



**Report on implementation of PARCOM  
Recommendation 91/4 on radioactive discharges  
and the application of BAT and BEP**



**Denmark**

Danish Health Authority, 2026  
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Advice on radiation protection  
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ISBN online: 978-87-7014-696-8  
Language: English  
Version: 01 Versions  
Date: 13.02.2026  
Format: pdf  
Published by Danish Health Authority

E-mail: [sis@sis.dk](mailto:sis@sis.dk)  
Web: [www.sis.dk](http://www.sis.dk)

## Executive Summary

As contracting party to the OSPAR Convention, Denmark has submitted the present **Report on implementation of PARCOM Recommendation 91/4 on radioactive discharges** for review in the Radioactive Substances Committee (RSC) as part of the eighth reporting round.

The report presents general information on national legislation, dose limits, discharge limits as well as site specific information on the Danish nuclear research site Risø, which is the only site for nuclear facilities in Denmark.

The site has been in operation since the 1950'ies and the facilities on the site have been under decommissioning since 2003. During operation as well as decommissioning, discharges to the environment have been subject to regulatory requirements regarding permissible discharges, monitoring thereof and monitoring of radioactivity in the surrounding environment.

Waste management facilities and methodologies for limiting discharges and effects thereof have been in operation throughout the history of the nuclear facilities at the Risø site. Over the last two decades, where decommissioning activities have been ongoing, the basic management methodologies and technical facilities have remained largely unchanged. However, facilities have been continuously adapted to the needs specific to decommissioning at any given point in time.

Based on results of the environmental monitoring programme, including data on the discharges, environmental impact assessments and recorded doses to workers and inferred exposure of member of the public, it may be concluded, that the BAT and BEP as applied at the Risø site, is commensurate with the nature, scale and complexity of the current activities related to operation, decommissioning and waste management at Risø Site.

The environmental monitoring programme for the Risø site will continue to be reviewed and updated to ensure it reflects the impact of the operations of the facilities at any given time.

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# 1. General Information

## 1.1. Introduction

The OSPAR Convention, the Convention for the Protection of the Marine Environment of the North-East Atlantic was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force in 1998 on March 25.

The Contracting Parties to the convention are Belgium, Denmark, the European Union, Finland, France, Germany, Iceland, Ireland, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom.

This report was compiled in accordance with the ***Guidelines for the submission of Information about, and the Assessment of, the Application of BAT and BEP in Nuclear Facilities***, (OSPAR Agreement: 2018-01). The report was submitted for review in the Radioactive Substances Committee (RSC) as part of the eighth reporting round.

The report contains information on national legislation, dose limits, discharge limits as well as site specific information on the Danish nuclear research site Risø.

The report was compiled by the Danish Health Authority in agreement with the Danish Environmental Protection Agency under the Danish Ministry of Environment.

## 1.2. Relevant national authorities and responsibilities

The Danish Health Authority (DHA) is the leading health authority in Denmark, promoting public health – creating and maintaining a framework for the health service in Denmark. The tasks include health promotion, prevention and disease treatment, radiation protection, training of health professionals, health preparedness and planning of health care. DHA counsels the Minister of Interior and Health as well as national, regional and municipal authorities and work with professional societies and organisations, private actors and civil society.

The DHA's division for Radiation Protection (hereafter DHARP) is according to the Radiation Protection Act<sup>1</sup> the competent authority in all matters relating to the use of ionizing radiation and exposures to natural radiation sources. The overall mission of DHARP is to protect humans and the environment from the harmful effects of ionising radiation in the use of or exposure to human-made or natural radiation sources, whether in planned, existing or emergency radiation situations. The core function of DHARP is thus to ensure that use of, or exposure to, radiation sources are always justified, optimized and within the dose limits.

<sup>1</sup> The Radiation Protection Act and Act amending the Radiation Protection Act

DHARP is the responsible authority for the oversight of radioactive discharges. This includes radioactive discharges from nuclear facilities, their associated radioactive waste treatment facilities and discharges from decommissioning activities. Discharges of all other (non-radioactive) substances are regulated by the Danish Environmental Protection Agency.

As an additional function, DHARP in cooperation with the Nuclear Division of the Danish Emergency Management Agency (DEMA) under the Ministry of Resilience and Preparedness, performs the everyday administration delegated to the Nuclear Regulatory Authorities consistent with the Nuclear Installations Act<sup>2</sup>.

### 1.2.1. Risø site

The nuclear facilities in Denmark are all located on the Risø peninsula (hereafter Risø site) to the North of Roskilde (Figure 1). Decommissioning has been in progress since 2003, when responsibility for operation and decommissioning of the nuclear facilities, as well as continued waste management at the Waste Management Plant according to [Parliamentary Resolution B48](#) was assigned to the state-owned enterprise Danish Decommissioning.

Danish Decommissioning is responsible for operation and decommissioning of the former nuclear facilities in Denmark. Danish Decommissioning is tasked with the responsibility of collecting, characterizing and managing radioactive waste generated from institutional applications and radioactive waste resulting from operation and decommissioning of the original six nuclear facilities at the Risø site. The activities of Danish Decommissioning result in discharges of radioactive substances to the atmosphere and to the surrounding waters of Roskilde Fjord. As part of operations and decommissioning, discharges of radioactive substances take place within the parameters specified in the operational limits and conditions set for Danish Decommissioning.

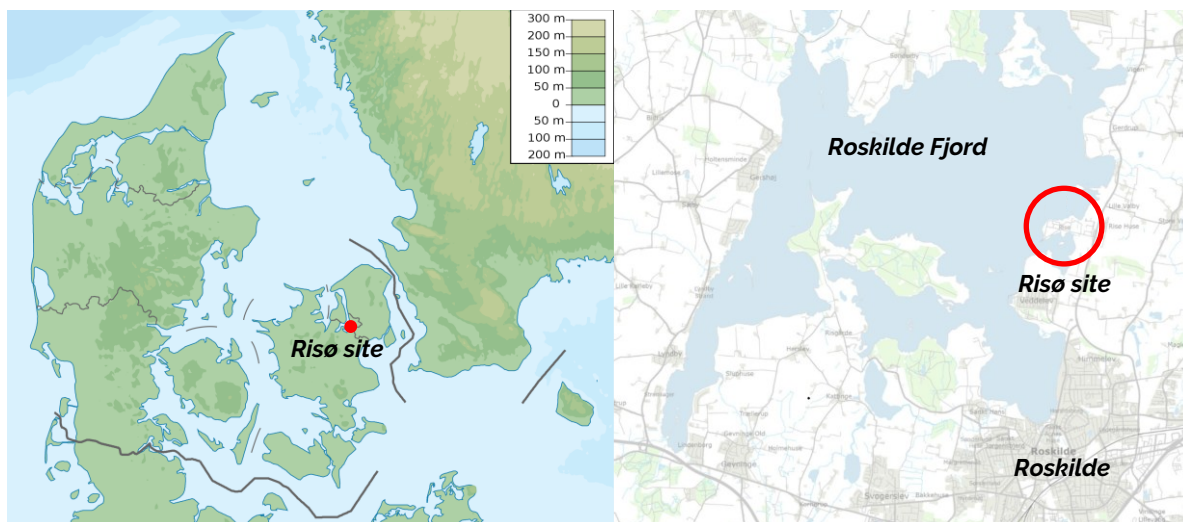


Figure 1: Map of Denmark showing the location of the Risø site in Roskilde Fjord.

<sup>2</sup> The Nuclear Installations Act

### 1.3. National legislation and basis for regulation

The Danish legislation listed below is in force per January 2026. The legislation (currently only in Danish) is available at the web site of the DHARP ([Danish legislation on radiation protection](#)).

#### Acts:

- Act no. 23 of 15 January 2018, on Ionising Radiation and Radiation Protection (The Radiation Protection Act)
- Act nr. 305 of 25 March 2025, Act amending the Radiation Protection Act (Radiation protection contingency plan and strategies for handling existing radiation exposure situations, etc.)
- Act no. 244 of 12 Maj 1976 on Safety and Environmental Conditions at Nuclear Facilities, etc. (The Nuclear Safety Act)
- Act no. 170 of 16 May 1962, on Nuclear Installations (The Nuclear Installations Act)
- Consolidation Act no. 993 of 9 September 2014 on compensation for nuclear accidents and incidents
- The Finance Act, 2019, § 16.11.11 including text annotation 2
- Consolidation Act no. 903 of 26 August 2019 on Health (The Health Act)
- Consolidation Act no. 1225 of 25 October 2018 on Environmental Impact Assessment of Plans and Programs and of Specific Projects (EIA) (The EIA Act)

#### Parliamentary Resolutions:

- Parliamentary Resolution B103, 1985 on Energy Planning without Nuclear Energy
- Parliamentary Resolution B48, 2003 on the Decommissioning of the Nuclear Facilities at Research Station, Risø (Parliamentary Resolution B48)
- Parliamentary Resolution B90, 2018 on a Long-Term Solution for Denmark's Radioactive Waste (Parliamentary Resolution B90)

#### Executive Orders:

- Executive Order no. 1384 of 18 November 2025 on Ionising Radiation and Radiation Protection (Executive Order 1384/2025)
- Executive Order no. 1385 of 18 November 2025 on Radioactive Substances (Executive Order 1385/2025)
- Executive Order no. 1386 of 18 November 2025 on Use of Radiation Generators
- Executive Order no. 1388 of 18 November 2025 on Transboundary Shipments of Radioactive Waste and Spent Nuclear Fuel
- Executive Order no. 672 of 1 July 2019 on Transboundary Shipments of Radioactive Waste and Spent Nuclear Fuel
- Executive Order no. 278 of 27 June 1963 on Protective Measures against Accidents at Nuclear Facilities, ect. - as changed according to Executive Order no. 502 of 10 January 1974
- Executive Order no. 1111 of 7 November 2019 on Fees for Danish Health Authority Inspection and Guidance (in Danish)
- Executive Order no. 1762 of 27 December 2016 on Security Measures for Nuclear Material and Nuclear Facilities and Drafting of Security Plans
- Executive Order no. 315 of 27 June 1972 on the Peaceful Control of Nuclear Materials

#### Circulars:

- Circular no. 15105 of 22 December 1975 on the 24/7 Expert Service at the Danish Health Authority, Radiation Protection
- Circular no. 3151 of 26 November 1964 on the Cooperation between the Danish Health Authority and the WEA
- 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.

- Circular no. 9635 of 16 June 2022 on tasks of the Danish Health Authority and the Danish Agency for Higher Education and Science concerning responsible and safe management of radioactive waste.
- Circular no. 9261 of 11 March 2022 on Danish Decommissioning.

**Operation Limits and Conditions:**

Operational Limits and Conditions issued by the nuclear regulatory authorities:

- Operational Limits and Conditions for Danish Decommissioning (OLC)
- Operational Limits and Conditions for DTU Risø Campus

**National policy and programme:**

- National Program for the Responsible and Safe Management of Radioactive Waste (2020)

## 1.4. Application of BAT/BEP in domestic legislation

### 1.4.1. Legislation on radiation protection

The Radiation Protection Act and its underlying Executive Orders, in particular Executive Order No. 1384/2025 and 1385/2025 provide the legal framework for radiation protection and the regulation of the use of radioactive substances including discharges to the environment.

**Justification, Optimisation and Dose limitation**

The general provisions of Executive Order 1384/2025 (see Chapter 5, 6, and 7) state that any use of radiation substances shall be justified and optimized, and the resulting sum of doses to an individual from the use shall not exceed the dose limits.

**Licensing and notification**

According to Executive Order 1385/2025 (§ 8), discharge of radioactive materials may be subject to licensing from or notification to the DHA or may be exempt from the licensing and notification requirements in accordance with the limits of activity and activity concentration specified in Annex 1, Annex 3 and Annex 4 of the Executive Order.

**General provisions on use of radioactive substances**

Furthermore, general provisions in Executive Order no. 1385/2025 are in place that ensures that:

- the manufacture of radionuclides and any holdings of radioactive material shall be kept to the minimum necessary for its use (§ 38).
- all use of radioactive material shall be facilitated in such a way that the production of radioactive waste is kept to the minimum necessary for that use (§ 39).

**Clearance or exemption**

Clearance or exemption may be granted, with prior approval of the DHA (Executive Order no. 1385/2025, § 13). In accordance with the general criteria for exemption from licensing or notification requirements and for clearance as given in Annex 2 of. The general criteria reflect the framework given in section 3 of Annex VII in the EU BSS and state amongst other, that the effective dose to any member of the public due to cleared radioactive material must be of the order of 10 µSv or less in a year for artificial radionuclides or of the order of 1 mSv or less in a year for naturally occurring radionuclides.

**Discharge**

Discharge of radioactive material must take place as soon as reasonably achievable, and within a time period of no more than 12 months (Executive Order no. 1385/2025, § 27).

The discharge shall ensure that dispersion of radioactive substances in the surrounding environment is effective (Executive Order no. 1385/2025, § 29).

## 1.5. Dose limit, constraints and discharge limit setting rationale

The Radiation Protection Act and underlying Executive Orders define dose limit, dose constraints and provisions regarding discharge of radioactive substances to be taken into account with respect to planned discharges of radioactive substances from the nuclear facilities at the Risø site.

The dose limit for members of the public from ionizing radiation, specified in the Executive Order 1384/2025 is 1 mSv/year (effective dose).

According to § 11 in Executive Order 1384/2025, an undertaking's use of radiation sources or exposure at the same geographical location is subject to a dose constraint on the effective dose to members of the public of 0.1 mSv/year. Where the use of radiation sources or exposure by multiple undertakings may affect the same member of the public at the same geographical location, the DHA may, for each of those undertakings, stipulate a dose constraint lower than 0.1 mSv/year.

These provisions are implemented in Operational Limits and Conditions (OLC) for Danish Decommissioning through stipulated permissible levels of discharge of radioactive substances. Permissible discharges correspond to the dose constraint for a member of the public living in the neighbouring community to the Risø site. For the Risø site specifically, the dose constraints have been set at 0.05 mSv/year for each of the 6 facilities on the site and 0.1 mSv/year for the activities of Danish Decommissioning as a whole.

## 1.6. Regulation, surveillance and monitoring

The Chapter 5 and 6 in the OLC also provide conditions for radiological monitoring programs and permissible levels for discharge of radioactive substances at the Risø site. The annual allowed levels of discharge of radioactive substances to the atmosphere from a single nuclear facility is given in Table 1.

Radionuclide	Annual discharge limit to the atmosphere (GBq/year)
<sup>3</sup> H	1,000,000
<sup>14</sup> C	1,000
<sup>60</sup> Co	1,000
<sup>90</sup> Sr	200
<sup>137</sup> Cs	700
<sup>152+154</sup> Eu	700
Actinides	1

**Table 1: Annual permissible levels of discharge to the atmosphere.**

The annually permissible levels of discharges to Roskilde Fjord from a single nuclear facility is given in Table 2..

Radionuclide	Annual discharge limit to Roskilde Fjord (GBq/year)
$^3\text{H}$	1,000,000
$^{137}\text{Cs}$	400

**Table 2: Annual permissible levels of discharge to Roskilde Fjord.**

Reporting levels for discharge of radioactive substances have been set in OLC, for Danish Decommissioning. Accordingly, increases in discharges of radioactive substances must be reported to the Nuclear Regulatory Authorities within 14 days, if the discharges per month or the expected discharges per month will exceeding the values given in Table 3 and Table 4.

Radionuclide	Reporting level for discharges to the atmosphere from one nuclear facility [GBq/month]
$^3\text{H}^*$	1.000
$^{14}\text{C}$	1
$^{60}\text{Co}$	1
$^{90}\text{Sr}$	0,2
$^{137}\text{Cs}$	0,5
$^{152+154}\text{Eu}$	0,5
Actinides	0,001

**Table 3: Reporting levels for discharge to the atmosphere. \* Discharge of Tritium into the atmosphere is only reported for DR 3.**

Radionuclide	Reporting level for discharge to Roskilde Fjord from the Waste Management Plant [GBq/month]
$^3\text{H}$	1000
$^{137}\text{Cs}$	0.5

**Table 4: Reporting levels for discharges to Roskilde Fjord.**

The discharges of radioactive substances to Roskilde Fjord and to the atmosphere from the nuclear facilities at the Risø site are documented in discharge and monitoring reports, submitted every six months to the Nuclear Regulatory Authorities.

## 1.7. Environmental monitoring programmes

The Radiation Protection Act assigns the responsibility for radioactive waste management including discharge of radioactive substances with the licence holder,

The OLC for Danish Decommissioning, detail how the nuclear installations at the Risø site shall be safely operated and decommissioned, which includes the requirement of environmental monitoring programs.

According to the OCL, an environmental monitoring program of the nearby surroundings of the Risø site must include sampling and measurements as listed in Table 5.

Quantity	Type	Place	Frequency	Measurement
1	Air sample	The Risø site	Weekly	$\gamma$ -spectrometry
1	Precipitation sample	The Risø site	Monthly	$\gamma$ -spectrometry
1	Precipitation sample	The Risø site	Monthly	Tritium
1	Sediment sample	Roskilde Fjord the area between of Risø site and Bolund	Annual	$\gamma$ -spectrometry
1	Water sample	Roskilde Fjord by the Risø site pier	Quarterly	Tritium
1	Water sample	Roskilde Fjord by the Risø site pier	Annual	$^{137}\text{Cs}$
1	Grass sample	The Risø site	Monthly	$\gamma$ -spectrometry
9	Grass sample	At a distance of 16 km to the Risø site	Quarterly	$\gamma$ -spectrometry
1	Sea plant sample	Roskilde Fjord the area between the Risø site and Bolund	Annual	$\gamma$ -spectrometry
1	Waste water sample	Waste Management Plant	Weekly	Total $\beta$ -activity
25	External radiation	The Risø site	Annual	Scintillation counter and TL dosimeters

**Table 5: Monitoring program of the environment at the Risø site and its nearby surroundings (Risø District).**

The results of the monitoring program are presented in the half yearly monitoring reports, which are submitted to the Nuclear Regulatory Authorities. The latest report [Radioactivity in the Risø District](#),

[January-June 2025](#) is available via the homepage of Danish Decommissioning, and older reports can be obtained from Danish Decommissioning upon request.

In addition, Denmark carries out a national environmental radioactivity monitoring program in accordance with the provisions of the EURATOM treaty Art. 35. In May 2024, the European Commission conducted a verification visit in Denmark. The main purpose of the verification visit was to confirm that the environmental radioactivity monitoring arrangement in Denmark in routine and emergency situation is in accordance with EURATOM treaty Art. 35. The main conclusions of the verification visit were:

- The verification activities performed demonstrated that the facilities necessary for the monitoring of levels of radioactivity in air, water and soil in Denmark are adequate.
- The verification activities performed demonstrated that the facilities necessary for the monitoring of levels of radioactivity in air, water, and soil in Denmark in the event of a radiological emergency are adequate.

For a full account of results of the verification visit to Denmark please see:

1. [Questionnaire for the Euratom Article 35 verification visit to Denmark, 2024](#)
2. [Verification under the terms of Article 35 of the Euratom Treaty, Main Conclusions, Denmark 2024](#)
3. [Verification under the terms of Article 35 of the Euratom Treaty, Technical Report, Denmark 2024](#)

## 1.8. Radiation dose assessment methods

The permissible limits stipulated in the OLC for the discharge of radioactive substances from the operation and decommissioning of the nuclear facilities were derived through assessment of exposure scenarios and referring to the dose constraint specified for a member of the public living in close vicinity to the Risø site. The dose constraint is thus of 0.05 mSv/year for each nuclear facility and 0.1 mSv/year for Danish Decommissioning considered as a whole.

As a basis for setting the dose constraints, radiation doses were assessed for atmospheric discharges as well as discharges into Roskilde Fjord.

For assessment of doses associated with discharges to atmosphere, the model applied was a gaussian dispersion model using average atmospheric stability conditions based on the local distribution of Pasquill/Gifford stability categories. Transfer factors from deposited activity to major foodstuffs and the methodology to assess ingestion doses took into consideration that individual doses from the exposure to activity released during decommissioning is dominated by the inhalation and ingestion pathways compared to external doses. Therefore, only doses from ingestion of contaminated foodstuffs and inhalation doses were calculated.

The aquatic dispersion of radioactive materials being released to Roskilde Fjord was calculated from a compartment model, taking into account residence times of waste masses in adjacent water bodies to the fjord. Derived average (steady-state) concentrations of radionuclides in the waters of Roskilde Fjord were used as a basis for exposure assessment related to intake of fish and water (as drinking water, which is highly conservative, since all drinking water in Denmark is ground water).

The dose assessment methodology is consistent with recommended methodologies applied for submission of General Data relating as called for under the Article 37 of the Euratom Treaty and as recommended in Commission Recommendation 1999/829/Euratom of 6 December 1999.

## 1.9. Environmental norms and standards

The operation and decommissioning of the nuclear facilities at the Risø site is subject to requirements for environmental impact assessment (EIA). The EIA related to the operation and decommissioning of the nuclear facilities was carried out in 2003 and demonstrated adherence to national regulations and standards. Approval of operational and decommissioning activities was granted the same year. Decommissioning activities are expected to be completed around 2030.

## 1.10. Quality assurance

According to Executive Order no. 1384/2025 § 89 there are general provisions in place requiring that the use of radiation sources and exposure must be carried out in accordance with an effective quality management system. This requirement is also reflected in the OCL for Danish Decommissioning.

Hence, Danish Decommissioning was certified according to ISO 9001 in June 2004. The quality assurance system at present covers the entire process of decommissioning, including all radioactive waste management steps. The system is inspected biannually by Danish Standards (DS) and is subject to a complete audit every third year. Danish Decommissioning regularly conducts internal audits as required by the standard. All audit reports are available to the Nuclear Regulatory Authorities.

IT security requirements according to ISO 27001 have been implemented since 2015. Danish Decommissioning operates a radiological characterization laboratory for sampling and characterisation of radiological materials from the nuclear facilities, buildings and was commissioned in 2005. Since, the laboratory has undergone multiple external audits of quality assurance in accordance with the DS/EN ISO 9001:2015 standard. As part of its commitment to maintaining high-quality standards, the laboratory is subject to an external audit on an annual basis. In addition to external audits, the laboratory conducts internal audits on a yearly basis.

The Clearance Laboratory for decommissioning waste upholds an independent accreditation. The accreditation was granted in 2007 by DANAK in accordance with ISO/IEC 17025:2005 and revised to ISO/IEC 17025:2017 in 2020. This accreditation was confirmed during the latest audit in May 2023. The accreditation provides for the clearance of materials with no restrictions on the amount or type of decommissioning waste. The Waste Documentation System operated by Danish Decommissioning is based on bar code identification which enables real-time spatial tracking of any registered waste item. Danish Decommissioning also applies colour-coding of waste categories, waste containers and waste routes, which has reduced the number of waste handlings as well as waste destination errors.

## 2. Site-specific information – Risø

### 2.1. History of the Risø site

The Danish Nuclear Programme led to the construction and operation of three research reactors, Danish Reactor 1 (DR 1), Danish Reactor 2 (DR 2) and Danish Reactor 3 (DR 3), commissioned in 1957, 1958 and 1964 respectively, as well as an associated Waste Management Plant including radioactive waste storages, Hot Cells Facility and a Fuel Fabrication Facility – all situated at the Risø Peninsula (the Risø site, see Figure 2),



Figure 2: Aerial photo of the Risø Peninsula. All Danish nuclear facilities are located on the Risø site. Yellow circles indicate nuclear facilities under decommissioning. Green circles indicate nuclear facilities that are fully decommissioned and released from regulatory control.

The programme was active until the turn of the millennium, albeit the Danish Parliament in 1985 decided to adopt a resolution on energy planning without utilization of nuclear energy (Parliamentary Resolution B103, 1985 on Energy Planning without Nuclear Energy).

Following final termination of operations of the nuclear facilities at the Risø site, the Danish Parliament adopted Parliamentary Resolution B48, on the Decommissioning of the Nuclear Facilities at Research Centre, Risø (2003). Through this resolution, the Danish Parliament agreed to the costs and the general decommissioning approach for the Risø site, with the objective to decommission all nuclear installations and subsequently release the site for unrestricted use as soon as possible within a timeframe of 20 years.

In accordance with Parliamentary Resolution B90 adopted in 2018, on a Long-Term Solution for Denmark's Radioactive Waste, radioactive waste from decommissioning of the nuclear facilities at the Risø site as well as of institutional origin is to be stored at the Risø Peninsula for up to 50 years in an upgraded storage facility (to be established). A geological disposal facility for all Danish radioactive waste is scheduled for commissioning by 2073 at the latest.

An overview of the decommissioning status of each of the six nuclear facilities at the Risø site is given in Table 6.

Nuclear facility	Type	Taken out of operation	Decommissioning status
Danish Reactor 1 (DR 1)	Small homogeneous 2 kW reactor	2001	DR 1 is fully decommissioned and the building was released from regulatory control in 2006.
Danish Reactor 2 (DR 2)	5 MW research reactor of the open pool type	1975	DR 2 is fully decommissioned, but the Reactor Containment Hall is used for handling of contaminated waste objects.
Danish Reactor 3 (DR 3)	10 MW heavy water research reactor of the PLUTO type	2000	Biological shield is being removed.
Hot Cell Facility	Facility for post irradiation investigations of nuclear fuel	1989	85% of the activity has been removed and preparation for the demolishing of the cells is ongoing.
Fuel Fabrication Plant	Fuel Fabrication Plant for DR 2 and DR 3	2002	Fully decommissioned and the building was released from regulatory control in 2023.
Waste Management Plant including waste storage facilities	Radioactive waste management facilities	2019	The decommissioning plan is approved. The preparatory work and initial decommissioning of building 211 is ongoing.

**Table 6: Status of the decommissioning of the six nuclear facilities at the Risø site.**

## 2.2. Radioactive waste treatment facilities

The waste management facilities at the Risø site are at present operating in direct relation to the decommissioning activities providing facilities for decontamination, handling, and storage of radioactive waste.

The waste management facilities at the Risø site includes the Waste Management Plant (Figure 2) and associated waste storages for radioactive waste.

The function of the Waste Management Plant original included collection, conditioning and storage of radioactive waste from the laboratories and the nuclear facilities at the Risø site as well as institutional waste from other Danish users of radioactive substances.

No final disposal of radioactive waste has taken place in Denmark and all waste units generated since 1950'ies are presently stored in the storage facilities at the Risø site.

### **Name of the site**

Risø site

### **Location**

All nuclear facilities in Denmark are located at the Risø site. The Risø site is located at the Risø peninsula north of Roskilde, 30 km west of Copenhagen.

### **Type of the facilities**

Waste Management Plant (building no. 211) originally included facilities for distillation of liquid radioactive waste, active tanks for radioactive waste, active laboratories, active laundry facility, workshops and office facilities. However, these facilities have been moved to other buildings as part of the preparatory work and initial decommissioning of the Waste Management Plant.

Below is a list of facilities associated with the Waste Management Plant in operation today located in other buildings in operation:

- Active laboratory
- Decontamination facility
- Dismantling and packing facility
- Water treatment facility
- Laundry facility
- Storage facilities for radioactive waste

Associated with the Waste Management Plant are also several waste storages:

- Centralvej storage
- Low level waste storage
- The drum storage
- Intermediate storage
- Storage of liquid radioactive waste
- Institutional waste storage
- Decay storage for container for institutional waste

#### **Year of commissioning/licensing/decommissioning**

- The Waste Management Plant (building no. 211) was built in 1958.
- A decommissioning plan was submitted to the Nuclear Regulatory Authorities for approval in December 2018. In May 2019, Danish Decommissioning received a formal approval of the decommissioning plan from the authorities.
- The preparatory work for the decommissioning were initiated in 2020, as facilities to remain in operation were moved to other buildings on the Risø site. Preparations for decommissioning of Waste Management Plant are ongoing.

#### **Receiving waters and catchment area**

All radioactive waste water from the nuclear facilities at the Risø site plus radioactive waste water from other users of radioactive substances in Denmark are received and treated at the waste management facilities at the Risø Site. After treatment of the radioactive waste water at the waste management treatment facilities the water is pumped to the conventional water treatment plant at the Risø site. Following treatment at the conventional water treatment plant the water is discharged into Roskilde Fjord.

#### **Other relevant information**

Not relevant.

## **2.3. Decommissioning activities**

For a detailed description of the decommissioning of the six nuclear facilities at the Risø site the reader is referred to Denmark's eight national reports to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, which are made available online (Rigsfællesskabets rapporter til IAEA). A short status of the decommissioning of each facility at the Risø site is given in Table 6.

### **2.3.1. Danish Reactor 1 (DR 1)**

The Danish Reactor 1 (DR 1) was a 2kW thermal homogeneous solution type reactor, which used 20% enriched uranium fuel and light water as moderator. During the first 10 years of operation the reactor was used for neutron experiments and thereafter mainly for educational purposes

The DR 1 is fully decommissioned and the building and nearby land is release from regulatory control (Figure 2).

#### **Location of nuclear/non-nuclear installation**

One out of three research reactors located on the Risø peninsula (the Risø site), located near the city of Roskilde 30 km west of Copenhagen.

#### **Year for commissioning/licensing/decommissioning**

DR 1 was in operation from august 1957 until 2001. The decommissioning of DR 1 began in 2004 and finished by mid-2005. The building and nearby land was release from regulatory control in January 2006. Today, the building is used by the Danish Technical University for other purposes.

**Receiving waters and catchment area**

Not relevant.

**Other voluntary relevant information that does not tend to change.**

Not relevant.

**2.3.2. Danish Reactor 2 (DR 2)**

The Danish Reactor 2 (DR 2) was a 5MW pool-type light water reactor. The reactor was used for physics experiments and for the production of isotopes.

Today, the DR 2 is fully decommissioned, but the Reactor Containment Hall is used for handling of larger contaminated waste objects (Figure 2).

**Location of nuclear/non-nuclear installation**

One out of three research reactors located on the Risø peninsula (the Risø site), located near the city of Roskilde 30 km west of Copenhagen.

**Year for commissioning/licensing/decommissioning**

DR 2 was in operation from August 1958 until 1975. The decommissioning of DR 2 began in May 2006 and finished by the end of 2007. Today, the Reactor Containment Hall is used for handling of larger contaminated waste objects.

**Receiving waters and catchment area**

Not relevant.

**Other voluntary relevant information that does not tend to change.**

Not relevant.

**2.3.3. Danish Reactor 3 (DR 3)**

Danish Reactor 3 (DR 3) a heavy water reactor with a thermal power of 10 MW (Figure 2). The reactor was primarily used for basic neutron physics research, material research and production of isotopes for, for example, medical and industrial applications. In addition, the reactor was used for neutron irradiation (doping) of silicon for use in the semiconductor industry.

**Location of nuclear/non-nuclear installation**

One out of three research reactors located on the Risø peninsula (the Risø site), located near the city of Roskilde 30 km west of Copenhagen.

**Year for commissioning/licensing/decommissioning**

DR 3 was in operation from August 1960 until 2000, where it was shut down due to suspicion of a leak in the reactor tank. The shutdown ended up being permanent. The decommissioning of DR 3 was initiated in 2011 and the operator (Danish Decommissioning) plans to complete the decommissioning of DR 3 by 2027. The defined end state for decommissioning of DR 3 is release from regulatory control without restrictions.

**Receiving waters and catchment area**

All active waste water produced during the decommissioning of DR 3 is collected and transferred to the Waste Management Facility at the site for treatment.

**Other voluntary relevant information that does not tend to change.**

Not relevant.

### **2.3.4. The Hot Cell Facility**

The Hot Cell Facility (Figure 2) consists of six connected concrete cells, which have been used for handling radioactive materials and studies on irradiated subjects. Among other things, experimental fuel from DR 3 and cobalt sources for the hospitals' blood irradiation facilities have been handled and packaged here.

**Location of nuclear/non-nuclear installation**

Located on the Risø peninsula (the Risø site), located near the city of Roskilde 30 km west of Copenhagen.

**Year for commissioning/licensing/decommissioning**

The Hot Cell Facility was in operation from 1964 to 1989. The decommissioning of the Hot Cell is on-going and the operator (Danish Decommissioning) plans to complete the decommissioning of facility by 2030. The defined end state for decommissioning of facility is release from regulatory control without restrictions.

**Receiving waters and catchment area**

All active waste water produced during the decommissioning of the Hot Cell Facility is collected and transferred to the Waste Management Facility at the site for treatment.

**Other voluntary relevant information that does not tend to change.**

Not relevant.

### **2.3.5. The Fuel Fabrication**

The Fuel Fabrication Plant (Figure 2) is a former fuel factory where, reactor fuel for DR 2 and DR 3 was produced using enriched uranium powder.

**Location of nuclear/non-nuclear installation**

Located on the Risø peninsula (the Risø site), located near the city of Roskilde 30 km west of Copenhagen.

**Year for commissioning/licensing/decommissioning**

The Fuel Fabrication Plant was in operation from 1963 until 2000. The decommissioning of the Fuel Fabrication Plant is completed, and the building was following released from regulatory control in May 2023.

**Receiving waters and catchment area**

Not relevant.

**Other voluntary relevant information that does not tend to change.**

Not relevant.

## 2.4. Discharges to the Marine environment

### 2.4.1. Name of site

Risø Site

### 2.4.2. Activities from which radioactive liquid effluents arises

Danish Decommissioning is the main generator of the radioactive liquids managed at the Waste Management Facility at the Risø site. All radioactive liquids arising from operation and decommissioning activities at the nuclear facilities at Risø site are collected and managed at the Waste Management Facility.

The Waste Management Facility also receives radioactive waste liquids from licensees in industry in Denmark.

Additional information is given in Annex 1, Annex 2 and Annex 3,

### 2.4.3. BAT/BEP systems in place

All radioactive liquids arising from operation and decommissioning of the nuclear facilities at the Risø site are collected and managed via the following systems in place.

#### **Holding tanks for radioactive liquids (active tanks)**

Aqueous radioactive liquids arising from operation of individual facilities, including laboratories, on site laundry services and the high-pressure water decontamination cabin, are collected through dedicated drains connected to holding tanks. Water used for cooling or rinsing purposes during decommissioning is collected separately and transferred for further processing together with radioactive liquids arising from operations. The active tanks are protected from overflow, and are equipped with level alarms as well as alarms indicating overflow.

#### **Distillation and active storage tanks**

The contents of active tanks as well as active liquids received from external users are transferred to active storage tanks of the distillation unit at the Waste Management Facility.

According to OLC, the discharge of distilled water into the on-site water treatment plant for treatment as conventional waste water may only take place after a demonstration through measurements that the beta activity is less than 1.5 Bq/ml and if the total discharge complies with the requirements of OLC, see also Table 2.

Outlet from the distillation must be via the chimney. The ventilation air in the chimney must be continuously monitored for particulate beta activity. The discharge of particulate beta activity via the chimney must be determined by measurement on the filter of the air monitor in the chimney. The filter is replaced approx. every 14 days.

The content of uranium and other alpha activity as well as tritium must be determined by measuring quarterly samples of the distillate from the distillation.

The active concentrate resulting from the distillation of active water, is collected and transferred to the Waste Management Facility for further treatment. Currently, the management option considered is volume reduction by incineration abroad.

#### **Water treatment plant for conventional treatment of waste water (in-active treatment plant)**

Discharges to the recipient (Roskilde Fjord) of treated water must be checked. Hence, water samples are taken from the sand trap and just before the outlet to Roskilde Fjord. The samples are measured for  $\beta$ -activity content. If the concentration of  $\beta$ -activity in the water samples exceeds 0.15 Bq/ml, the water discharge must be stopped and further investigation initiated.

The content of  $\gamma$  and  $\beta$  activity in sludge from the water treatment plant must be determined based on representative half-yearly pooled samples of the sludge. Sludge from the water treatment plant is released if it meets the clearance criteria or handled according to the relevant waste category if clearance values are exceeded. In addition to the analyses on the half-yearly pooled samples, random samples of the sludge are taken and analysed before being sent to an external receiver.

#### **Storage container for liquid radioactive waste**

Organic radioactive liquids received from external users are transferred to the Storage of liquid radioactive waste. These liquids await incineration at a facility outside the Risø site.

#### **2.4.4. Efficiency of abatement systems**

Discharges from the Waste Management Facility at the Risø site originate primarily from the radioactive waste water distillation facility from which the purified liquids are transferred to the conventional water treatment plant and in are turn discharged to Roskilde Fjord.

The evolution of discharge to Roskilde Fjord over time is illustrated in Figure 3 (release of tritium in GBq/year) and Figure 4 (gross  $\beta/\gamma$ -activity in GBq/year).

The management facilities for liquid waste management have been maintained and updated support both operation and decommissioning of the nuclear research facilities. The plateau levels of discharge from the operational period (pre-2000) testify to the robustness of the management system. Since the research reactors were taken out of operation, the release of tritium to Roskilde Fjord dropped by one to two orders of magnitude and now displays a declining trend below 100 GBq per year (Figure 3). As facilities containing tritium have progressively been decommissioned, the remaining tritium inventory is low and discharges are similarly expected to remain so.

The overall provisions driving the management of discharge are specified in the OLC:

- *The discharge of radioactive substances into the environment from the operation and decommissioning of nuclear facilities at the Risø site must be optimized, i.e. kept as low as reasonably achievable.*
- *The control levels for the discharge of radioactive substances from the operation and decommissioning of the nuclear facilities are based on the dose constraint for a member of the public living in the neighbouring community to the Risø site. The dose constraint is thus of 0.05 mSv/year for each nuclear facility and 0.1 mSv/year for DD considered as one facility.*
- *The annual control levels of discharges to Roskilde Fjord from a single nuclear facility, is given in Table 2.*

- *The control levels of discharges to the atmosphere and to Roskilde Fjord are independent of each other, due to the conservative assumptions in the calculations on which they are based.*
- *If the discharge, for one or more nuclear facility, to the atmosphere or Roskilde fjord, contains radionuclide mixtures, an index value expressed as an operational sum formula must be applied to ensure that the control levels are not exceeded.*
- *If discharges of radionuclides, which are not included in Table 1 and Table 2, occur or are planned, then the Nuclear Regulatory Authorities must be informed. Along with the notification of discharges, DD must submit a proposal for control levels for these radionuclides.*

Furthermore, the OLC includes provisions on reporting of unexpected events such as:

- *If discharge of radionuclides not included in the tables occur*
- *If exceeding the limits of discharges of radioactive substances*
- *If exceeding the dose limits for occupational exposure*
- *If other limits are exceeded*
- *If the reporting levels for discharge of radioactive substances are exceeded*

The reporting levels have been adjusted and simplified over time as the decommissioning of the nuclear facilities have progressed. Original each of the six nuclear facilities at the Risø site had specific reporting level for each radionuclide, Today the same set of reporting levels apply to each of the nuclear facilities at the Risø site,

Thus, the reporting level for each radionuclide per month from any facility is today set at one permille of the annual discharge limit, which is very conservative but easy to manage from the operator's point of view (Table 4).

According to OLC the liquid discharges to Roskilde Fjord are documented in half-yearly reports to the Nuclear Regulatory Authorities.

The latest report ([Radioactivity in the Risø District January-June 2025](#)) is made available via Danish Decommissioning webpage, and the preceding reports are available upon request.

#### **2.4.5. Annual liquid discharges:**

The evolution of discharge to Roskilde Fjord over time is illustrated in Figure 3 (release of tritium in GBq/year) and Figure 4 (gross  $\beta/\gamma$ -activity in GBq/year).

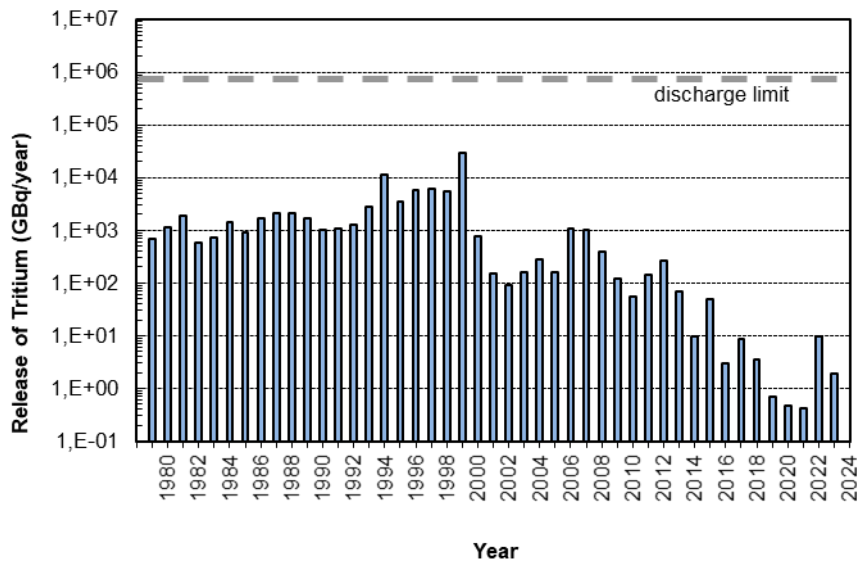


Figure 3: Annual release of tritium into Roskilde Fjord from the Waste Management Plant

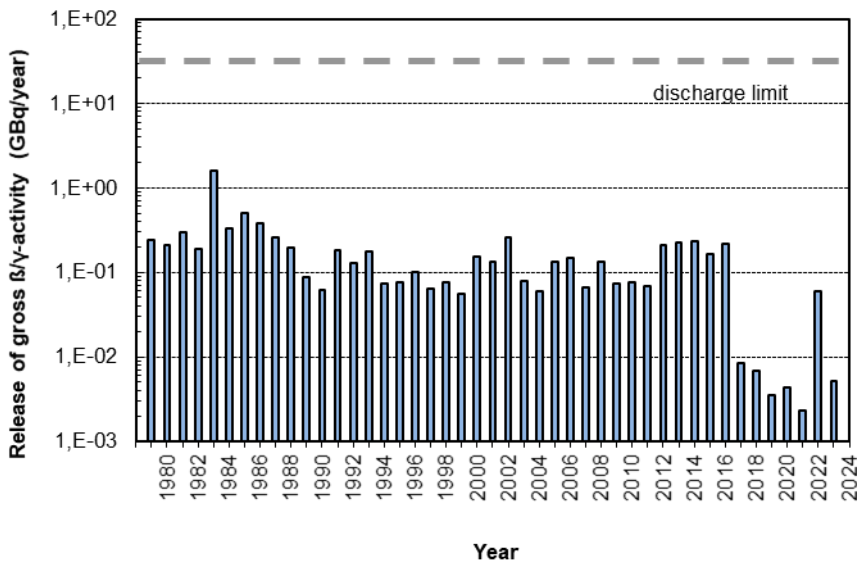


Figure 4: Annual release of gross beta/gamma activity into Roskilde Fjord from the Waste Management Plant.

The spike in discharged activity (Figure 3 and Figure 4) recorded for 2022 reflects the outcome from specific decommissioning activities, and should be viewed in light of the substantially reduced discharge levels recorded during the COVID-19 pandemic where decommissioning commenced at a very slow

pace. The plateau of discharge levels in gross beta/gamma activity from onset of decommissioning in 2003 until 2016 reflects discharges resulting from operation of facilities awaiting decommissioning.

#### **2.4.6. Downward trends in absolute and normalised discharges**

The annual release of tritium and gross  $\beta/\gamma$ -activity into Roskilde Fjord from the Waste Management Plant displaying are shown in Figure 3 and Figure 4. The downward trends documents that decommissioning of the nuclear facilities is at its final stage, hence less radioactive materials are handled which in turn is reflected in the downward trends in the annual discharge of tritium and gross  $\beta/\gamma$ -activity into Roskilde Fjord.

The general decline in discharged amounts of activity since the initiation of decommissioning activities reflects the combined effects of the efficiency of the waste water treatments systems in operation and the progression of decommissioning leading to overall decreases in discharges.

#### **2.4.7. Comparison with values of similar installations world-wide, based on the most recent compilations published by OSPAR, UNSCEAR or EC.**

Sites with similar histories and installation specific similarities have not been identified. Therefore, no comparison is presented.

### **2.5. Emissions to air of concern for the marine environment**

The annual control levels of discharge of radioactive substances to the atmosphere from a single nuclear facility at the Risø site is found in the OCL. The annual discharge limits to the atmosphere are reproduced in the Table 1 and the reporting levels are given in Table 3.

At the Risø site the discharge to the atmosphere via the ventilation systems of DR 3, the Hot Cell Facility and the Waste Management Facility are monitored for  $\alpha$ - and  $\beta$ -activity (Figure 5).

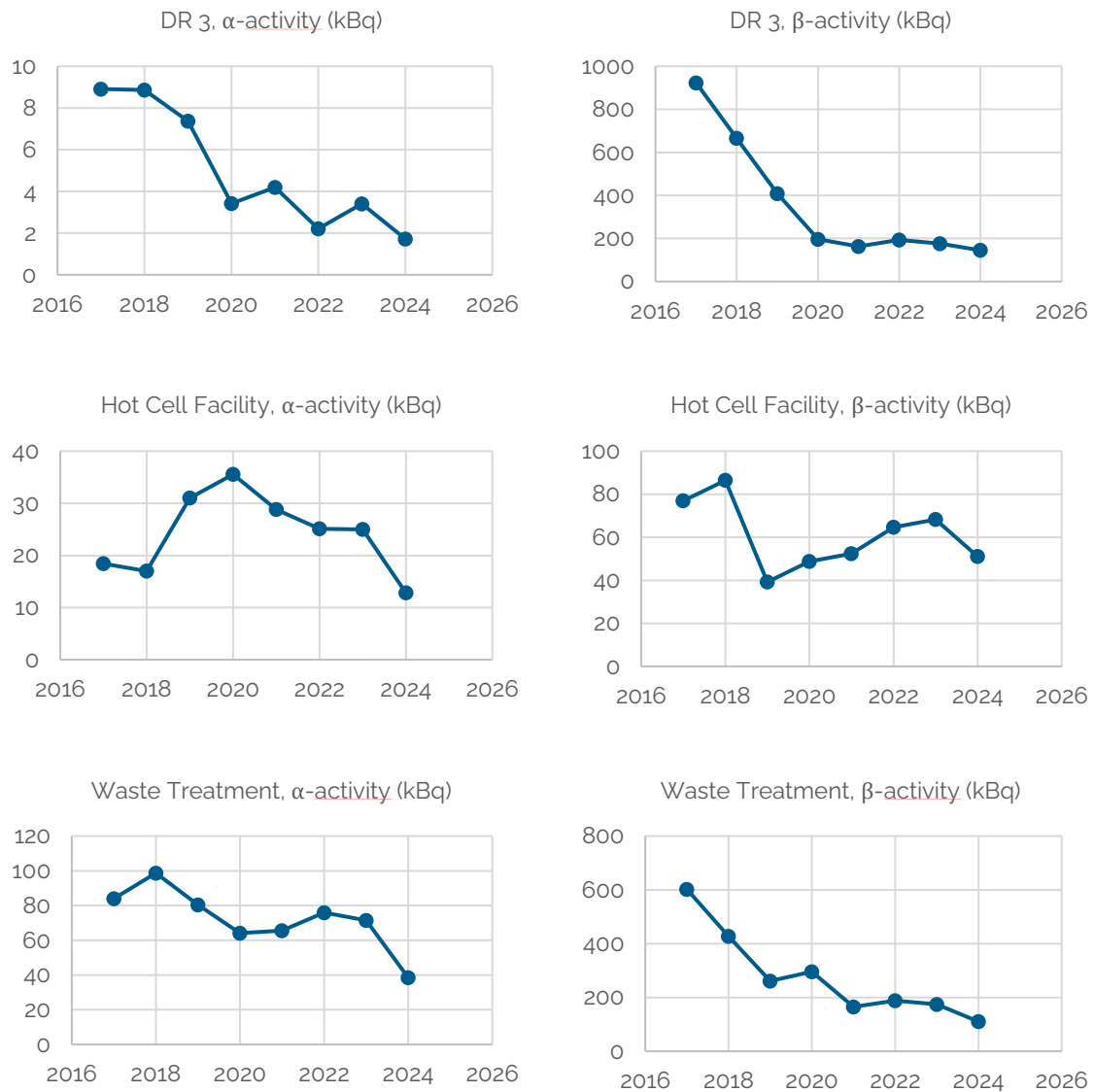
The annual discharge of  $\alpha$ - and  $\beta$ -activity to the atmosphere from the DR 3, the Hot Cell Facility and the Waste Management Facility are shown in Figure 5. The overall downward trends from 2017 to 2024 document that decommissioning of the nuclear facilities is at its final stage, hence less radioactive materials are handled which in turn is reflected in the downward trends in discharge of  $\alpha$ -activity and  $\beta$ -activity to the atmosphere. Some of the variation displayed in Figure 5 for each of the three facilities reflect the on-going decommissioning activities at that point in time.

The predominant wind direction at the Risø site directs emissions to air in easterly directions, i.e. away from the waters of Roskilde Fjord. The fraction for emissions relevant to the marine environment in Roskilde Fjord has not been assessed, but is expectedly low. Radioactive substances carried east from the Risø site will pass the Strait of Oresund between Denmark and Sweden before reaching the landmass of southern Sweden and the Baltic Sea, further to the east. The relevance of such emissions to the marine environment has not been assessed.

Additional information on site-specific discharges is given in Annex 1, Annex 2 and Annex 3.

The results of the monitoring program of discharges are presented in half-yearly reports to the Nuclear Regulatory Authorities.

Both the Nuclear Regulatory Authorities and Danish Decommissioning make these reports available upon request.



**Figure 5: Annual discharge of α-activity and β-activity to the atmosphere from DR 3, the Hot Cell Facility and the Waste Treatment Facility.**

**2.5.1. Explanations for lack of data or failure to meet BAT/BEP indicators**

N/A

## 2.6. Summary BAT/BEP

The decommissioning of the nuclear facilities at the Risø site is coming to an end. Since the three reactors were taken out of operation, the discharges from the Risø site have remained at operational levels or have decreased as decommissioning reduced the inventory of radioactive substances which may become subject to discharge.

Waste management facilities and methodologies for limiting discharges and effects thereof have been in operation throughout the history of the nuclear facilities at the Risø site. Over the last two decades, where decommissioning activities have been ongoing, the basic management methodologies and technical facilities have remained largely unchanged. However, facilities have been continuously adapted to the needs specific to decommissioning at any given point in time. The decrease in discharges over the last two decades may be attributed to the combined effects of reducing the inventory of radioactive substances during decommissioning and the efficiency of continuous adaptation of the waste management system.

Based on results of the environmental monitoring programme, including data on the discharges, environmental impact assessments and recorded doses to workers and inferred exposure of member of the public, it may be concluded, that the BAT and BEP as applied at the Risø site, is commensurate with the nature, scale and complexity of the current activities related to operation, decommissioning and waste management at Risø Site.

Following the decommissioning of the nuclear facilities, the site will continue to be a national centre for predisposal waste management, which will include an upgraded storage facility and associated waste management facilities.

The environmental monitoring programme for the Risø site will continue to be reviewed and updated to ensure it reflects the impact of the operations of the facilities at any given time.

# Annex 1

## Site-Specific information discharges

OBJECTIVE	INFORMATION TO BE SUBMITTED	BAT/BEP INDICATOR
<p>Discharges to the marine environment, as well as emissions of concern to the marine environment, are limited through application of technical and managerial practices in accordance with Article 2, 3 (b) (i), as well as Appendix 1 on BAT/BEP of the OSPAR Convention</p>	<p>Name of site:</p> <p>The nuclear facilities at the Risø Site. Danish Decommissioning is a state-owned entity responsible for operation and decommissioning of the nuclear facilities at the Risø Site</p>	<p>N/A</p>
	<p>Activities from which radioactive liquid effluents arise (e.g. fuel handling operations).</p> <p>The following activities at the Risø site may give rise to radioactive liquid effluents as part of the operation and decommissioning of the nuclear facilities:</p> <ul style="list-style-type: none"> <li>• Decontamination by high-pressure water jet washing</li> <li>• Reception of radioactive liquids waste from external users (institutional waste)</li> <li>• Laboratory activities</li> <li>• Active Landry</li> <li>• General cleaning of the nuclear facilities</li> <li>• Distillation of radioactive water</li> </ul>	<p>N/A</p>

	<p>BAT/BEP system(s) in place to reduce, prevent or eliminate discharges of radioactive substances to the marine environment, as well as emissions of radioactive substances of concern to the marine environment. In particular, systems taken into operation during the reporting period (or decided to be taken into operation) should be reported as well as changes in management of waste treatment (for example use of other waste streams), or processes that reduce discharges or emissions should be reported.</p>	<p>Relevant systems in place.</p> <p>All nuclear facilities where radioactive waste water is handled have dedicated drain systems, from which the water is collected in holding tanks. This includes active water from the laboratories, the decontamination cabin, and the active laundry. The active water is collected and transferred to the distillation facility for treatment. The active tanks are equipped with alarms for overflow.</p> <p>A new distillation for treatment of active water was installed and put in operation in 2016. Active water is collected in two storage tanks (10 m<sup>3</sup> each). The distilled water is collected in two 5 m<sup>3</sup> tanks (and sampled before it is transferred to the conventional water treatment plant. Discharges to recipient (Roskilde Fjord) of treated water must be checked. Hence, the treated water is sampled every day and analysed to ensure that <math>\beta</math> activity in the water samples does not exceed 0.15 Bq/ml. If above the discharge must be stopped and further investigation must be initiated.</p> <p>The content of <math>\gamma</math> and <math>\beta</math> activity in sludge from the water treatment plant must be analysed to ensure it meets the criteria for clearance before being sent to an external receiver.</p>
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		<p>The decontamination (or abatement) factor or other measure of efficiency of abatement systems.</p> <p>The amount of radioactive water managed at the distillation facility is reported every sixth month. In the first 6 month of 2025, 15,812 m<sup>3</sup> water was discharged to Roskilde Fjord with an average 0.014 Bq/ml gross-β.</p>
	<p>Annual liquid discharges:</p> <ul style="list-style-type: none"> <li>• nuclide specific data as given in the OSPAR Annual Report on Liquid Discharges with possible additional radionuclides from EC reporting requirements.</li> <li>• data on beta emitters (excluding tritium), tritium and alpha emitters (normalised data with regard to net electrical output (power reactors) or tonnes U processed (reprocessing plants and fuel fabrication plants). Factors influencing the normalisation should be reported).</li> </ul> <p>Data for at least the last six years should be submitted.</p>	<p>Downward trends in absolute and normalised discharges</p> <p>See Figure 3 and Figure 4.</p> <p>Comparison with values of similar installations world-wide, based on the most recent compilations published by OSPAR, UNSCEAR or EC.</p>
	<p>Emissions to air of concern for the marine environment. Only nuclides with half-life &gt;30 days should be considered, however, as a minimum, information on tritium, C-14 and I-129 should be submitted. Data for at least the last six years.</p>	<p>Downward trends</p> <p>The discharge to the atmosphere is documented by measurement of α- and β-activities. The data for the time period from 2017 to 2024 is presented for individual facilities under decommissioning as well as the waste treatment plant in the diagrams in Figure 5.</p>
	<p>Explanations for lack of data or failure to meet BAT/BEP indicators, as well as, when appropriate, a description of on-going or planned activities.</p>	

## Annex 2

### Environmental impact

OBJECTIVE	INFORMATION TO BE SUBMITTED	BAT/BEP INDICATOR
<p>Marine ecosystems shall be protected, in accordance with Article 2, 1 (a), of the OSPAR Convention.</p>	<p><i>Concentrations of radionuclides of concern in representative samples of water, sediment and fish. Data for at least the last six years.</i></p> <p>According to the OLC the monitoring program in the vicinity of the Risø Site includes the following samples:</p> <p>Sediment sample from Roskilde Fjord (yearly, Cs-137). see Figure below</p> <p>Seawater sample from Roskilde Fjord (quarterly, tritium), (yearly, Cs-137) see Figures below.</p> <p>Fish is not included in the monitoring programme.</p> <p>Once every six months, a report on the results of the monitoring of radioactivity in the Risø district must be prepared and submitted for review to the Nuclear Regulatory Authorities.</p>	<p>Development of environmental quality criteria is a part of the OSPAR Strategy with Regard to Radioactive Substances. Such criteria may be used as a BAT/BEP indicator.</p> <p>Downward trends.</p> <p>The below timeseries (1980-2025) of Cs-137 and tritium in seawater from Roskilde Fjord and Cs-137 in sediment show level or decreasing trends of radionuclide contents in water as well as sediments. Some departures / spikes in levels reflect operational events or decommissioning activities, for instance the spike in tritium in seawater detected in 2000 as a result of the detected leakage in the heavy water system of research reactor DR 3, prompting the shutdown of the nuclear facilities as a whole and initiation of decommissioning activities.</p>
	<p>Environmental monitoring programme, frequency of sampling, organisms and or other types of environmental samples considered.</p> <p>The monitoring program in the vicinity of the Risø site does not include sampling of organisms.</p> <p>Grass is sampled at the Risø peninsula (monthly, Cs-137).</p> <p>Seaweed (<i>Fucus vesiculosus</i>) are sampled in Roskilde Fjord (yearly, Cs-137)</p>	<p>The environmental monitoring programme is relevant, taking sample types, frequencies and the local environment into account.</p>
	<p>Any relevant information not covered by the requirements specified above.</p>	

	<p>Explanations for lack of data or failure to meet BAT/BEP indicators, as well as, when appropriate, a description of on-going or planned activities.</p>	
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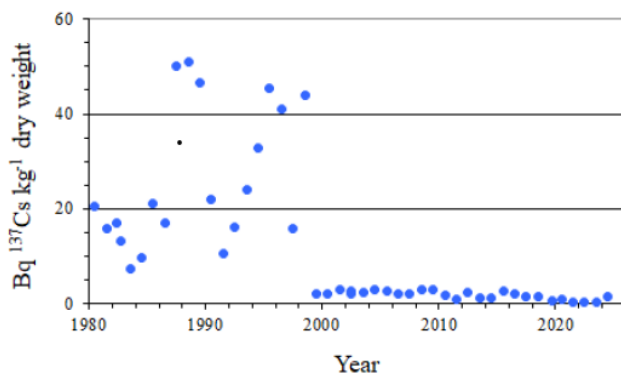


Fig. 3.1. Caesium-137 in sediment samples collected at Bolund in Roskilde Fjord. 1980 – 2025. (Unit: Bq kg<sup>-1</sup> dry matter)

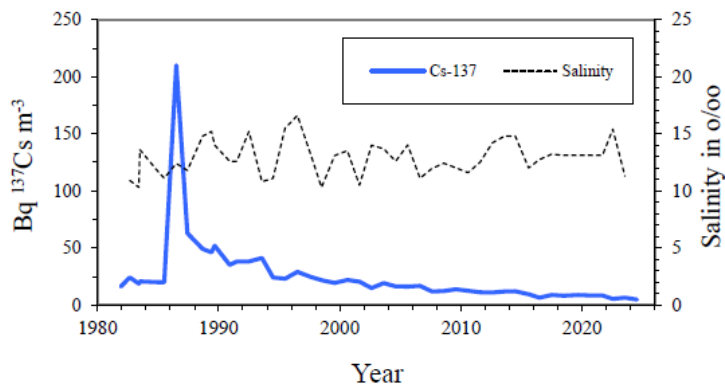
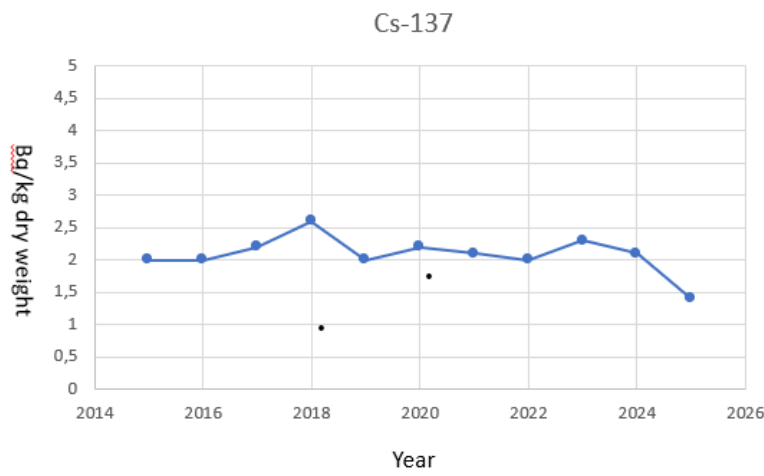


Fig. 4.1. Caesium-137 in seawater collected in Roskilde Fjord 1980 – 2025. (Unit: Bq m<sup>-3</sup>)



### Seaweed (*Fucus vesiculosus*) collected in Roskilde Fjord

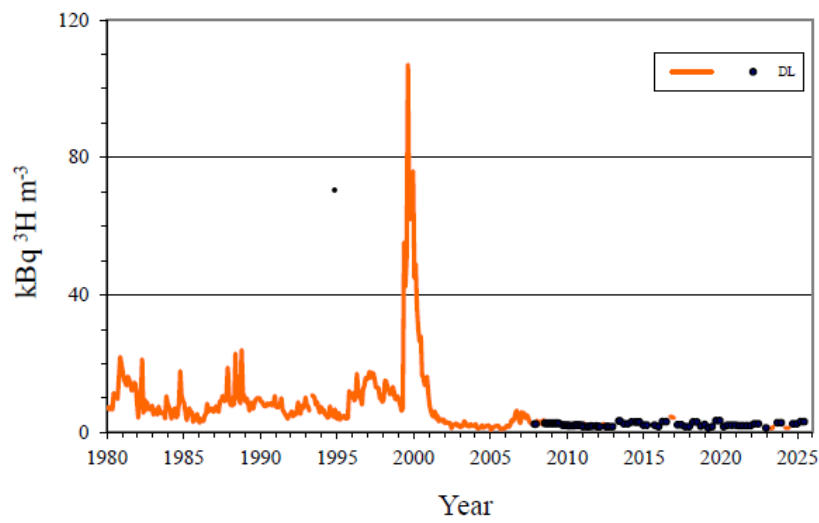


Fig. 4.2. Tritium in seawater collected in Roskilde Fjord 1980 - 2025. (Unit: kBq m<sup>-3</sup>; DL = detection limit)

## Annex 3

### Radiation doses to the public

OBJECTIVE	INFORMATION TO BE SUBMITTED	BAT/BEP INDICATOR
<p>Human health shall be protected, in accordance with Article 2.1 (a) of the OSPAR Convention.</p>	<p>Average annual effective dose to the representative person via the marine exposure pathway(s), and caused by current discharges. Data should be submitted for the last six years.</p>	<p>Downward trend</p> <p>Annual effective doses have not been assessed, since discharge levels have remained below the limits for permissible discharges, and hence lower than dose constraints specified for the operation and decommissioning of the facilities at the Risø site.</p>
	<p>Total exposures (i.e. including those from emissions and historic discharges/emissions).</p>	<p>The exposure is well within the constraint (or similar), provided the constraint gives reasonable allowance for other practices so that the annual effective dose from all practices is kept below 1 mSv.</p> <p>Confirmation through measurement programs of adherence to permissible discharge levels corresponding to specified dose constraints verify that total exposures in a year may be expected to be kept below 1 mSv.</p>
	<p>The definition of the representative person, including information on age distribution, size and other relevant information, and on whether the representative person is real (identified) or hypothetical.</p> <p>Information on exposure pathway(s) considered, and whether these are treated individually or collectively.</p>	<p>Whether the representative person has changed, whilst taking into account local conditions and habits, as well as the exposure situation.</p> <p>Periodic re-assessments of exposure scenarios have resulted in minor adjustments to exposure pathways being considered, but has not led to changes in identified representative persons</p>

	<p>Basis for methodology to estimate doses (models, actual measurements, and verification of data, as appropriate).<sup>3</sup></p> <p>The envisaged annual discharge limits and reporting levels are given in Table 2 and Table 4. The annual discharge limits are based on a dose constraint of 0.05 mSv/y per facility and 0,1 mSv for all facilities and the calculations based on exposure assessment methodologies consistent with assessments provided in The dose assessment methodology is consistent with recommended methodologies applied for submission of General Data relating as called for under the Article 37 of the Euratom Treaty and as recommended in Commission Recommendation 1999/829/Euratom of 6 December 1999.</p> <p>Site-specific factors for significant nuclides, used to estimate the dose to representative person from discharge values.</p>	<p>The dose estimates are reliable and sufficiently realistic.</p>
	<p>Site specific target annual effective dose.</p>	<p>Relevance of target and closeness to target value.</p>
	<p>Any relevant information not covered by the requirements specified above.</p>	
	<p>Explanations for lack of data or failure to meet BAT/BEP indicators, as well as, when appropriate, a description of on-going or planned activities.</p>	

<sup>3</sup> If this information is general for the nuclear sector and/or part of a statutory programme, this information may be entered in the Country Profile.



**Health for all ♥ + ●**