL REPORT FROM THE UNITY OF THE REALM
DENMARK
GREENLAND
7TH REVIEW MEETING



Joint convention on the safety of spent fuel management and on the safety of radioactive waste management

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National report from the Unity of the Realm, Denmark,
Greenland
7TH Review meeting

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Contents

Foreword	4
1. Questions and Comments	5
1.1. Question 1 (#30989)	5
1.2. Question 2 (#30990)	6
1.3. Question 3 (#30991)	6
1.4. Question 4 (#30992)	7
1.5. Question 5 (#30689)	7
1.6. Question 6 (#30683)	7
1.7. Question 7 (#29835)	8
1.8. Question 8 (#29836)	8
1.9. Question 9 (#29837)	9
1.10. Question 10 (#29838)	9
1.11. Question 11 (#29839)	10
1.12. Question 12 (#28085)	10
1.13. Question 13 (#28086)	11
1.14. Question 14 (#28087)	11
1.15. Question 15 (#28088)	11
1.16. Question 16 (#25529)	11
1.17. Question 17 (#24387)	12
1.18. Question 18 (#24388)	12
1.19. Question 19 (#24389)	13
1.20. Question 20 (#24390)	14
1.21. Question 21 (#24391)	15
1.22. Question 22 (#24392)	15
1.23. Question 23 (#24393)	16
1.24. Question 24 (#24394)	17
1.25. Question 25 (#24395)	17
1.26. Question 26 (#24396)	18
1.27. Question 27 (#24397)	19
1.28. Question 28 (#24398)	21
1.29. Question 29 (#21240)	22
1.30. Question 30 (#20062)	22
1.31. Question 31 (#19268)	23
1.32. Question 32 (#17105)	24
1.33. Question 33 (#17106)	24
1.34. Question 34 (#17107)	24

Foreword

In October 2020 the Unity of the Realm submitted the seventh National Report¹ under the obligation of JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT.

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 seventh National Report from the Unity of the Realm. Questions are presented in such a way as to preserve the anonymity of the Contracting Party posing the question.

The questions to the National report from Denmark were answered by the Radiation Protection under the Danish Health Authority in co-operation with the Danish Ministry of Health, the Danish Ministry of Higher Education and Science, Danish Decommissioning and the Danish Emergency Management Agency.

The questions to the National report from Greenland were answered by Radiation Protection under the Greenlandic National Board of Health.

¹ [The 7th National Report](#)

1. Questions and Comments

1.1. Question 1 (#30989)

It is stated that in Denmark, radioactive waste produced as a result of activities in oil and gas industries (geothermal heat generation, water treatment plants) are subject to the same regulatory regime. Can Denmark please describe the waste that is generated from these industries and if they are also considered licensees and subject to the same regulatory oversight? If not, is this waste sent to the Risoe waste management facility?

Answer

NORM is regulated as any other radioactive material, hence any user of radioactive materials, including use involving NORM is subjected to licensing under the provisions of the Radiation Protection Act.

The legislation states that radioactive waste must be disposed of as soon as reasonable achievable and may only be stored for a maximum of 12 months. However, Denmark does not have a dedicated waste disposal facility for NORM-waste. Therefore, the NORM waste producing companies in the oil, gas and geothermal industries are authorised by the Danish Health Authority to store the NORM-waste for more than 12 months. Hence, the NORM-waste owner (the producing company) is responsible for the safe management of the NORM-waste, until a disposal option for the waste is available.

Typically, these companies each have a storage facility for NORM-waste. However, some companies also have a license to store NORM-waste on the behalf of other companies. The NORM-storage facilities must comply to the general requirements in Order 670/2019 concerning storage of radioactive materials.

The waste management facility at the Risø Site has to date on case by case basis accepted smaller quantities of NORM-waste.

NORM-waste may be generated from the following industries in Denmark:

- Oil and gas industry
- Coal-fired power plants
- Geothermal energy production
- Industrial use of natural materials e.g. corundum
- Storage of ore and tailings, borehole cores and geological sample materials (rocks and minerals)
- Waste processing facilities.

The mentioned industries may generate NORM-waste such as: sludge, scales, sand, ashes, contaminated sand, uranium ore and tailings in addition to NORM-contaminated equipment and materials.

1.2. Question 2 (#30990)

Section H.2.5 states that the Geological Survey of Denmark and Greenland have initiated studies and modelling exercises for the siting of a radioactive waste repository, which will be reported on in 2021. Can Denmark and Greenland please provide an update on this report and how it will form the basis of stakeholder involvement for the siting locations?

Answer

The report was finalised and made public in January 2022. The report (9 vols.) is available on the website of Geological Survey of Denmark and Greenland (<https://www.geus.dk/om-geus/nyheder/nyhedsarkiv/2022/jan/evaluering>). An English translation of the summarising Vol. 9, Characterisation and evaluation of geological properties and conditions at 500 meters depth, will be available in late 2022. The report was presented on 7 February 2022 to the contact fora (one national, one regional) that have been established to facilitate dialogue with main stakeholders. Later in 2022, the report will be presented in depth to municipal authorities and local communities as part of a dialogue process to form a partnership on the siting of further geological investigations from 2023 onwards.

1.3. Question 3 (#30991)

Can Greenland provide details on when the executive order detailing responsibilities for registrants and licensees will be incorporated into its regulatory framework? How are international best practices being incorporated? Are there opportunities for stakeholder involvement in the development of this executive order?

Answer

The project is still in progress. Greenland will seek advice from the Danish Health Authority, Radiation Protection (DHARP) to ensure international best practices being incorporated. The few stakeholders are already involved. The magnitude of the task is limited. There are a very limited number of applications involving use of ionising radiation. The health care sector has a limited number of x-ray machines and scanners. Only a couple of other sectors have this kind of equipment. Our work so far has shown that there is a very limited number of radioactive sources, for instance a minor amount of unsealed and sealed radioactive sources used in the educational sector and some ionizing smoke detectors. In practice, we have already a good overview of what is present in the country.

1.4. Question 4 (#30992)

A country commends Greenland's initiatives to establishing an autonomous management system for radioactive waste and regulatory framework initiatives.

Answer

Work is in progress to ensure that unused radioactive sources in the educational sector will be managed according to international best practice. The plan is to establish a storage facility in Nuuk. Due to the very limited amounts of radioactive waste, final disposal in Greenland may not be a realistic solution.

1.5. Question 5 (#30689)

Report stated that a system for the storage of radioactive waste generated in the educational sector and from industry is under development according to the Radiation Protection Act.

It is not clear whether the radioactive waste from industry and education sector is stored in the licensed storage facility or is it under the development?

Answer

It is still under development. Waste from the education sector is still stored in the schools etc. We are at present not aware of any radioactive waste elsewhere in Greenland. Our research has not identified any industries using radioactive sources.

1.6. Question 6 (#30683)

Should a nuclear or a radiological accident occur near Greenland territory, the Danish, Emergency Management Authority may accord assistance. The Danish Emergency Management Authority has a revised nationwide nuclear emergency preparedness plan, which entered into force in 2014.

Answer

The Danish Emergency Management Authority (DEMA) prepares the national nuclear contingency plan, which concerns the tasks and capacities of the Danish and Greenlandic authorities as well as coordination in the event of nuclear accidents and incidents that cannot be handled within the individual authorities' own daily contingency.

The plan may also apply to radiological events. The nuclear contingency plan must according to provision in the Emergency Management Act be revised at least every four years. The latest version was issued in 2018, but has undergone a minor revision in 2021. The plan will be revised in 2022. Greenland participated in an exercise arranged by the DEMA.

1.7. Question 7 (#29835)

Could Denmark please describe in general the major waste streams from the decommissioning of the Hot Cell Facility and what amounts of waste have been generated?

Answer

The major waste streams from decommissioning of the Hot Cell Facility are by far steel (164 tons) and concrete (98 tons). In comparison all other minor waste streams sums up to 22 tons. From the remaining decommissioning of the Hot Cell Facility it is expected that the major waste streams will continue to be steel and concrete.

1.8. Question 8 (#29836)

"The original decommissioning plan for the Hot Cell Facility was to decommission the Hot Cells Facility, preserve building and release the facility from regulatory control, hence, to Green Field.

How does the regulator handle the end state changing throughout the decommissioning process?"

Answer

The designated end state for the decommissioning of the Hot Cell Facility remains the same - green field. However, the findings during decommissioning has demonstrated that to achieve this result, further decommissioning tasks than was originally planned, are required. The decommissioning and operation of the nuclear facilities at the Risø Site shall be according to the Operational Limits and Conditions for Danish Decommissioning (BfDA) issued by the Nuclear Regulatory Authorities.

Chapter 2 in the BfDA stipulates the framework for decommissioning of the nuclear facilities. As such it is required that DD prepare an overall plan for decommissioning of the nuclear facilities at the Risø site (decommissioning plan). The overall plan must be approved by the Nuclear Regulatory Authorities.

Prior to decommissioning of a facility, a project description must be prepared and submitted to the Nuclear Regulatory Authorities for approval. Experiences from previous decommissioning projects must be included in the preparation of a new project description. The complexity of the project may even require that subproject descriptions are prepared and submitted to the Nuclear Regulatory Authorities for approval.

For each identified decommissioning action, in an individual project or subproject, the project management must ensure that detailed work plans are developed.

The decommissioning of a nuclear facility is finally documented in a final decommissioning report and a clearance report according to the requirements given in BfDA (Chapter 14).

For all of the above mentioned documents it is required that these must be updated if significant changes are planned for the decommissioning of the nuclear facilities at the Risø Site, and the documents must be resubmitted to the Nuclear Regulatory Authorities for approval.

The Nuclear Regulatory Authorities maintain close contact with the operator. Due to the change of decommissioning strategy for the Hot Cell Facility the Nuclear Regulatory Authorities awaits an updated project description, specifying actions to accommodate the change of decommissioning strategy.

1.9. Question 9 (#29837)

The report states that there are three regulatory authorities in Denmark who share the responsibility in terms of nuclear regulation and radiation protection. Could Denmark please explain which Authority is responsible for radiation protection, and if the responsibility for radiation protection from nuclear and natural sources of radioactivity fall under the same authority?

Answer

The national framework for radiation protection and safety is based on The Radiation Protection Act. The act empowers the Danish Health Authority (DHA) with all regulatory core functions, also in relation to radiation protection from nuclear and natural sources.

1.10. Question 10 (#29838)

The report states that the national nuclear contingency plan entered into force in 2018. Could Denmark please explain how the emergency plan is being tested, and at what frequency?

Answer

The National Nuclear Contingency Plan is tested by conducting "dilemma exercises", where the relevant sector responsible authorities test preparedness with regard to competencies, capacities, implementation of countermeasures, communication and coordination on the basis of simulated incidents / scenarios. "Dilemma exercises" are conducted approximately every two years - supplemented by meetings with thematic review of individual areas.

1.11. Question 11 (#29839)

Could Denmark please explain if there exists a sealed source register, and list its inventory?

Answer

The Danish Health Authority regulates all use of radioactive substances according to Executive Order no. 670/2019. The use of sealed radioactive sources (including import) is subject to licensing from or notification to the Danish Health Authority according to the limits of activity specified in Annex 1 in the before mentioned Executive Order, hence the Danish Health Authority have a central register of sealed radioactive sources in use.

Sealed radioactive sources are categorised according to the activity criteria given in Executive Order no. 670/2019, chapter 12 and annex 6.

Below is an overview of the number sealed radioactive sources in each category, in use as of February 15 2022:

- Security category A: 383¹⁾
- Security category B: 85
- Security category C: 30
- Uncategorized²⁾ sealed sources: 1898

¹⁾ Category A sources are mainly used in irradiation facilities.

²⁾ Sealed sources with activity lower than the lower activity limit for category C.

Disused sealed radioactive sources are either returned to the manufacturer or transferred to the national waste management organisation, Danish Decommissioning. Upon transfer to Danish Decommissioning, sealed radioactive sources are included in the waste management database as part of the national inventory of radioactive waste.

1.12. Question 12 (#28085)

Which organization is responsible for record keeping during and following decommissioning?

Answer

Licensees subject to the requirements for dose monitoring (cf. Executive Order 669/2019) must report results of dose monitoring to the Danish Health Authority's Personal Dose Registry (SRP). SRP is in turn according to Executive Order 669/2019, § 88 required to retain the data for the duration of the work period in which the worker is exposed to radiation, and afterwards until they have or would have attained the age of 75 years, but in any case not less than 30 years after termination of the work involving exposure.

1.13. Question 13 (#28086)

The text (for Greenland) makes reference to limits and constraints for members of the public. Are there plans to consider the potential impacts on non-human species/the environment in addition?

Answer

There are at present no plans to consider the potential impacts on non-human species/the environment. At present, there are no sources with a large potential to affect non-human species/the environment. The Greenlandic zero tolerance policy to uranium is likely to stop development of any major radioactive sources within the next few years.

1.14. Question 14 (#28087)

Has the benefit of assessing if sealed sources could or should be returned to the country of origin, instead of storage or permanent disposal, been considered?

Answer

Greenland will under all circumstances need a temporary storage facility to ensure safety of sealed radioactive sources prior to potential transport out of the country. See also response to Question 30992.

1.15. Question 15 (#28088)

There is no list of storage storage facilities for radioactive waste for Greenland.

Answer

The planned storage facility for radioactive waste for Greenland has not yet been established.

1.16. Question 16 (#25529)

Section B.2. "Management policies and practices of spent fuel and radioactive waste at Risoe site" indicates that "Radioactive waste produced as a result of activities in oil and gas industries, as a byproduct of geothermal heat generation, at water treatment plants etc. are subject to the same regulatory regime as specified above. Radioactive waste from these activities is stored at facilities operated by the waste-generators, awaiting development of a final management solution for these types of radioactive waste". What could be an appropriate long term management solution for this type of waste and how this is addressed in the national policy / strategy of the country?

Answer

Parliamentary resolution B90/2018 holds provisions for the long term management, including disposal, of radioactive waste from decommissioning of the nuclear facilities at the Risø Site as well as institutional waste transferred to Danish Decommissioning. While Parliamentary resolution B90/2018 includes the option for including NORM waste from the oil and gas industries in a disposal solution, no special provisions for the management of these types of waste up to disposal have been defined.

1.17. Question 17 (#24387)

"In order to address the challenges identified at the previous review meeting, Greenland has initiated work to establish ""a well-defined regulatory infrastructure for radioactive waste management in Greenland with clear allocation of mandate and responsibilities and provisions to ensure necessary expertise.""

""The National Board of Health was in January 2020 appointed as the Greenlandic authority on radiation protection in close cooperation with the Ministry of Health, All initiatives are now coordinated by the National Board of Health. The necessary staff to start the processes have now been employed.

A plan and priority of initiatives has been developed.

Initially, advanced technical expertise is expected to be hired outside Greenland. General advice is obtained from the Danish radiation protection agency under the Danish Health Authority.""

What is the organizational structure and the staffing of the NBH and how many staff are dedicated to the safe management of radioactive waste?"

Answer

The organizational structure of the NBH is simple. There are at present a staff of three academics including the chief medical officer. These three academics take care of all tasks in NBH. The office has been fully responsible for COVID-19 management in Greenland for more than two years, which have had a negative influence on progress of other tasks.

1.18. Question 18 (#24388)

In order to address the challenges identified at the previous review meeting, Greenland has initiated "drafting executive orders and implementation provisions for radiation protection."

"The Ministry of Health is drafting the executive order: "Self-Government Executive Order on dose limits for ionizing radiation" under the Radiation Protection Act. The executive order sets threshold values for annual dose limits for occupational and members of the public from use and exposure to ionizing radiation. The executive order is still under development. It is expected that the executive order will enter into force at the end of 2021.

The Danish Working Environment Authority (WEA) is drafting a new executive order regarding ionizing radiation and the working environment in Greenland. The executive order is prepared in collaboration with the Greenland Self-Government. The scope of the order will include occupational health and safety issues associated with exposure to ionizing radiation. Requirements of the order, which may have a direct effect on health and safety (such as adherence to dose limits), will apply to both employees and self-employed. On a more general note, the provisions will stipulate requirements, such as avoiding unnecessary exposure to radiation, drafting a workplace assessment, and prohibiting employment of persons under 18 years of age in work with ionizing radiation. Dose limits will be set to ensure human health and safety. Methods of evaluation and calculation of radiation exposure will be based on international approved standards and on the system applied in Denmark. Work with ionizing radiation must only be carried out by trained personnel. To ensure minimum risk of exposure, health examinations must be carried out regularly. Occupational monitoring will be required. The executive order is under development. It is expected that the executive order will enter into force at the end of 2021."

Have these orders been published and, if not, what is the current timeline for their publication. When will they enter into force?

Answer

The executive order is still under development.

1.19. Question 19 (#24389)

"In order to address the challenges identified at the previous review meeting, Greenland has initiated "Drafting guidelines for the Safe Management of Radioactive Waste generated from the mineral and hydrocarbons industries in Greenland."

"DCE has prepared recommendations for guidelines for the Safe Management of Radioactive Waste generated from the mineral and hydrocarbons industries in Greenland for EAMRA. The recommendations for guidelines provide safety requirements and guidance to ensure the safe management of waste containing naturally occurring radioactive materials (NORM) and technologically enhanced naturally occurring radioactive material (TENORM) generated from the mineral and hydrocarbons industries in Greenland. The recommendations for guidelines include requirements for all phases of

the waste facility, such as site selection, site assessment, site design and preparation, construction, operation, closure, site release from licensing, and long-term stewardship.

The recommendations for guidelines supplement the Mineral Resources Act and Guidelines for preparing an Environmental Impact Assessment (EIA) report for mineral exploitation in Greenland. These recommendations for guidelines are based on the most recent international standards and recommendations by the International Commission on Radiological Protection (ICRP), (Council Directive 2013/59/EURATOM, Council Directive 2011/70/EURATOM), and the International Atomic Energy Agency (IAEA). So far, independent senior experts from Canada and EAMRA have reviewed the recommendations for guidelines. Relevant experts in Greenland will further review the recommendations for guidelines before the expected publishing at the end of 2021."

Have the recommendations been published? If not, what is the current timeline for such publication?"

Answer

The guidelines for the Safe Management of Radioactive Waste generated from the mineral and hydrocarbons industries in Greenland have not yet been published.

1.20. Question 20 (#24390)

"In order to address the challenges identified at the previous review meeting, Greenland has initiated work in the following areas:

"4. Development and implementation of a system for the registration of radioactive sources, including radioactive waste.

5. Development of a system for management of radioactive waste generated from the industrial and educational sectors.

6. Development of a tracking system for sealed sources.

7. Procedures for dealing with an orphan source."

"A system for online registration of radioactive waste has been developed and is expected to be implemented during 2021. In the meantime, The National Board of Health has begun registration of ionizing sources in Greenland."

"the National Board of Health in Greenland plans to store radioactive waste such as sealed sources (e.g., Am-241 sources taken out of the smoke detectors, sources incorporated in measuring instruments) in a storage facility. It should be underlined that the volume/quantity, the number of waste types, and the activity of the stored waste are very low. Additional assessments will be performed before a decision for the need of a

permanent disposal facility or implementation of alternative solutions, including options for export to Denmark under a Danish-Greenlandic agreement, can be made."

"The Ministry of Health is working in close collaboration with Arctic region experts to develop and implement procedures for dealing with an orphan source."

What is the current status of these actions ? Is the process to come to a decision on the need for a permanent disposal facility clear for all parties involved?"

Answer

The possibility of establishing a permanent disposal facility is still seen as an unlikely solution due to the very limited amount of radioactive waste identified in Greenland. No decisions have been made so far in relation to this or other issues raised in the question. See also response to Question 24387.

1.21. Question 21 (#24391)

"The challenges identified at the previous review meeting were on:

- "- Public acceptance regarding the long-term storage facility at the Risoe site, Denmark
- Adjustment of Denmark's waste management infrastructure and design of all relevant aspects of the strategy to accommodate policy on long-term storage and disposal by latest 2073."

"The main developments since the Sixth Review Meeting centre around the adoption of a new policy for achieving a final national management solution for radioactive waste in Denmark and the continued progress in decommissioning activities".

Answer

The comments are acknowledged. The challenges identified at the previous review meeting are summarised correctly.

1.22. Question 22 (#24392)

"The Hot Cell Facility was in active use in the years from 1964 to 1989. The facility consists of 6 interconnected concrete hot cells."

"As a result of the cutting and destructive testing of irradiated fuel and other irradiated materials, dust containing fission and activation products have been released within the cells. Hence, Sr-90 and Cs-137 as well as a number of transuranic α -emitters were still present in the cells as dust settled on workbenches and other surfaces. Also, hot spots on workbenches and floors occur due to the work with Co-60 radiotherapy

sources, here a number of Co pellets were dropped, and not retrieved." Remote controlled blasting has been used to decontaminate the interiors of the hot cells and effectiveness of this method is summarized in table 7. Hot cell 5 results show that decontamination was a lot less effective than in the other cells. Is there any specificities that can explain these differences ?"

Answer

In Hot Cell no. 5 there is a hot spot stuck at the edge of the table, effectively in the middle of the cell. The dose rate from this hot spot contributes to higher dose rate measurements in the rest of the cell and results in a high average dose rate in this cell. This is considered to be the reason that the effectiveness of the decontamination seems less effective in Hot Cell no. 5.

1.23. Question 23 (#24393)

"The original decommissioning plan for the Hot Cell Facility was to decommission the Hot Cells Facility, preserve building and release the facility from regulatory control, hence to Green Field.

To evaluate whether or not this is a realistic goal, a study was made in 2019. The study showed that especially due to the imbedded pipes and cables (Figure 28), there is too considerable a risk that this will not be possible or be very time consuming. Because of the result of the study, the decision of not to preserve the facility has been made. This means that the entire cell range will be dismantled totally and an attempt to free release as much concrete as possible will be made."

With regard to the Fuel Fabrication Plant, "The planned work, milling of 6 cm of concrete from the basement floor, has not yet been carried out, in the anticipation that the floor might be releasable without further actions under the provisions of the new radiation protection act from 2018. However, in September 2018 the Nuclear Regulatory Authorities rejected the application for the release of the contaminated basement floor.

Hence, the top 6 cm of the basement floor is to be removed. The task is difficult, both technically and with regard to work-environment safety due to the limited space. "

What lessons learned can be drawn for these cases for the decommissioning strategy for other facilities of where significant contamination may exist?"

Answer

The lessons learned from these two cases are, that assumptions made in the early stages of decommissioning planning also needs ongoing verification in the early stages as the decommissioning progress. If you wait with this verification and the assumption turns out to be wrong, it can result in major strategy changes later in the project, often with a high impact on the projects finishing dates and increased use of resources.

Assumptions, which later on during the decommissioning turn, out not to be valid can also result in wasted work or missed strategic opportunities. This is the case in the Hot Cell project, where a lot of the decommissioning work would have been easier and faster with an earlier decision to dismantle the entire cell range. Regarding the Fuel Fabrication Plant it turned out that the interpretation of the exceptions in the legislation changed over time.

1.24. Question 24 (#24394)

"In accordance with The Nuclear Installations Act (with later repeals and amendments), the regulatory oversight with the nuclear facilities at Risoe, lies with the Nuclear Regulatory Authorities. The Danish Health Authority and the Danish Emergency Management Agency jointly constitute the Nuclear Regulatory Authorities. The two authorities jointly carry out regulatory activities in accordance with their respective areas of authority, i.e. technical nuclear safety and radiation protection. In practical terms, activities conducted

in relation to decommissioning and waste management fall under the jurisdiction of The Radiation Protection Act, as they concern radiation protection and safety. Hence, all inspectional, licensing and other regulatory activities are conducted with reference to this act and pursuant executive orders."

In practice, how is coordination between DHA and DEMA ensured and what is the actual role of DEMA in oversight ?"

Answer

The coordination is ensured by close contact via email, telephone calls and physical meetings between all relevant staff and management at DHA and DEMA. The Nuclear Regulatory Authorities carry a joint responsibility for the overall inspections and regulation of the new and operating facilities. DEMA has a special focus on the nuclear safety and security of the facilities while DHA addresses matters regarding security of radioactive sources as well as radiation protection and safety. Most requirements following inspections are by mutual agreement based on the demands in The Radiation Protection Act, and a number of the demands could (as well) be issued according to The Nuclear Installations Act.

1.25. Question 25 (#24395)

"There are legislative provisions for the funding of the regulatory authorities. The Finance Act, fee and revenue provide funding as detailed below. Apart from the broad specifications in the annual Finance Act there are no detailed provisions to ensure that the regulatory authorities is assured relevant competences and resources corresponding to the obligations given to the regulatory body by law."

Is this system satisfactory, in principle and in practice, as it seems that each year may be challenging the adequacy of the regulator's resources?"

Answer

Concerning financial resources for regulatory activities related to decommissioning and radioactive waste: DHA is financed through § 16 of The Finance Act, dedicated for this purpose. Moreover, The Radiation Protection Act, § 24 authorize the Minister of Health to lay down rules regarding fees payable for DHA's inspection, advisory and assistance duties in accordance with the act and rules pursuant thereto. Finally, Executive Order no. 1111 of 7 November 2019 on Fees for the Danish Health Authority, provides funding for regulatory oversight with i.e. radioactive waste management conducted by undertakings in general.

The budget of the DHA is determined at the annual negotiation of The Finance Act as well as by fee and revenue-covered business. The budget is stable over years and on this background, DHA has the number of qualified and competent staff members, which DHA finds sufficient.

As for DEMA (agency under the Danish Ministry of Defence), the agency's total grants are allocated through the Finance Act, as the framework for this usually follows from multi-year political agreements usually between a broad majority of parties in/members of the Parliament.

DEMA's work as Nuclear Regulatory Authority only forms part of DEMA's authority tasks, but within DEMA, appropriations are organized with due regard for "mandatory" tasks - for example tasks such as Nuclear Regulatory Authority.

Overall, the Nuclear Regulatory Authorities has so far found the current system for allocating appropriations satisfactory both in principle and in practice.

1.26. Question 26 (#24396)

"For Danish Decommissioning, ""the availability of adequate financial resources is also assured, inasmuch as the organization is subordinate to the Ministry of Higher Education and Science. Thus, the financial provisions to support the safety of facilities for radioactive waste management are in place.""

What mechanism are in place to ensure that adequate funding will remain available in the hypothesis that the budget allocated to the Ministry is cut?"

Answer

Denmark fully acknowledges the obligations posed by Article 22 of the Joint Convention. The following facts of the financing of Danish Decommissioning can be offered:

1. Support for ensuring the continuing operations of Danish Decommissioning is enshrined in two, unanimously adopted, Parliamentary Resolutions in 2003 and 2018.
2. Reserve funds have been established under the Financial Act to secure the execution of operations by Danish Decommissioning.
3. The annual budget of Danish Decommissioning (in 2022: 66.4 million DKK) amounts to 1.024 per mille of the total budget of the Ministry of Higher Education and Science (in 2022: 63.7 billion DKK).

1.27. Question 27 (#24397)

"The political negotiations were concluded in May 2018 with the unanimous adoption by Danish Parliament of Parliamentary Resolution B90 of 15 May 2018." "Parliamentary Resolution B90 stipulates the national policy for management and disposal of spent research fuel and radioactive waste."

"The realisation of the goals in the national policy will be elaborated further in a strategy (programme) for implementing the policy as required under the articles of Council Directive 2011/70/EURATOM. The updated strategy will be established according to the relevant parts of the body of IAEA standards as well as in accordance with the articles of Joint convention on the safety of spent fuel management and on the safety of radioactive waste management Council Directive 2011/70/EURATOM, and is foreseen to enter into force by January 2021."

Has this policy been adopted and made public? If yes, what are the main principles, actions and milestones included?"

Answer

Yes, the policy has been fully adopted and further elaborated in National Programme for the Responsible and Safe Management of Radioactive Waste of December 2020. The national programme is publicly available on the website of Danish Health Authority (<https://sst.dk/-/media/Udgivelser/2021/Nationalt-program---radioaktivt-affald/National-Programme-Denmark-2020-Council-Directive-2011-70-EURATOM.ashx>).

The main principles are:

1. Denmark takes ultimate responsibility for management of the radioactive waste generated in the country.
2. The implementation of waste management measures applies a graded approach to ensure that the necessary level of analysis, documentation and actions are carried out in relation to the magnitudes of any radiological and non-radiological hazards.
3. The interdependencies between different steps in spent fuel and radioactive waste management are taken into account.

4. The generation of radioactive waste shall be kept to a minimum by means of appropriate design and operation practices.
5. Radioactive waste shall be safely managed for as long as it represents a risk to man and the environment.
6. The costs of the management of radioactive waste shall be borne by those who generate the radioactive waste.
7. The health effects of radioactive waste on future generations as a result of the long-term solution must not exceed current acceptable levels.
8. The long-term solution must allow for an implementation process that involves and creates dialogue with central stakeholders during the localisation, establishing, and operation of a disposal solution.

The main actions include:

1. Waste Management:

- Facilities upgrade (storage facility)
- Probing for international solution (for the so-called ""special waste"", or experimentally irradiated spent fuel)
- Storage, predisposal and disposal.

4. Geology and Siting:

- Review of geological data
- Site selection for further investigation
- Site investigation.

5. Disposal Solution:

- Development of a disposal facility concept
- Safety demonstration of a disposal facility
- Environmental Impact Assessment + Safety Case of a disposal facility
- Construction of a disposal facility
- Operation of a disposal facility
- Closure of a disposal facility.

6. Organisational Framework:

- Clear division of tasks and mandates between authorities
- Development of technical and socio-economic competences of operators and authorities
- Mechanisms to maintain communication and cooperation between operators, authorities and decisionmakers.

7. Stakeholder Engagement:

- Effective processes of statutory public consultation
- Continuation and adaptation of the contact forum instrument
- Dialogue forum and communications resource on the site of the disposal facility
- Operation of a communications platform to provide open access to all documents relating to the national programme
- Provision of a contact person-function to enable one-stop access to information.

8. Finance and Costing:

- Costing and financing of waste management
- Costing and financing of geological investigations
- Costing and financing of disposal solution.

Milestones are divided into short term, mid term and long term on a time line running from 2023 to 2073 in acknowledgement of the objective of Parliamentary Resolution B90 that a disposal facility must have entered into operation by no later than 2073.

In the short term phase, the focus is mainly on the construction of an upgraded storage facility and associated waste management facilities – and transfer of the waste from existing storage facilities to the upgraded storage facility. In this phase, the initial geological site investigations are commenced. Short and mid-term storage and predisposal activities mainly involves characterisation and reassessment of the waste inventory in order to identify options for e.g. sorting, segregation, decay storage, volume reduction and reprocessing in a manner that ensures that further waste management as well as implementation of a disposal solution remains possible. Lastly, the outcome of the short to mid term probing for an international solution for the so-called “special waste” is crucial for the final design of the disposal solution. The “special waste” constitutes a limited fraction of the radioactive waste in terms of mass and volume, but accounts for a significant proportion of the long lived activity in the combined inventory, and therefore places critical constraints on predisposal management and disposal options."

1.28. Question 28 (#24398)

"The Parliamentary Resolution B90 ""includes further exploration of the feasibility of concluding an agreement with another EU Member State or third country regarding disposal of the experimentally irradiated spent fuel fraction included in Denmark's waste inventory. The task is delegated to the Ministry of Foreign Affairs, which has not yet been able to report any progress in the matter for the period covered by this report."

As there been any progress since the National Report was submitted?"

Answer

In February 2022, the Ministry of Foreign Affairs has reported that no progress has been achieved in the matter.

1.29. Question 29 (#21240)

The report states that in January 2021 updated radioactive waste management strategy shall be in force. Could you elaborate on the key differences in comparison to the latter strategy?

Answer

The new strategy was adopted in December 2020, and is based on the provisions of Parliamentary Resolution B90/2018, which defined an updated goal for long term management of radioactive waste in Denmark. According to Parliamentary Resolution B90/2018, radioactive waste is to be stored for a period of up to 50 years, pending the implementation of a disposal solution for this waste. The previous strategy was based on the provisions of Parliamentary Resolution B48/2003, envisaging a disposal facility in operation by the time when decommissioning of the nuclear facilities at the Risø Site is completed. Further details of the updated strategy are provided in the response to question 24397.

1.30. Question 30 (#20062)

Could you please briefly describe the principal geological studies that will be conducted to identify candidate sites and then select one of them to construct a deep geological disposal facility for RW?

Answer

Briefly, the principal geological studies will consist of:

- Seismic mapping of spatial extent of the host rock and the effective containment zone (ECZ)
- Site investigations to approx. 500 m below surface to establish geological properties
- Laboratory analyses and modelling.

Site evaluation will be performed using the following geological criteria:

1. Properties of the host rock and the containment zone:
 - 1.1. Spatial extent
 - 1.2. Hydraulic barrier effectiveness
 - 1.3. Geochemical conditions for retardation
 - 1.4. Release pathways.
2. Long-term natural stability:
 - 2.1. Stability of the site and rock properties
 - 2.2. Erosion
 - 2.3. Repository induced influences.

3. Geotechnical feasibility
 - 3.1. Rock mechanical properties and conditions
 - 3.2. Underground access and drainage.
4. Possibility to acquire reliable new geological data:
 - 4.1. Ease of characterisation of the rock
 - 4.2. Explorability of spatial conditions
 - 4.3. Predictability of long-term changes.

For details see <https://www.geus.dk/Media/637781282588847388/Report%201.pdf>

1.31. Question 31 (#19268)

What are the lessons learned following feedback from the local contact forum that has been established in Roskilde Municipality? What are, in the view of the Danish Health Authority, the necessary steps that a “proactive dialogue with local authorities” needs to include in order to create a relationship of mutual trust between regulatory authorities and/or future operators of radioactive waste repositories on the one hand and the population affected by these repositories on the other hand?

Answer

The feedback of the contact forum in Roskilde Municipality has been favourable. Since the launch of the contact forum in 2019, dialogue has been constructive and inclusive in the sense that local participation in the preparation and planning of a new upgraded storage facility on the Risø site has resulted in a shared horizon of challenges and solutions, taking into account the diversity of interests. The participation of members of the Municipal Assembly, local NGOs and neighbouring local communities has been consistent and conducive to discussions. The collaboration between Municipal Authorities and Danish Decommissioning is taking place in a climate of mutual sharing of information and open discussion of planning and compliance issues. Records of the contact forum in Roskilde Municipality are accessible (in Danish only) on the website of Ministry of Higher Education and Science, cf. link (<https://ufm.dk/aktuelt/temaer/deponering-af-radioaktivt-affald-i-dk/kontaktforum-roskilde>)

The Danish Health Authority (DHA) does not participate in meetings of the contact forum on a regular basis, in order not to cause uncertainty about the effective independence of the authority. However, the DHA remains available at any time for such participation, should the need to clarify the position of the authority in any particular matter arise. Such participation has taken place on several occasions.

For the further development and maintenance of confidence, the systematic and independent review and statement of opinions by the DHA – also in communication with the public – in relation to the future development of a disposal facility, will play an important role.

1.32. Question 32 (#17105)

The Greenland report indicates that the licensee is responsible for environmental monitoring of naturally occurring radioactive materials mining/milling sites for a number of years after closure. Please elaborate on the long-term care and maintenance requirements and responsibilities for uranium mill tailings after the completion of decommissioning, as the tailings can remain radioactive/hazardous for many centuries.

Answer

The Greenlandic zero tolerance policy to uranium is likely to stop development of any major radioactive sources within the next few years. The Kuannersuit project near Narsaq in Southern Greenland has stopped. We have therefor also stopped the work defining long-term care and maintenance requirements and responsibilities for uranium mill tailings. It is at present not relevant.

1.33. Question 33 (#17106)

The Danish report addresses Parliamentary Resolution B90, adopted in 2018, which states that all radioactive waste generated from institutional use and decommissioning will be disposed of in a geological disposal facility. Does Resolution B90 allow other types of disposal (e.g., near-surface disposal) for radioactive waste that does not meet standards for clearance, such as very low-level waste? Please elaborate on any other management strategies other than geological disposal being considered for high-volume, low-activity waste.

Answer

Section VII of Parliamentary Resolution B90 (https://ufm.dk/en/newsroom/issues/radio-active-waste/english-material/english_translation_of_danish_parliament_resolution_b90.pdf), allows for other types of disposal than a geological disposal facility to be considered during the planning phase of a disposal facility. If an international solution can be found regarding the disposal of the experimentally irradiated spent fuel (aka "the special waste"), it is not precluded that other disposal strategies can be employed. Such strategies have been outlined in the prefeasibility studies of a disposal facility (2011), cf. <https://inis.iaea.org/collection/NCLCollectionStore/Public/42/086/42086372.pdf> (accessed 10 March 2022).

1.34. Question 34 (#17107)

The Greenland report notes that a system for registration and storage of radioactive waste is under development. Please provide additional details on the status of the storage facility. For example, has siting and design work been completed? What is the

planned storage capacity for the facility? Does the government of Greenland plan to levy fees on license holders who transfer waste to the facility?

Answer

The planned storage facility for radioactive waste for Greenland has not yet been established. We expect it will be placed in Nuuk. The required storage capacity for the facility will be very limited, taking the limited inventory in consideration. Levy fees have not been discussed until now. As the government finance, all education levy fees are unlikely to make sense as it will only move costs from one part of the government to another.

