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COUNCIL DIRECTIVE 2011/70/EURATOM FOR THE RESPONSIBLE AND SAFE MANAGEMENT OF SPENT FUEL AND RADIOACTIVE WASTE

Third report from Denmark

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Introduction

The bulk of radioactive waste in Denmark originates from the decommissioning of the former research reactors and supporting facilities at the Risø site close to Roskilde, where all nuclear facilities in Denmark are located. All former research reactors have been decommissioned entirely or are nearly at completion of decommissioning. Operation of the supporting facilities is restricted to “care and maintanence” and activities which support the ongoing decommissioning work.

Minimal amounts of experimentally irradiated spent fuel of power reactor type and fuel from one former research reactor (included in the term “special waste”) is stored under safe and secure conditions at the Risø site by the operator, Danish Decommissioning. Radioactive waste (including the “special waste”) stored at the facilities of Danish Decommissioning complies with the criteria for classification as Low Level Waste and Intermediate Level Waste.

Nuclear energy is not part of the Danish energy portfolio, and the limited annual production of radioactive waste from users of radioactive substances in research, industry and in the medical sector in Denmark is managed by Danish Decommissioning. NORM waste is managed and stored by the responsible licensees at their sites.

Danish Decommissioning is the operator responsible for decommissioning of the former research reactors and supporting facilities at the Risø site. Danish Decommissioning is also responsible for the safe and secure management of radioactive waste arising from the decommissioning activities as well as radioactive waste originating in the research, industrial and the medical sectors in Denmark. Danish Decommissioning refers to the Ministry of Higher Education and Science, which is the entity responsible for the implementation of the provisions provided in the national programme for responsible and safe management of radioactive waste.

The Danish Health Authority regulates all use of radioactive substances, including management of radioactive waste, in Denmark. For the regulatory oversight of the nuclear installations at the Risø site, The Danish Health Authority and the Nuclear Division of the Danish Emergency Management Agency constitute the Nuclear Regulatory Authorities, which refer to the Minister of Health.

The policy and practice for management of radioactive waste was up to 2015 governed by the Parliamentary Resolution B48/2003, which in May 2018 was supplemented by Parliamentary Resolution B90/2018 specifying long term storage for up to 50 years of all radioactive waste managed by Danish Decommissioning, at the Risø site, followed by disposal in a disposal facility that is to be in operation no later than 2073. The location of a future disposal facility is to be determined in a siting process. Further information on these events is given in Chapter 1.

This report was compiled by the Danish Health Authority for the Ministry of Health. The report is structured with reference to the guidelines prepared by ENSREG Working Group 2 on Member States reporting on Article 14.1 of Council Directive 2011/70/Euratom (2018). The information presented includes contributions from the Danish Emergency Management Agency, the Ministry of Higher Education and Science and Danish Decommissioning (DD).

1. Recent developments

Since the last reporting[1], the main efforts in implementing national policies for radioactive waste management in Denmark have centered on the continued decommissioning of the nuclear facilities at the Risø site, as specified in Parliamentary Resolution B48/2003 and planning and conduct of the measures necessary to establish an upgraded storage facility as specified in Parliamentary Resolution B90/2018.

The COVID-19 pandemic situation prompted decommissioning activities to be put on stand-by for most of the year 2020, but caused only minor delays in the planning for the upgraded storage facility.

1.1. Decommissioning of the nuclear facilities at the Risø site.

The decommissioning work at the Risoe site has apart from the delays in 2020 due to the COVID-19 pandemic situation, developed largely as anticipated for the reporting period, and has been centered on the decommissioning of the Hot Cell Facility, Danish Reactor 3 (DR 3), and the facilities of the Waste Management Plant. Section 2.2.1 provides more detail regarding completed as well as ongoing decommissioning works at the Risoe site.

1.2. Parliamentary Resolution B90/2018

In May 2018, the Danish parliament adopted resolution B90/2018 on a long-term solution for Denmark's radioactive waste, specifying long term storage for up to 50 years of all radioactive waste followed by geological disposal no later than 2073. The adopted Parliamentary Resolution B90/2018 on a long-term solution for Denmark's radioactive waste is available (in Danish) on the website of the Danish parliament[2], and a full-text version is available in English at the website of the Ministry of Higher Education and Science[3]. As part of the same resolution, the Government will continue to explore possibilities for an international solution for the disposal of parts of the intermediate level waste (the so-called "special waste"), either through export via a bilateral agreement or through Danish participation in an international disposal solution for long-lived radioactive waste.

Parliamentary Resolution B90/2018 followed a number of earlier adopted resolutions and agreements and their subsequent surveys and technical studies. An overview of these decisions, agreements and measures since 2003 is presented in Chapter 1 of the Danish

[1] Council Directive 2011/70/Euratom - Second report from Denmark
[2] Parliamentary decision B90/2018 (Danish)
[3] Parliamentary decision B90/2018 (English)

National Programme[4]. This framework served as the new political foundation upon which an updated National Programme for the responsible and safe management of radioactive waste was established. The updated National Programme was adopted in January 2021.

1.3. Adoption of updated National Programme

The contents of the National Programme was developed by a working group under the Ministry of Health and the Ministry of Higher Education and Science and was adopted by the Ministry of Health in January 2021.

The overall programme structure is described in Section 1.1 of the National Programme and is comprised by 3 technical and 3 socio-economic areas considered in Parliamentary Resolution B90/2018 and projected over a timescale ranging from the completion of the decommissioning of the nuclear facilities until commissioning of a geological disposal facility by 2073 at the latest. The timescale is divided into short, mid and long term periods, which provides the time frame for the course and completion of the main deliveries defined in the programme.

The technical areas are subdivided into “Waste Management”, “Geology & Siting” and “Disposal Solution” – whereas the socio-economic areas are subdivided into “Organisational Framework”, “Stakeholder Engagement” and “Finance and Costing”. The main areas are further divided into a number of variably interdependent deliveries, which take effect in the short term, mid term or long term, or extends over several terms.
As a consequence of the operational timespan of the programme, the exact timing (and in cases even sequence) of deliverables placed far into the future, is less constrained than delivery of short- to mid-tem objective taking effect within the next 5 to 10 years.

The short- to mid-term objectives defined in the National Programme are:

1) Construction of an upgraded storage facility based on reassessed radioactive waste inventory and associated predisposal management options – taking into account management options for the “special waste”.

2) Review and identification of geologies suitable for disposal down to 500m depth

3) Identify possible disposal concepts incl. feasibility and barrier system studies

4) Designation of most relevant sites for detailed studies based on the outcome of 1-3.

[4] National Programme for the Responsible and Safe Management of Radioactive Waste, Denmark 2020

1.4. New act on radiation protection

On February 6, 2018 a complete revision of Danish legislation in the area of radiation protection was finalized through the adoption of one new law on radiation protection and three new executive orders, replacing two laws (one on the use of radioactive substances and one on the use of X-rays), and in excess of 15 orders. The legal framework was further supplemented in 2019 by adoption of additionally updated versions of the executive orders. The full texts of the law and pursuant orders are available through links on the website of the Danish Health Authority[5]. The new law and orders were adopted as part of the implementation of the provisions of Council Directive 2013/59/Euratom into the Danish regulatory framework. Regulatory guidance on key subject matters has been published[6] and further guidance is under development.

The regulatory framework for safe and responsible management of radioactive waste was further strengthened by issuance of Circular no. 9654, 2020 on the tasks of the Danish Health Authority and the Danish Agency for Higher Education and Science concerning responsible and safe management of radioactive waste[7]. The circular delegates responsibilities and tasks in relation to the fulfilment of the requirements in Council Directive 2011/70/EURATOM, to the Danish Health Authority and the Danish Agency for Higher Education and Science - including the establishment of a national programme.

A circular on the revised tasks of Danish Decommissioning as subsidiary to the Danish Agency for Higher Education and Science is in preparation and expected to enter into force in the autumn of 2021.

Further details on the regulatory and legal framework for safe management of radioactive waste are presented in Chapter 4.

1.5. IAEA review missions to Denmark in 2021 and 2022

Denmark invited the IAEA to conduct full scope IRRS and ARTEMIS missions in the spring of 2020 in accordance with the requirements in Council Directives 2009/71/Euratom, article 9.3 regarding national framework and authorities for nuclear safety and 2011/70/Euratom, article 14.3 regarding the national framework, competent regulatory authority and national programme. However, due to the COVID-19 pandemic, the IRRS mission was postponed twice, and is now scheduled to take place from 30. August to 8. September, 2021. The ARTEMIS mission was correspondingly postponed and is now scheduled for 1. May to 9. May, 2022.

[5] Danish Health Authority, Radiation Protection, Legislation
[6] Danish Health Authority, Radiation Protection, Guidance
[7] Circular 9654

2. Scope and Inventory

Article 2 – Scope

1. This Directive shall apply to all stages of:
   - (a) spent fuel management when the spent fuel results from civilian activities;
   - (b) radioactive waste management, from generation to disposal, when the radioactive waste results from civilian activities.
2. This Directive shall not apply to:
   - (a) waste from extractive industries which may be radioactive and which falls within the scope of Directive 2006/21/EC;
   - (b) authorised releases.
3. Article 4(4) of this Directive shall not apply to:
   - (a) repatriation of disused sealed sources to a supplier or manufacturer;
   - (b) shipment of spent fuel of research reactors to a country where research reactor fuels are supplied or manufactured, taking into account applicable international agreements;
   - (c) the waste and spent fuel of the existing Krško nuclear power plant, when it concerns shipments between Slovenia and Croatia.
4. This Directive shall not affect the right of a Member State or an undertaking in that Member State to return radioactive waste after processing to its country of origin where:
   - (a) the radioactive waste is to be shipped to that Member State or undertaking for processing; or
   - (b) other material is to be shipped to that Member State or undertaking with the purpose of recovering the radioactive waste.

   This Directive shall not affect the right of a Member State or an undertaking in that Member State to which spent fuel is to be shipped for treatment or reprocessing to return to its country of origin radioactive waste recovered from the treatment or reprocessing operation, or an agreed equivalent.

Article 12 – Contents of national programmes

1. The national programmes shall set out how the Member States intend to implement their national policies referred to in Article 4 for the responsible and safe management of spent fuel and radioactive waste to secure the aims of this Directive, and shall include all of the following:

(…)

   - (c) an inventory of all spent fuel and radioactive waste and estimates for future quantities, including those from decommissioning, clearly indicating the location and amount of the radioactive waste and spent fuel in accordance with appropriate classification of the radioactive waste;

Article 14 – Reporting

(…)

2. On the basis of the Member States' reports, the Commission shall submit to the European Parliament and the Council the following:

(…)

   - (b) an inventory of radioactive waste and spent fuel present in the Community's territory and the future prospects.

2.1. Radioactive waste in Denmark

In accordance with Danish law, radioactive materials, including NORM (Naturally Occuring Radioactive Materials) without any foreseen use are to be considered as radioactive waste.

Radioactive waste in Denmark is presently stored by Danish Decommissioning and, in the case of NORM waste also by responsible licensees.

Classification of radioactive waste in Denmark is based on the IAEA Classification of 2009 (IAEA Safety Guide “Classification of Radioactive Waste”, GSG-1, 2009). The use of the category “Very Low Level Waste” (VLLW) may only take place after specific approval by the Nuclear Regulatory Authorities.

2.2. Waste generating activities

The bulk of radioactive waste in Denmark originates from the decommissioning of the former research reactors and supporting facilities at the Risø site, where all nuclear installations in Denmark are located. Comparatively minor quantities of radioactive waste are delivered to Danish Decommissioning from users of radioactive materials in Denmark, i.e. research institutions, hospitals, industries etc. Furthermore, routine maintenance and operational activities in the oil and gas-extractive industry result in an annual production of NORM waste, which is stored at the sites of the licensees.

2.2.1. Decommissioning of the nuclear facilities at the Risø site

The decommissioning of the two smaller research reactors (DR 1 and DR 2) at the Risø site was successfully completed in 2005 and in 2008, respectively. The decommissioning work at the Risø site is progressing, and currently emphasis is on the decommissioning of the one remaining research reactor - Danish Reactor 3 (DR 3), the Hot Cell Facility, the Fuel Fabrication Plant, and the facilities of the Waste Management Plant.

Main progress in decommissioning since 2018 fall within the following areas:

1) Decommissioning of Danish Reactor 3 (DR 3),

2) Decommissioning of the Hot Cell Facility,

3) Decommissioning and clearance measurement of the Fuel Fabrication Facility

4) Decommissioning of the facilities of the Waste Management Plant

Below, the current status is briefly summarised. Further details on the decommissioning activities at the Risø site are presented in the 7th national report from Denmark to the Joint Convention[8].

With respect to DR 3, the internal reactor parts have been finally dismantled, and demolition of the reactor block is now well under way.

At the Hot Cell Facility, the initial remote sandblasting and vacuum cleaning was completed, resulting in removal of 85 % of the total estimated activity. Removal of remaining contamination requires development of new equipment which is ongoing.

As for the Fuel Fabrication Facility, the last stage of decommissioning requires removal of low levels of uranium contamination identified on a concrete floor in a crawlspace. Due to the technical and work-environment safety challenges associated with working in the confined crawlspace, the work has been postponed until the current users of the building will vacate the premises (expectedly by the end of 2021). By that time removal of the floor structure overlying the crawlspace will facilitate easier acces to the crawlspace and hence, completion of the decommissioning of the Fuel Fabrication Facility.

Decommissioning plans for the facilities at the Waste Management Plant were approved by the Nuclear Regulatory Authorities in May 2019. In the approval it was specified that decommissioning of certain parts of the Waste Management Plant would require more detailed decommissioning plans. These plans are in development and require approval before the decommissioning may be initiated. Other parts of Waste Management Plant are not considered to be contaminated which is to be documented by radiological contamination surveys. Facilities at the Waste Management Plant, which are still essential for supporting decommissioning facilities, such as analytical laboratories and waste water treatment units, have been relocated in other buildings managed by Danish Decommissioning at the Risø site.

2.2.2. Radioactive waste from institutional users

Institutional users of radioactive materials in Denmark (i.e. hospitals, industries, research institutions etc.) are required to transfer all non-dischargeable types of radioactive waste within one year of generation of the waste. This ensures a continuous flow of transferred radioactive waste to Danish Decommissioning and prevents accumulation of radioactive waste at local sites. Institutional users of radioactive materials delivered up to 10 tons LLW and disused sealed sources per year to Danish Decommissioning. In 2018 Danish Decommissioing received from external users 10.0 tons of solid waste including 6.6 tons of smoke detectors and 753 litres of liquid waste. In 2019 2.5 tons of solid waste (incl. 1.5 tons of smoke detectors) and 287 litres of liquid waste were received, and for 2020 the amounts received were 6.0 tons of solid waste (incl 2.4 tons of smoke detectors) and 419 litres of liquid waste.

[8] Joint Convention – 7th National Report from Denmark

While production of radioactive waste from institutional use over the past decade or so has proven relatively constant, the increase in the number of cyclotron facilities installed at research and treatment centres poses a potential source of radioactive waste, once the shielding of such bunker-type facilities is decommissioned. The total number of cyclotron facilities currently in operation is five, and the number of planned facilities is two. Preliminary studies indicate that decommissioning may generate substantial volumes of concrete and steel with overall low activity concentrations enabling storage and decay as a possible waste management route. The specific characteristics of this potential waste stream are still subject to study, and will be included in future projections for generation of radioactive waste, taking inter alia the expected lifespans of cyclotron facilities into consideration.

2.2.3. NORM waste from offshore oil and gas industries

The bulk of NORM waste originates from the offshore oil and gas industry and is stored at licensee sites. The combined amount of NORM waste at these locations is approximately 600 tons. The annual production of NORM waste from the oil and gas industry in the reporting period has thus been in the order of 50 tons per year.

2.3. Inventory

The expected total inventory of radioactive waste intended for disposal as a result of decommissioining of the nuclear facilities at the Risø site was estimated in 2008 to 5000 – 10.000 m^3, depending on the final choice for long term management of NORM waste stored at Danish Decommissiong (see below). Management and disposal options for NORM waste were not included in this estimate.

Since then, updates in decommissiong plans for the nuclear facilities at the Risø site have prompted revised estimates of the volume required for long term storage, such that the currently anticipated requirement for storage volume in the upgraded storage facility amounts to ca. 15.000 m^3 waste conditioned for storage – including both institutional waste and decommissioning waste. The storage facility will be constructed with a storage capacity of 15.000 m^3 allowing for an added 25% storage capacity for potential future waste arisings as well as a possibility for future further expansion of the storage capacity. In addition, approximately 2500 m^3 uranium ore, 900 m^3 concrete embedded tailings and 114 m^3 NORM material which is currently managed by Danish Decommissioning will be accommodated in a separate storage building at the Risø site.

2.3.1. Radioactive waste managed by Danish Decommissioning

The low and intermediate level radioactive waste managed by Danish Decommissioning is stored in various storage facilities at the Risø site. Inventories of radioactive waste are given in the Table 1 and Table 2 with reference to storage facility, volume or mass and activity stored.

2.3.2. Special waste

There are no spent fuel management facilities in Denmark. The “special waste” comprises minor amounts of spent fuel consisting of the liquid core of a former research reactor DR 1, and well as experimentally produced and irradiated power type fuel and associated tubing. The latter was subject to post-irradiation physical and mechanical testing and examination and was cut up and disaggregated in the process. The “special waste” is stored under safe and secure conditions at the storage facilities for radioactive waste at Danish Decommissioning. No precautions for heat dissipation are necessary for these materials. Based on these properties and nuclide activity concentrations, the “special waste” is designated as ILW.

The activity of spent fuel from DR 1 reported here includes the fission product isotopes ^{137}Cs and ^{90}Sr and actinides ^{239}Pu and ^{240}Pu with correction for decay until January 2021. The activity of experimentally produced and irradiated spent fuel of power reactor type was calculated using Safeguard records and burnup scaling factors with decay correction to January 2021. Fission product isotopes include ^{137}Cs, ^{90}Sr, ^{151}Eu and ^{154}Eu and actinide isotopes include: ^{235}U, ^{236}U, ^{237}Np, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu, and ^{241}Am. The calculation of actinides has been updated to take into account the transformation of ^{241}Pu to ^{241}Am.

An inventory of the stored special waste is given in Table 1.

Waste designation	Storage facility	Material	Mass/ Volume	Activity
DR 1 liquid reactor core	DR 3 building complex	Solution of 20 % enriched uranyl sulphate in light water	4.9 kg U 15.8 l	27.7 GBq fission products 0,4 GBq actinides
Experimentally produced and irradiated spent fuel of power reactor type	The Centralvej Storage	Uranium oxide pellets mostly in zircalloy tube	233 kg U	520 TBq fission products 35 TBq actinides

Table 1. Special waste in storage. Activity data as of January 2021.

2.3.3. Other low and intermediate level radioactive waste stored at the Risø site

In addition to the “special waste”, low level radioactive waste and intermediate level radioactive waste is stored at different storage facilities at the Risø site, as indicated in Table 2.

Storage facility	Volume (m^3) / Mass (tons)	Activity (TBq)
Low Level Waste Storage	1776 t	6
Drum Storage and Centralvej Storage	~130 t	458
Taillings pools and ore	4,800 t	0.1
Intermediate Storage	1775 t	217

Table 2. Inventory of radioactive waste stored at Danish Decommissioning as of January 2021, classified as low and intermediate level waste (LLW and ILW).

The inventory in the Intermediate Storage contained has increased from an activity of 112 TBq and a mass of 808 tons at the last reporting in 2018 to 217 TBq and a mass of 1775 tons. The increase in activity is largely due to the addition of graphite from the former reactor DR 3, where in particular ^{3}H and ^{152}Eu account for the main portion of the activity. A large quantity of experimental rigs previously used in DR 3 has also been added, but a consolidated activity values remains to be determined. The increase in mass is a result of the additional drums transferred from the Low Level Waste Storage and concrete used as radiation shielding for the added rigs. Furthermore, a campaign of drying and repackaging around 100 drums contributed to the increase in mass.

Danish Decommissioning also stores a combined amount of 4800 tons of uranium ore and tailings with a total activity of 0,1 TBq.

3. General principles and policies

Article 4 – General principles

1. Member States shall establish and maintain national policies on spent fuel and radioactive waste management. Without prejudice to Article 2(3), each Member State shall have ultimate responsibility for management of the spent fuel and radioactive waste generated in it.
2. Where radioactive waste or spent fuel is shipped for processing or reprocessing to a Member State or a third country, the ultimate responsibility for the safe and responsible disposal of those materials, including any waste as a by-product, shall remain with the Member State or third country from which the radioactive material was shipped.
3. National policies shall be based on all of the following principles:
   - (a) the generation of radioactive waste shall be kept to the minimum which is reasonably practicable, both in terms of activity and volume, by means of appropriate design measures and of operating and decommissioning practices, including the recycling and reuse of materials;
   - (b) the interdependencies between all steps in spent fuel and radioactive waste generation and management shall be taken into account;
   - (c) spent fuel and radioactive waste shall be safely managed, including in the long term with passive safety features;
   - (d) implementation of measures shall follow a graded approach;
   - (e) the costs for the management of spent fuel and radioactive waste shall be borne by those who generated those materials;
   - (f) an evidence-based and documented decision-making process shall be applied with regard to all stages of the management of spent fuel and radioactive waste.
4. Radioactive waste shall be disposed of in the Member State in which it was generated, unless at the time of shipment an agreement, taking into account the criteria established by the Commission in accordance with Article 16(2) of Directive 2006/117/Euratom, has entered into force between the Member State concerned 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 inform the Commission of the content of any such agreement and take reasonable measures to be assured that:

- (a) 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 on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (‘the Joint Convention’);
- (b) the country of destination has radioactive waste management and disposal programmes with objectives representing a high level of safety equivalent to those established by this Directive; and
- (c) 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.

3.1. National policy for responsible and safe management of radioactive waste.

Through the adoption of Parliamentary Resolution B48/2003 and Parliamentary Resolution B90/2018, the Government established a national policy with initial provisions for the safe decommissioning of the nuclear facilities at the Risø site and the safe

management and disposal of the resulting radioactive waste as well as radioactive waste from institutional use of radioactive material in Denmark.

Parliamentary Resolution B48/2003 forms the basis for the current policy on decommissioning and management of radioactive waste. Herein, the Danish Parliament announces its agreement that the Government will promote the decommissioning of the nuclear facilities at Risø Research Center by the state enterprise Danish Decommissioning (DD), in order to release the areas on the site for unrestricted use within a timeframe of up to 20 years. Pursuant to the resolution, the Danish Parliament also gave its consent that the government, at the time of the dismantling (decommissioning), starts preparing a basis for decision for a Danish final disposal facility for low- and medium-level waste.

Parliamentary Resolution B90/2018 further specifies the end goals for management and disposal of these waste streams, and defines the responsibilities of Danish Decommissioning as national waste management organisation in the framework of Parliamentary Resolution B90/2018. The resolution aims to implement a long-term solution for Denmark's radioactive waste with a view to continued safe storage until the waste may be disposed of in a disposal facility. Parliamentary Resolution B90/2018 enables the short-term improvement of safety through the construction of a new upgraded storage facility at the Risø site. The resolution facilitates - in the medium term - geological studies at depths of up to 500 meters in order to identify suitable geologies for a deep geological disposal facility in Denmark. After this, a location of the geological disposal facility can be recommended based on a number of analyses of safety, geological, physical and socio-economic conditions, in particular the option for voluntary participation by local municipalities/communities. In the long term, Parliamentary Resolution B90/2018 will enable the establishment of a geological disposal facility to be commissioned by 2073 at the latest.

Parliamentary Resolution B90/2018 also allows for the – in parallel – continued exploration of the possibilities for an international solution for the so-called “special waste”, comprising the bulk of long-lived activity in the Danish inventory of radioactive waste (cf. section 2.3.2). The “special waste” will, at the latest at the point in time where a planning act for a geological disposal facility is passed, be included in the inventory to be disposed of in Denmark, should an international solution not have been found for this waste.

Finally, according to Parliamentary Resolution B90/2018, a disposal solution could also be considered for naturally occurring radioactive material (NORM) designated as waste, which is currently stored by the responsible licensees until a long-term management and disposal solution is decided upon.

In 2020, the issue of management and disposal of NORM was discussed by members of the Nordic Council[9] in order to establish the state-of-the-art of NORM management in the Nordic countries and to explore possible avenues for collaboration between member states. In April 2021, the Nordic Council Committee for a Sustainable Nordic Region put forward Proposal A 1860 that the Nordic Council adopt the following recommendations to the Nordic Council of Ministers:

- that suitable sites for one or more joint Nordic disposal facilities for NORM should be identified
- that any legal and regulatory obstacles for import/export of NORM between member states should be identified and remedied
- that negotiations should be initiated to establish joint financing of one or more NORM disposal facilities
- that procedures are established to ensure the safe management and handling of NORM transportation between member states.

Proposal A 1860 will be resolved during the Joint Session of the Nordic Council in November 2021. If adopted, the resolution will be forwarded to the national parliaments of the member states for approval.

[9] The Nordic Council is the parliamentary arm of Nordic Co-operation, an inter-governmental regional partnership of Denmark, Finland, Iceland, Norway, Sweden, the Faroe Islands, Greenland and Åland, cf. https://www.norden.org/en/information/official-nordic-co-operation.

4. National framework

Article 5 – National framework

1. Member States shall establish and maintain a national legislative, regulatory and organisational framework ('national framework') for spent fuel and radioactive waste management that allocates responsibility and provides for coordination between relevant competent bodies. The national framework shall provide for all of the following:
   - (a) a national programme for the implementation of spent fuel and radioactive waste management policy;
   - (b) national arrangements for the safety of spent fuel and radioactive waste management. The determination of how those arrangements are to be adopted and through which instrument they are to be applied rests within the competence of the Member States;
   - (c) a system of licensing of spent fuel and radioactive waste management activities, facilities or both, including the prohibition of spent fuel or radioactive waste management activities, of the operation of a spent fuel or radioactive waste management facility without a licence or both and, if appropriate, prescribing conditions for further management of the activity, facility or both;
   - (d) a system of appropriate control, a management system, regulatory inspections, documentation and reporting obligations for radioactive waste and spent fuel management activities, facilities or both, including appropriate measures for the post- closure periods of disposal facilities;
   - (e) enforcement actions, including the suspension of activities and the modification, expiration or revocation of a licence together with requirements, if appropriate, for alternative solutions that lead to improved safety;
   - (f) the allocation of responsibility to the bodies involved in the different steps of spent fuel and radioactive waste management; in particular, the national framework shall give primary responsibility for the spent fuel and radioactive waste to their generators or, under specific circumstances, to a licence holder to whom this responsibility has been entrusted by competent bodies;
   - (g) national requirements for public information and participation;
   - (h) the financing scheme(s) for spent fuel and radioactive waste management in accordance with Article 9.
2. Member States shall ensure that the national framework is improved where appropriate, taking into account operating experience, insights gained from the decision- making process referred to in Article 4(3)(f), and the development of relevant technology and research.

4.1. National framework during the reporting period

The legislative, regulatory and organisational framework for safe and management of radioactive waste in Denmark has been consolidated in the period from the last reporting, following revised legislation entering into force in February 2018 and subsequent specification of roles and responsibilities of regulators, operators and licence holders.

New executive orders on ionising radiation and radiation protection, use of radioactive substances, and transboundary shipments of radioactive waste and spent nuclear fuel have been issued in 2019 in consequence of the revised legislation.

In 2020, the Ministry of Health and the Ministry of Defence have issued a circular on the regulatory control exercised by the nuclear regulatory authorities regarding the nuclear safety of nuclear installations.

A new circular, specifying the tasks and responsibilities of the Danish Health Authority (regulator) and the Danish Agency for Higher Education and Science (operator), with respect to responsible and safe management of radioactive waste was issued in 2020.

Finally, Danish Agency for Higher Education and Science is currently working towards a complete revision of a circular regulating tasks and responsibilities of Danish Decommissioning (licence holder) in consequence of Parliamentary Resolution B90/2018.

The national framework is presented in more detail in the next section.

4.1.1. National Legal Framework

The national legal framework for both radiation protection and safety as well as for responsible and safe management of radioactive waste in Denmark essentially rests on The Radiation Protection Act[10] and The Nuclear Installations Act[11] and their underlying orders and circulars.

The Radiation Protection Act is the main instrument for transposition of Council Directive 2013/59/EURATOM (The European Basic Safety Standards). In addition to the provisions of the Directive, the act implements the framework and principles of The 2007 Recommendations of the International Commission on Radiological Protection, ICRP Publication 103. In covering the ICRP “exposure situations” and “exposure categories”, the act is all-inclusive in terms of facilities and activities, applying also to all management of radioactive waste. The act empowers the Danish Health Authority with all regulatory core functions such as authorization, review and assessment, inspection and enforcement.

The Nuclear Installations Act defines the concept of nuclear installations and establishes the fundamental principles for authorization – safety during commissioning, operation and decommissioning of the facilities. It stipulates that the Danish Health Authority under the Ministry of Health and (by later amendments) the Danish Emergency Management Agency under the Ministry of Defence, constitute the Nuclear Regulatory Authorities. The Nuclear Regulatory Authorities are authorised to establish limits and conditions for operation and decommissioning, to issue terms necessary to ensure compliance and to access nuclear facilities at any time. The nuclear installations at the Risø site, including the national storage facilities for radioactive waste, are subject to oversight and inspection by the Nuclear Regulatory Authorities.

The nuclear facilities at the Risø site are thus subject to regulatory control by the Danish Health Authority and by the Nuclear Regulatory Authorities at the same time. This will also apply to the new, upgraded storage facility to be established according to the provisions of Parliamentary Resolution B90/2018. However, the application of the

[10] Act no. 23 of 15 January 2018, on Ionising Radiation and Radiation Protection (The Radiation Protection Act)
[11] Act no. 170 of 16 May 1962, on Nuclear Installations (The Nuclear Installations Act)

Nuclear Installations Act will reflect that the upgraded storage facility itself as well as the activities undertaken there, shares few similarities with nuclear installations as such.

The national legal framework comprise additional legislation supporting more distinct aspects of responsible and safe management of radioactive waste, including: The Environmental Impact Assessment Act, The Nuclear Safety Act, The Health Act , The Public Information Act and The Planning Act - and relevant underlying orders.

Circular no. 9654/2020 on the tasks of the Danish Health Authority and the Danish Agency for Higher Education and Science concerning responsible and safe management of radioactive waste – provide important components in the framework. By this Circular, the Ministry of Health and the Ministry of Higher Education and Science in detail delegate responsibilities and tasks in relation to the fulfilment of the requirements in Council Directive 2011/70/EURATOM, to the Danish Health Authority and the Danish Agency for Higher Education and Science - including provisions for establishing and implementing a national programme for responsible and safe management of radioactive waste.

4.1.2. Regulatory Framework for Safe Management of Radioactive Waste

The regulatory framework for the management of radioactive waste comprise three ministries in the main. Pursuant to the all-encompassing nature of The Radiation Protection Act, the Ministry of Health is responsible for the legal framework in relation to virtually all facilities and activities involving radiation sources including radioactive waste. The Ministry of Health and the Ministry of Defence are responsible for the legal framework governing the administration of the Nuclear Regulatory Authorities. The Ministry of Higher Education and Science is administratively responsible (as operating entity) for the nuclear facilities in Denmark, which are all government property.

The Danish Health Authority

The Danish Health Authority acts under the Ministry of Health. The main tasks include health promotion, disease treatment and prevention – the latter including radiation protection and safety. In accordance with The Radiation Protection Act, the Danish Health Authority is the national competent authority for regulating the use of radioactive substances including radioactive waste. The everyday administration of the obligations and powers of the act is delegated to the Danish Health Authority, Radiation Protection. Pursuant to the Nuclear Installations Act, the Danish Health Authority and the Danish Emergency Management Agency constitute the Nuclear Regulatory Authorities – and as such conduct inspections of nuclear installations, including storage facilities. The Danish Health Authority has been assigned particular responsibilities in relation to the implementation of the programme. The relevant legislation is:

1. The Radiation Protection Act (Act no. 23 of 15 January 2018 on Ionising Radiation and Radiation Protection) and the following underlying Executive Orders transpose the large majority of the EU-BSS provisions into Danish legislation:
   1.1. Executive Order no. 669 of 1 July 2019 on Ionising Radiation and Radiation Protection.
   1.2. Executive Order no. 670 of 1 July 2019 on Use of Radioactive Substances.

1.3. Executive Order no. 672 of 1 July 2019 on Transboundary Shipments of Radioactive Waste and Spent Nuclear Fuel.
1.4. Circular no. 9654, 2020 on the tasks of the Danish Health Authority and the Danish Agency for Higher Education and Science concerning responsible and safe management of radioactive waste
2. The Nuclear Installations Act (Act no. 170 of 16 May 1962 on Nuclear Installations)
2.1. Circular no. 9450 of 9.July 2020 on the regulatory control exercised by the nuclear regulatory authorities regarding the nuclear safety of nuclear installations, etc.

The Danish Agency for Higher Education and Science

The Agency has the formal responsibility for institutions under the Ministry of Higher Education and Science, including Danish Decommissioning (DD). The primary tasks of DD are to: 1) dismantle the nuclear research facilities at Risø by 2023, in a safe, environmentally sound and economically optimal way, 2) receive, process and store radioactive waste from Danish users of radioactive material, and 3) participate in the process that lead to a long-term solution for the radioactive waste by 2073 - until then, storing the waste. The Danish Agency for Higher Education and Science has been assigned particular responsibilities in relation the implementation of the national programme. The relevant legislation is:

1. Parliamentary Resolution B48, 2003 on the Decommissioning of the Nuclear Facilities at Research Station, Risø.
2. Parliamentary Resolution B90, 2018 on a Long-Term Solution for Denmark's Radioactive Waste.
3. Executive Order no. 1229 of 3 November 2015 on Resort Changes between Ministers
4. Circular no. 9654, 2020 on the tasks of the Danish Health Authority and the Danish Agency for Higher Education and Science concerning responsible and safe management of radioactive waste.
5. Circular no. 64, 2012 on Danish Decommissioning.

The Danish Emergency Management Agency

The Danish Emergency Management Agency (DEMA) is responsible for Danish emergency preparedness and acts under the Ministry of Defense. DEMA supervises authorities and municipalities on emergency preparedness and comprise the second half of the Nuclear Regulatory Authorities. Pursuant to the Nuclear Installations Act, the Danish Emergency Management Agency and the Danish Health Authority constitute the Nuclear Regulatory Authorities.The relevant legislation is:

1. The Nuclear Installations Act (Act no. 170 of 16 May 1962 on Nuclear Installations)
1.1. Circular no. 9450 of 9.July 2020 on the regulatory control exercised by the nuclear regulatory authorities regarding the nuclear safety of nuclear installations, etc.
2. The Emergency Management Act, Nuclear Preparedness Chapter 7a (Consolidation Act no. 314 of 3 April 2017 on Emergency Management).
2.1. Executive Order no. 1762 of 27 December 2016 on Security Measures for Nuclear Material and Nuclear Facilities and Drafting of Security Plans.
3. The Nuclear Safety Act (Act no. 244 of 12 May 1976 on Safety and Environmental Conditions at Nuclear Facilities, etc.) (Only § 11 and § 12 (1) is in force).
3.1. Executive Order no. 278 of 27 June 1963 on Protective Measures against Accidents at Nuclear Facilities, etc. – as changed according to Executive Order no. 502 of 10 January 1974.

The Danish Environmental Protection Agency

The Danish Environmental Protection Agency is part of the Ministry of the Environment and Food, and it administers the legislation on environmental protection, which is to ensure clean air, (drinking-) water and soil and good living conditions for people, animals and nature. The Environmental Impact Assessment Act as well as the Planning Act (under the Ministry of Business) are relevant in the planning and siting of facilities such as nuclear facilities or a disposal facility for radioactive waste. The relevant legislation is:

1. The Environmental Impact Assessment Act (Consolidation Act no. 1225 of 25 October 2018 on Environmental Impact Assessment of Plans and Programs and of Specific Projects (EIA).
2. The Environmental Protection Act (Consolidation Act no. 1218 of 25 November 2019 on Environmental Protection)

The Danish Business Authority (Ministry of Business)

The Danish Business Authority administers The Planning Act on involving the public in a coherent planning that combines social interests in land use, contributes to protect nature and environment, and creates a good framework for growth and development throughout the country. The Planning Act as well as the Environmental Impact Assessment Act are relevant in the planning and siting of facilities such as nuclear facilities or a disposal facility for radioactive waste. The relevant legislation is:

3. The Planning Act (Consolidation Act no. 287 of 16 April 2018 on Planning).

5. Competent regulatory authorities

Article 6 – Competent regulatory authority

1. Each Member State shall establish and maintain a competent regulatory authority in the field of safety of spent fuel and radioactive waste management.
2. Member States shall ensure that the competent regulatory authority is functionally separate from any other body or organisation concerned with the promotion or utilisation of nuclear energy or radioactive material, including electricity production and radioisotope applications, or with the management of spent fuel and radioactive waste, in order to ensure effective independence from undue influence on its regulatory function.
3. Member States shall ensure that the competent regulatory authority is given the legal powers and human and financial resources necessary to fulfil its obligations in connection with the national framework as described in Article 5(1)(b), (c), (d) and (e).

5.1. Legal and regulatory framework for the safe management of radioactive waste

The legal framework for responsible and safe management of radioactive waste in Denmark rests on The Radiation Protection Act, The Nuclear Installations Act and their underlying orders and circulars.

The Radiation Protection Act is the main instrument for transposition of Council Directive 2011/70/Euratom. The act empowers the Danish Health Authority with all regulatory core functions such as authorization, review and assessment, inspection and enforcement, and ensures that the Danish Health Authority exercises its functions under the act in full professional independence.

The Nuclear Installations Act defines the concept of nuclear installations and establishes the fundamental principles for authorization to ensure safety during commissioning, operation and decommissioning of nuclear facilities. The act stipulates that the Danish Health Authority under the Ministry of Health and (by later amendments) the Danish Emergency Management Agency under the Ministry of Defence, constitute the Nuclear Regulatory Authorities. The Nuclear Installations Act authorizes the Nuclear Regulatory Authorities to establish limits and conditions for operation and decommissioning of nuclear facilities and to issue terms necessary to ensure compliance with such conditions. The Nuclear Installations Act furthermore grants the Nuclear Regulatory Authorities the right to access nuclear facilities at any time and the Nuclear Regulatory Authorities can as well demand that operation shall be stopped if it does not take place in accordance with limits and conditions.

The nuclear installations at Risø, including the national storage facilities for radioactive waste, are thus subject to oversight and inspection by the Danish Health Authority as well as the Nuclear Regulatory Authorities.

The Danish Health Authority and the Danish Emergency Management Agency remain functionally separated from organisations or bodies responsible for management of radioactive waste in Denmark through allocation of the responsibility for implementing the political decisions in Parliamentary Resolution B48/2003 and later B90/2018 to the Ministry of Higher Education and Science.

Further details regarding the national framework for responsible and safe management of radioactive waste is provided in the Danish national programme[12] and chapter 4 in this report.

5.2. Financial provisions

The Financial Act covers the operating costs of the Danish Health Authority and the Danish Emergency Management Agency through allocations to the respective ministries in charge i.e., the Ministry of Health and the Ministry of Defense, respectively.

The responsibility for funding the Danish national programme, including the activities of the Danish Health Authority and the Danish Emergency Management Agency, in order to fulfill the obligations related to article 5(1)(b), (c), (d) and (e) lies with the Danish Parliament. The adoption of the annual Financial Act, which is a requirement in the Danish constitution, confirms the obligations of Parliament to meet the costs of the national programme and to guarantee the availability of funds at the time when they are needed.

In the event of an unforeseen budget requirement, a motion of approval is prepared by the responsible ministry to be presented to the Financial Committee of the Danish Parliament. The decision for approval rests with the Finance Committee.

[12] National Programme for Responsible and Safe Management of Radioactive Waste Denmark 2020

6. Licence holder

Article 7 – Licence holders

1. Member States shall ensure that the prime responsibility for the safety of spent fuel and radioactive waste management facilities and/or activities rest with the licence holder. That responsibility can not be delegated.
2. Member States shall ensure that the national framework in place require licence holders, under the regulatory control of the competent regulatory authority, to regularly assess, verify and continuously improve, as far as is reasonably achievable, the safety of the radioactive waste and spent fuel management facility or activity in a systematic and verifiable manner. This shall be achieved through an appropriate safety assessment, other arguments and evidence.
3. As part of the licensing of a facility or activity the safety demonstration shall cover the development and operation of an activity and the development, operation and decommissioning of a facility or closure of a disposal facility as well as the post-closure phase of a disposal facility. The extent of the safety demonstration shall be commensurate with the complexity of the operation and the magnitude of the hazards associated with the radioactive waste and spent fuel, and the facility or activity. The licensing process shall contribute to safety in the facility or activity during normal operating conditions, anticipated operational occurrences and design basis accidents. It shall provide the required assurance of safety in the facility or activity. Measures shall be in place to prevent accidents and mitigate the consequences of accidents, including verification of physical barriers and the licence holder's administrative protection procedures that would have to fail before workers and the general public would be significantly affected by ionising radiation. That approach shall identify and reduce uncertainties.
4. Member States shall ensure that the national framework require licence holders to establish and implement integrated management systems, including quality assurance, which give due priority for overall management of spent fuel and radioactive waste to safety and are regularly verified by the competent regulatory authority.
5. Member States shall ensure that the national framework require licence holders to provide for and maintain adequate financial and human resources to fulfil their obligations with respect to the safety of spent fuel and radioactive waste management as laid down in paragraphs 1 to 4.

6.1. Obligations of the licence holder

The obligations of licence holders have remained unchanged during the reporting period, and assigns prime responsibility for the safe management of radioactive waste with the licence holder. As reported in previous national reports from Denmark, the Nuclear Regulatory Authorities have issued Operational Limits and Conditions for Danish Decommissioning, detailing how the nuclear installations at the Risø site may be safely operated and decommissioned.

The Operational Limits and Conditions for Danish Decommissioning specifically specifies that Danish Decommissioning has the responsibility for ensuring that operation and decommissioning of the nuclear facilities at the Risø site takes place in accordance with the conditions set in the Operational Limits and Conditions and laws and orders regarding radiation protection and nuclear security. The Operational Limits and Conditions set conditions regarding, *inter alia,* maintaining and improving safety of spent fuel and radioactive waste management, documentation for safety, quality assurance and management systems.

As the decommissioning of the nuclear facilities at the Risø site is ongoing, the Operational Limits and Conditions are progressively updated. Latest version of the Operational Limits and Conditions is from 2020. Public versions of the Operational Limits and Conditions are available on the website of the Danish Health Authority[13].

6.2. Extension of mandate, tasks and responsibilities for Danish Decommissioning

The adoption of Parliamentary Resolution B90/2018 extends the tasks of Danish Decommissioning to also include contributions to establishing a long-term solution for radioactive waste. In this capacity, Danish Decommissioning will take active part in processes related to planning, localisation, construction, operation and decommissioning of the planned intermediate storage facility as well as in the development of the disposal solution to be implemented by 2073 at the latest. The full scope of these activities as well as the expanded role and responsibilities of Danish Decommissioning in the national framework will be reported together with notification of national policy and associated programme.

6.3. Measures regarding the safety of the radioactive waste

According to Operational Limits and Conditions for Danish Decommissioning the collective Safety Documentation for Danish Decommissioning must be updated minimum every 5th year. The Safety Documentation is presently under revision and is expected to be updated by the end of 2021.

Following Parliamentary Resolution B90/2018, Danish Decommissioning is planning construction of a new upgraded storage facility for all the radioactive waste for which Danish Decommissioning bears prime responbility. The storage facility will be in operation until no later than 2073 when a final disposal facility for the waste will be in operation.

Also, until now the main focus of Danish Decommissioning has been decommissioning. In the future, focus will change, gradually turning the organization into an organization centered on waste management, responsible for safe storage of the waste, and co-responsible for the process leading to a final disposal. In 2021, Danish Decommissioning introduces a major organisational change in order to better prepare the organisation to the new tasks.

Since the adoption of Parliamentary Resolution B90/2018 Danish Decommissioning's main focus has been on preparation and planning of the new upgraded storage facility. According to the resolution, the facility shall be located on the Risoe peninsula. The more precise location on the peninsula has been decided, based on an overall safety

[13] Operational Limits and Conditions for Danish Decommissioning 2020

assessment, an assessment of the location in relation to already existing facilities and an assessment of the geotechnical conditions on the preferred location. In parallel, the overall demands and specifications have been formulated, and a detailed project proposal formulated in close cooperation between Danish Decommissioning and the associated contractors. During the process there has been a close dialogue with the nuclear regulatory authorities and other stakeholders, both directly and through the established national and local contact fora.

After finalization of the detailed project proposal, the main focus has been on finalizing the safety assessment for the upgraded storage facility. In parallel, the documentation for obtaining the necessary approvals regarding environmental impacts (Act 973/2020) and spatial planning (Act 1157/2020) is under preparation. Simultaneously, a detailed budget has been elaborated as a basis for obtaining approval by the Financial Committee of the Danish Parliament. When all necessary approvals are obtained, the construction site will be prepared and a public tender will be announced. Depending on approvals, it is estimated that the facility will be ready for operation by 2025.

When the upgraded storage facility is ready for operation, the radioactive waste will be transferred from the present storage facilities.

After establishment of the facility and transfer of the waste, the main activities will be waste management, including continued reception of waste from external users of radioactive sources, inspection and necessary handling of the stored waste and preparation of the waste for final disposal, comprising a.o. planning and construction of new reception and handling facilities, as well as more detailed characterization and description of especially the historical waste, where the present documentation is insufficient, A more detailed long term waste management plan will be elaborated in cooperation with an international organisation with practical experience in waste management.

7. Expertise and skills

Article 8 – Expertise and skills

Member States shall ensure that the national framework require all parties to make arrangements for education and training for their staff, as well as research and development activities to cover the needs of the national programme for spent fuel and radioactive waste management in order to obtain, maintain and to further develop necessary expertise and skills.

7.1. Regulatory authorities

Circular no. 9654 on safe management of radioactive waste specifies that the Danish Health Authority as part of the implementation and maintenance of the national framework for radioactive waste management must maintain and further develop expertise and qualifications related to safe management of radioactive waste. This is to be achieved through training or other staff competence development arrangements corresponding to the needs of the national programme.

The general fulfilment of this requirement is ensured through the staffing and human resources planning policy of the Danish Health Authority, providing a framework of requirements regarding the competences and training for new as well as existing staff. In addition the Danish Health Authority actively takes part in international fora regarding safe management of radioactive waste, decommissioning, radiation protection, transport safety etc.

In the reporting period, the Danish Health Authority has been actively involved in the development of IAEA Safety Standards through participation in the IAEA safety standards committees RASSC, WASSC and TRANSSC. The Danish Health Authority contributed actively to the project on Decommissioning of Small Medical, Industrial and Research Facilities (MIRDEC) as part of the activities associated with participation in the IAEA´s International Decommissioning Network (IDN). In addition, the Danish Health Authority has provided consultancy services for the IAEA in the field of radioactive waste management and has supplied experts for IAEA mediated ARTEMIS review missions pursuant of the requirements in article 14.3 of Council Directive 2011/70/Euratom. Related to the European Union, staff from the Danish Health Authority contributed to the Euratom Article 31 and 37 Groups of Experts and in the work of the European Nuclear Safety Regulators Group (ENSREG), and the associated ENSREG Working Group 2 on waste management and decommissioning.

Pursuant of Circular no. 9450 on nuclear safety, The Nuclear Regulatory Authorities shall maintain and further develop their own qualifications and competences regarding nuclear safety and emergency preparedness through schemes for education and training, other competence development of staff and, for example, ongoing participation in international cooperation, international conferences, etc.

Danish Emergency Management like Danish Health Authority ensure adequate and competent staffing and maintenance of competencies through planning policy of the agency, including schemes for training for new as well as existing staff. In addition Danish Emergency Management Agency actively takes part in international cooperation.

Furthermore, the circular requires that the Nuclear Regulatory Authorities exercise regulatory control to verify that the owner of a nuclear installation ensures that nuclear safety during planning, operation and decommissioning of a nuclear installation is maintained through utilisation of necessary and adequate human, financial and competence resources, the latter including contractors and subcontractors.

7.2. The license holder

Operating in a country with a nuclear program of limited and continuously decreasing scope, it is necessary for Danish Decommissioning to maintain focus on the need for expertise and qualifications in order to sustain and develop the necessary competences for safe management of the radioactive waste. This overall requirement has also been a focus point when defining the new organizational setup mentioned in Section 6.3; an important aim has been to build an organizational structure where vulnerability and back up on critical competences is in focus.

Knowledge transfer, training, sharing of experience and networking are important factors in maintaining the necessary expertise and skills. Danish Decommissioning participates in differerent fora in the waste management field, a.o. Club of Agencies, the ERDO Association (Danish Decommissioning acts as vice chairman in the association), the EURAD programme (directly involved in the Routes WP and has for the first period represented SIMS in the Bureau). Danish Decommissiong also engages in highly beneficial bilateral cooperation with a.o. our neighboring countries, Sweden and Norway.

All new staff hired at Danish Decommissioning participate in an introductory course on the fundamentals of radiation protection, which contains a brief introduction to ionizing radiation, detection of ionizing radiation, biological effects of ionizing radiation, fundamental radiation protection principles and mitigating strategies, and practical radiation protection procedures related to the specific site.

In the process of developing a disposal solution for the radioactive waste, Danish Decommissioning plans to get assistance from one or more organization(s) experienced in waste management and disposal planning to describe the need for expertise and qualifications on a longer term basis, see also Section 6.3 above. This is to ensure that DD at all times is staffed with the necessary expertise and skills for waste management in general and in order to participate in the disposal process.

8. Financial resources

Article 9 – Financial resources

Member States shall ensure that the national framework require that adequate financial resources be available when needed for the implementation of national programmes referred to in Article 11, especially for the management of spent fuel and radioactive waste, taking due account of the responsibility of spent fuel and radioactive waste generators.

The financial resources for Denmark's national programme for the management of radioactive waste are derived from reserve fund allocations on the Financial Act adopted annually by Danish Parliament.

The financing system to secure the financing of the management of radioactive waste in Denmark has been established in two incremental stages:

1. The decision in 2003 to begin the decommissioning activities of Danish Decommissioning cf. Parliamentary Resolution B48/2003
2. The decision in 2018 to begin the upgrade of storage facilities of Danish Decommissioning and to begin the process towards the implementation of a disposal facility no later than 2073, cf. Parliamentary Resolution B90/2018.

In addition, financing relating to the competent national authorities and R&D activities are covered by allocations on the operating budgets of the various government agencies involved in the national programme.

In the following section, the financing system of the national programme will be described in relation to the areas and deliverables which are enshrined in the national programme.

8.1. Financing system of the national programme

The financing system covers the following areas:

Technical areas:
- Waste management
- Geology & siting
- Disposal solution

Socio-economic areas:
- Organisational framework
- Stakeholder management
- Economical & financial issues

8.1.1. Technical area: Waste management

Waste management includes the upgrade of the facilities at the Risø site, the probing for an international solution and the process moving from upgraded storage to predisposal to disposal. Danish Decommissioning is the waste management organisation responsible for operations to maintain and develop the national programme. The operating expenses of Danish Decommissioning are covered in § 19.61.03 of the Financial Act. Decommissioning projects are covered by installments from reserve fund § 19.11.79.70 in the Financial Act. This reserve fund was established in 2003 as a consequence of Parliamentary Resolution B48/2003.

Expenses relating to the upgrade of the storage facilities and projects relating to the predisposal and disposal phases of the national programme are covered by installments from reserve fund § 19.11.79.71 which was established in the Financial Act for 2019 following Parliamentary Resolution B90/2018.

8.1.2. Technical area: Geology & siting

Expenses relating to geological research and siting investigation activities are financed by an allocation from reserve fund § 19.11.79.71. The allocation is installed in the budget of The Geological Survey of Denmark and Greenland (§ 29.41.01.20 of the Financial Act) which is assigned the role as operator of geological and siting research in the national programme. The Geological Survey of Denmark and Greenland is a self-governing and independent research institution under the Ministry of Climate, Energy and Utilities.

8.1.3. Technical area: Disposal solution

Danish Decommissioning has been assigned the task to develop the technical conditions and the design of the disposal facility. The task is enshrined in § 19.63.03 of the Financial Act and will be consolidated further in a revision of the circular outlining tasks and responsibilities of Danish Decommissioning, mentioned in chapter 4 above. Funding for this purpose will derive from reserve fund § 19.11.79.71.

8.1.4. Socio-economic area: Organisational framework

The organisational framework consisting of the waste management organisation for storage, predisposal and disposal is financed through the operating budget of Danish Decommissioning.

The Danish Agency of Higher Education and Science is acting as the principal of Danish Decommissioning and supervises management priorities through the instrument of an annual target and performance plan[14]. The target and performance plan is revised and adjusted in an on-going dialogue between the Agency and Danish Decommissioning. The CEO of Danish Decommissioning enters a personal performance contract with the Agency on the basis of the approved target and performance plan.

[14] (available in Danish at: https://dekom.dk/en/2020/01/08/hvad-skal-vi-naa-i-2020/)

8.1.5. Socio-economic area: Stakeholder engagement

Stakeholder engagement is organized and performed in the communication infrastructure described in Section 1.5. The Agency of Higher Education and Science has the responsibility for organizing and coordinating stakeholder initiatives and processes with Danish Decommissioning. The competent regulatory authorities and other entities will be involved as per the issues and special competences to be included in stakeholder communication. Stakeholder dialogue at the local level will be designed in a participatory process to allow for local communication needs and preferences to determine the structure and activities of the dialogue. The dialogue structure will strive to achieve maximum flexibility during the entire duration of the programme.

8.1.6. Socio-economic area: Economic and financial issues

In the following, the cost assessment methodology (hypothesis, inputs & boundary conditions) will be described relating to 1) decommissioning activities and 2) upgraded storage and disposal facilities.

Decommissioning activities

The cost assessment of the decommissioning of the nuclear facilities on the Risø site is performed according to a target of complete decommission to greenfield status over a period of twenty years (2003-2023).

Costs are assessed according to two groups of activities: a) Basic expenses relating to the operation, security and maintenance of Danish Decommissioning; b) Project expenses relating to planning, investment and execution of decommission projects.

Cost assessment is laid out in Parliamentary Resolution B48/2003 stating annual expenses over the 20-year decommissioning project period. Estimations of project expenses include a buffer of approx. 31 pct. of total decommissioning costs to allow for unforeseen costs. Total decommissioning costs are estimated at approx. DKK 1,120 million (2003 net present values). Decommissioning activities are expected to be completed by 2025.

Upgraded Storage facilities

The specifications of the upgraded storage facilities are described in depth in a consultancy report published in 2016[15].

The cost assessment of upgraded storage facilities is targeting the implementation of an upgraded storage facility on the Risø site by 2025. The assessment of construction costs includes: a) Direct construction expenses, b) Construction site management expenses and c) Supervision/counselling expenses. A buffer to cover unforeseen expenses is estimated at 15 pct. of total construction costs.

[15] Safety, economy and operation for a Danish long-term storage facility for radioactive waste (2016)

In Parliamentary Resolution B90/2018, the construction costs of upgraded storage facilities were estimated at approx. 171 million DKK (2017 net present value) which included the following cost items:

- Storage facility
- Inspection area
- Loading/unloading space.

Existing facilities at Danish Decommissioning that will continue to be used or upgraded as part of the upgraded storage construction programme include:

- Fencing, perimeter guarding system and security gate
- Workshop and conditioning facilities
- Office space
- Roads and parking space
- Garages.

A consolidated construction budget is currently under scrutiny and will presented to Parliament for approval in 2021.

A visitor's centre is currently under consideration and may be included in the storage facility at a later stage.

Disposal facilities

The cost assessment of disposal facilities is based on a pre-feasibility study[16][17]. The pre-feasibility studies outlined 18 different disposal facility designs which were assessed according to the following items to be covered by the cost estimates:

- Acquisition of area
- Additional facilities at the disposal facility
- Construction
- Operation
- Closure
- Monitoring

The design of the disposal facility remains to be decided. The cost of the disposal facility has been calculated using a conservative estimate of the disposal facility design. As a consequence, cost estimation will be updated and further elaborated when a disposal facility design is decided and further specified for cost assessment purposes.

General assumptions for cost item estimates are summarized the following:

[16] Danish Decommissioning, Disposal pre-feasibility study (2011) (Danish)
[17] Danish Decommissioning, Disposal pre-feasibility study (2011) (English)

Acquisition of area

It is considered that the land acquired for the disposal facility is located in a rural scarcely populated area. Depending on various conditions, such as land use, location and quality of land, etc., the square meter price will vary significantly.

Additional facilities at the disposal facility

The additional facilities are considered to be the same for all concepts and are thus treated once for all. It is assumed that the additional facilities at the disposal facility are established based on containers and lightweight steel structures or similar inexpensive solutions.

Construction

Construction costs include: detailed design, invitation to tender and field investigations. Construction costs are determined based on bills of quantities (BoQs). The cost estimates are based on bids for similar projects and on actual price quotes, in order to reflect market prices.

The market situation may be considered by assuming a general uncertainty of 15 pct. to 20 pct. on all price estimates related to the disposal facility structures. 17.5 pct. are taken as plus/minus variation on the most likely costs.

Operation

It is estimated that the disposal facility will operate an active period of 31 years of which the first year is considered an initial filling year in which additional operational costs have to be taken into account. It is considered that the initial filling period, where the bulk waste amount shall be placed in the facility, lasts for one year. Hereafter, it is assumed that the active operation continues for 30 years with an inbound waste flux of approx. 8 m^3 per year. For the cost estimate it is assumed that the waste is supplied, packed and ready for deposit, i.e. the cost estimate excludes packing, transport, etc.

Due to the 31 years of operation, the total operational costs are very sensitive to assumptions concerning staffing and salaries. For the determination of the most likely price it has been assumed that the basic operation during 31 years is realised by a permanent staff that is hired at certain, individual annual salaries (incl. social charges, etc.). For the initial filling period it is assumed that additional external personnel is hired from a contractor at much higher unit prices for the various (short-term) jobs. The overall uncertainty for the operation costs is considered by using minimum and maximum percentages of the most likely costs of 75 pct. and 150 pct., respectively.

Closure

In correspondence with the construction costs, closure costs are determined by means of Bill of Quantities based on experience from recent comparable projects and actual price quotes. Thus, the general uncertainty of 15 pct. to 20 pct. on all most likely estimated costs also applies to the closure. 17.5 pct. are taken as plus/minus variation on the most likely costs.

Monitoring and institutional control

Monitoring during operation and after closure does not differ to a large extend and are thus treated together. The monitoring period taken into account for the cost estimates is 1+30 years and the depreciation period is set to 50 years, ending in 2122. Monitoring will be required after the closure. The expenditure on post-closure monitoring may actually be at the same level as the monitoring during the first 31 years.

The costs of monitoring during the first year of initial filling are considered to correspond to the costs for monitoring during the 30 years of active period. Monitoring costs are considered to largely agree between different facility types (differences in the cost for the required devices are negligible), except the costs for establishing the monitoring wells that might vary with the required depth.

One initial lump sum plus an annual lump sum are assumed and used for the estimate of the most likely monitoring costs for all types of disposal solutions. The initial lump sum includes the establishment of the monitoring wells and the costs for other equipment, whereas the lump sum per year includes personal costs and costs for the analyses.

The overall uncertainty for the monitoring costs is considered by using minimum and maximum percentages of the most likely costs of 75 pct. and 150 pct. respectively.

8.1.7. Cost profile over time and essential assumptions

Cost profiles over time are included in Parliamentary Resolutions B48/2003 (for decommissioning) and B90/2018 (for long-term storage and disposal facilities). An average interest rate of 5 pct. p.a. is calculated on the annual costs of the long-term storage facility as well as the disposal facility. A rate of depreciation is calculated on the basis of a 50 year period for each facility type.

8.2. Financing Schemes, Needs and Estimations

The Danish national programme is financed through the following allocations on the Financial Act:

- The operating costs of the competent regulatory authority are funded through allocations to the ministries in charge (Health and Defence).
- The operating costs of Danish Decommissioning (license holder) are funded through allocations to the Ministry of Higher Education and Science.
- The project costs of decommissioning are financed through a separate reserve fund of approx. DKK 1 bn.
- The costs of the long-term storage facility and the disposal facility are financed though a separate reserve fund of approx. DKK 2.3 bn. The operating costs of both facilities are covered by the reserve fund. For the long-term storage facility, the

reserve fund will finance a 50-year operation period from 2023-2073[18]. For the disposal facility, the reserve fund will finance a 50-year operation period from 2073 to 2122.

8.2.1. Responsibilities, adequacy, availability and security

The responsibility of funding the Danish national programme lies with the Danish Parliament. The adoption of the annual Financial Act, which is a requirement in the Danish constitution, confirms the obligations of Parliament to meet the costs of the national programme and to guarantee the availability of funds at the time when they are needed.

In the event of an unforeseen budget requirement, a motion of approval is prepared by the responsible ministry to be presented to the Financial Committee of the Danish Parliament. The Finance Committee will decide the motion of approval and allow for an additional appropriation. This procedure is typically used for handling the finance of activities where costing is difficult to perform accurately, such as decommissioning projects and other activities related to the management of radioactive waste.

All additional appropriations approved during the financial year are collected in a single appropriations law which is then adopted by Parliament immediately after the end of the financial year.

8.2.2. Re-assessments and validations

Annual re-assessment and validation of required financial resources are performed routinely in coordination with the preparation of the Financial Act. The responsibility lies with the ministries in charge. Hence, the Ministry of Higher Education and Science is responsible for validating required financial resources for Danish Decommissioning's activities and for reporting the results of the validation to the Ministry of Finance for inclusion in the proposal for next year's Financial Act

[18] The operation period will be shorter as the long-term storage facility will not enter into operation before 2024 at the earliest

9. Transparency

Article 10 – Transparency

1. Member States shall ensure that necessary information on the management of spent fuel and radioactive waste be made available to workers and the general public. This obligation includes ensuring that the competent regulatory authority inform the public in the fields of its competence. Information shall be made available to the public in accordance with national legislation and international obligations, provided that this does not jeopardise other interests such as, inter alia, security, recognized in national legislation or international obligations.
2. Member States shall ensure that the public be given the necessary opportunities to participate effectively in the decision-making process regarding spent fuel and radioactive waste management in accordance with national legislation and international obligations.

9.1. Information from the competent authority

All relevant legislation and guidance pertaining to the responsible and safe management of radioactive waste in Denmark is publicly available on the website of the Danish Health Authority[19]. All acts, executive orders, circulars and significant parts of guidance documents are also available in English.

Following Circular no.9654 on the responsible and safe management of radioactive waste, the Danish Health Authority is charged with the task of compiling and publishing the contents of the Danish national programme for the responsible and safe management of radioactive waste and subsequent reports to the European Commission on its implementation, as required by provisions of Council Directive 2011/70/Euratom.

In addition, the Danish Health Authority publishes the key outcomes of self-assessments and peer reviews carried out as required in Council Directive 2009/71/Euratom (as amended by Council Directive 2014/87/Euratom), article 9.3 regarding national framework and authorities for nuclear safety and Council Directive 2011/70/Euratom, article 14.3 regarding the national framework, competent regulatory authority and national programme.

The Danish Health Authority also compiles, presents and publishes Danish National reports to the International Joint Convention of 5 September 1997 on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management under the IAEA, and reports on the outcomes of the ensuing review meetings available to the public.

Circular 9450 on nuclear safety specifies obligations for the Nuclear Regulatory Authorities regarding information and reporting, ensuring that information to workers and the general public pertinent to safety on-site at and in the vicinity of nuclear installations

[19] Danish Health Authority, Radiation Protection, Legislation

be made available. In extension hereof, the Nuclear Regulatory Authorities compiles situation reports on nuclear safety with respect to the nuclear installations at the Risoe site. The situation reports *inter alia* provides information about the implementation of regulatory control of nuclear safety and the status of nuclear safety in Denmark. The situation report is to be submitted to the Ministry of Health, which forwards it to the Danish Parliament for briefing purposes, and the Danish Health Authority makes the report available to the public directly after briefing of the Danish Parliament.

9.2. Transparency and public participation

Mechanisms for enhancing transparency in the process of establishing a long-term management solution for radioactive waste and spent fuel in Denmark were introduced by the Ministry of Higher Education and Science in 2016. A dedicated landing page on the Ministry's website provides one-stop access to information, publications and news regarding activities of the long-term solution/national programme. A contact forum to provide information and solicit views and opinions from national stakeholders was formed. A panel of independent experts was formed to provide access for the general to public to scientifically vetted information on central aspects of radioactive waste management. Also in 2016, Danish Decommissioning formed an international experts' group in order to gain access to advice and counselling on technical matters relating to radioactive waste management.

Since the last national report in 2018, a new contact forum was established in Roskilde Municipality in 2019 to provide a venue for local stakeholders to follow Danish Decommissioning's long-term storage facility construction project under Parliamentary Resolution B90/2018. The new contact forum meets four times a year to discuss and provide counsel on various aspects of the facility project and its implications for local society. The Ministry of Higher Education and Science provides administrative assistance to Roskilde Contact Forum. Members of the contact forum include: representatives of Roskilde Municipal Council, local and national NGOs/concerned citizens' groups, the municipal administration, the nuclear regulatory authorities, Danish Decommissioning staff, other institutional stakeholders on the Risoe location, Geological Survey of Denmark and Greenland, finally, Danish Agency for Higher Education and Science.

10. Implementation of the national programme

Article 11 – National programmes

1. Each Member State shall ensure the implementation of its national programme for the management of spent fuel and radioactive waste ('national programme'), covering all types of spent fuel and radioactive waste under its jurisdiction and all stages of spent fuel and radioactive waste management from generation to disposal.
2. Each Member State shall regularly review and update its national programme, taking into account technical and scientific progress as appropriate as well as recommendations, lessons learned and good practices from peer reviews.

Article 12 – Contents of national programmes

1. The national programmes shall set out how the Member States intend to implement their national policies referred to in Article 4 for the responsible and safe management of spent fuel and radioactive waste to secure the aims of this Directive, and shall include all of the following:
   - (a) the overall objectives of the Member State's national policy in respect of spent fuel and radioactive waste management;
   - (b) the significant milestones and clear timeframes for the achievement of those milestones in light of the over-arching objectives of the national programme;
   - (c) an inventory of all spent fuel and radioactive waste and estimates for future quantities, including those from decommissioning, clearly indicating the location and amount of the radioactive waste and spent fuel in accordance with appropriate classification of the radioactive waste;
   - (d) the concepts or plans and technical solutions for spent fuel and radioactive waste management from generation to disposal;
   - (e) the concepts or plans for the post- closure period of a disposal facility's lifetime, including the period during which appropriate controls are retained and the means to be employed to preserve knowledge of that facility in the longer term;
   - (f) the research, development and demonstration activities that are needed in order to implement solutions for the management of spent fuel and radioactive waste;
   - (g) the responsibility for the implementation of the national programme and the key performance indicators to monitor progress towards implementation;
   - (h) n assessment of the national programme costs and the underlying basis and hypotheses for that assessment, which must include a profile over time;
   - (i) the financing scheme(s) in force;
   - (j) a transparency policy or process as referred to in Article 10;
   - (k) if any, the agreement(s) concluded with a Member State or a third country on management of spent fuel or radioactive waste, including on the use of disposal facilities.
2. The national programme together with the national policy may be contained in a single document or in a number of documents.

10.1. Implementation progress 2018-2021

The national programme of Denmark for the responsible and safe management of radioactive waste, cf. Article 11 of Council Directive 2011/70/Euratom, was communicated to the EU Commission in December 2020. The programme integrates the policy decisions of Parliament Resolutions B48/2003 and B90/2018 and outlines the implementation process in three stages: short term, mid term and long term, cf. Section 1.1. and Chapter 7 of the national programme.

During the short term stage (2020-approx. 2030), the deliveries are the following:

1. Establish upgraded storage facility, reassessment of radioactive waste inventory, predisposal management and research, development and demonstration activities – taking into account management options for the “special waste”.
2. Review and identification of geologies suitable for disposal down to 500m depth
3. Identify possible disposal concepts incl. feasibility and barrier system studies
4. Designation of most relevant sites for detailed studies based on the outcome of 1-3 and partnership options.

The implementation progress of short term stage deliveries are given below.

10.1.1. Upgraded storage facility

At present, one of the main activities is planning, design and construction of an upgraded storage facility as a substitute for the existing facilities that were not constructed for longerterm storage, re. B90/2018As described in Section 6.3 a detailed project proposal has been elaborated, and the main focus is now on finalising the safety analysis and preparing the documentation for obtaining the necessary approvals for the facility. It is envisaged that the building will be ready for operation in 2025, whereafter the radioactive waste will be transferred to the facility.

10.1.2. Decommissioning

The status of decommissioning is described in detail in Section 2.2.1. According to B48/2003 decommissiong was defined as finalised when all buildings and areas were cleared and released from regulatory control. However, with B90/2018 the radioactive waste will remain on the Risoe site until 2073 at the latest. When the waste has been transferred to the new, upgraded storage facility, all other existing facilities will be finally decommissioned and clearance measurements of existing buildings and land areas will be conducted. Once the waste has been transferred to a disposal facility, the upgraded storage facility and other facilities will be decommissioned and the entire peninsula cleared.

10.1.3. Geological data review and preliminary site studies

The geological data review and site studies is delivered by The Geological Survey of Denmark and Greenland. (GEUS). Following a project plan, covering two major phases running from 2019 to 2026, the first phase consists of a review of existing data in order to establish an overview of geological conditions at a depth of 500 m. Phase 1 has been

running since 2019 and will be concluded by the end of 2021 with an area report which will describe potential geologies for further consideration, according to a number of criteria which have been developed during this phase. Criteria are established by using IAEA guidelines and recommendations as well as earlier studies in Denmark by The Geological Survey of Denmark and Greenland to provide a baseline for area evaluation.

The second major phase of the project is scheduled for 2023-2026, focusing on detailed geological data acquisition and investigations for characterization of the geological properties at two sites. Based on the new data, an evaluation of the geological suitability for deep geological disposal at each of the two sites will be made.

10.1.4. Disposal concept

The preliminary studies, which were concluded in 2011, presented, amongst other things, a number of safe possible disposal concepts for further investigation if the Danish waste were to be disposed of in a near-surface repository or a repository at intermediate depth (see 10.2 above). These concepts are still relevant for part of or all the waste.

Since the adoption of B90/2018 deep geological disposal (300+ m) was included a possibility, as well as a combination of a deep geological facility such as a borehole with a facility at either near-surface or intermediate depth.

DD has visited Finland, Sweden and France where deep geological disposal facilities are in the planning and/or preparation to learn about the facilities and processes. In addition, DD is involved in the European Repository Development Organisation (ERDO) Deep Borehole investigations where the possibility of an internationally shared borehole facility is under investigation. The project has identified a basic design that could enable disposal of both spent fuel and high-level waste from reprocessing, thereby enabling disposal of a significant portion of the collective waste inventory from the participating countries (Croatia, Denmark, The Netherland, Norway, and Slovenia). Furthermore, a study comprising an initial assessment of a deep borehole solution for disposal of nuclear waste from the ERDO countries using established directional drilling techniques together with patented new technologies and processes has been initiated within the ERDO framework with Norsk Nukleær Dekommisjonering (NND) as project owner.

Leaving the possibility of facilities near-surface, at intermediate depth, and deep geological depths (or a combination hereof) open, gives a larger fan of possibilities regarding the selection of a host localilty during the planned voluntary process, as potentially fewer localities will need to be disregarded owing to unsuited geological settings.

Thus, DD is planning to present an overview of the safe, possible disposal solutions to the stakeholders as part of the communicartion plan during the process.

10.1.5. Designation of locations for detailed site studies

Concurrent with the geological data review, Ministry of Higher Education and Science is preparing a communication process with local stakeholders to take place in 2022 in order to explore if a voluntary partnership to identify two sites for detailed geological studies can be established as specified in Parliamentary Resolution B90/2018. The communication process will take its point of departure in the area report of The Geological Survey of Denmark, cf. section 10.3.3. A communication plan to guide the process in 2022 is under preparation for government approval during the fall of 2021.

The communication process will be concluded in 2022 and the outcome will provide the basis for a decision on the progression to detailed geological studies (phase 2 of the GEUS-project).

11. Peer reviews and self-assessments

Article 14 – Reporting

3. Member States shall periodically, and at least every 10 years, arrange for self-assessments of their national framework, competent regulatory authority, national programme and its implementation, and invite international peer review of their national framework, competent regulatory authority and/or national programme with the aim of ensuring that high safety standards are achieved in the safe management of spent fuel and radioactive waste. The outcomes of any peer review shall be reported to the Commission and the other Member States, and may be made available to the public where there is no conflict with security and proprietary information.

11.1. IRRS and ARTEMIS review missions

Denmark invited the IAEA to conduct full scope IRRS and ARTEMIS missions in the spring of 2020 in accordance with the requirements in Council Directives 2009/71/Euratom, article 9.3 regarding national framework and authorities for nuclear safety and 2011/70/Euratom, article 14.3 regarding the national framework, competent regulatory authority and national programme.

However, due to the COVID-19 pandemic, the IRRS mission was postponed twice, and is now scheduled to take place from 30. August to 8. September, 2021. The ARTEMIS mission was correspondingly postponed and is now scheduled for 1. May to 9. May, 2022.

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