Ministry of Infrastructure
and Water Management

National report for the Council Directive 2011/70/Euratom

Establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste

The Netherlands, 2021

Contents

List of symbols and abbreviations

Acronym	Full term	Translation or explanation
ALARA	As Low As Reasonably Achievable	
ANVS	Autoriteit Nucleaire Veiligheid en Stralingsbescherming	Authority for Nuclear Safety and Radiation Protection
Awb	Algemene wet bestuursrecht	General Administrative Act
Bbs	Besluit basisveiligheidsnormen stralingsbescherming	Basic Safety Standards Radiation Protection Decree
Bkse	Besluit kerninstallaties, splijtstoffen en ertsen	Nuclear Installations, Fissionable Materials and Ores Decree
Bvser	Besluit vervoer splijtstoffen, ertsen en radioactieve stoffen	Transport of Fissionable Materials, Ores, and Radioactive Substances Decree
Bq	Becquerel	
CETsn	Crisis Expert Team straling en nucleair	Crisis Expert Team – radiological and nuclear
COG	Container Opslag Gebouw	Container Storage Building
Conventional waste		Waste substances as intended in the Environmental Protection Act (or non-radioactive waste)
COVRA	Centrale Organisatie Voor Radioactief Afval	Central Organisation for Radioactive Waste
Directive 2011/70/ Euratom	Directive 2011/70/Euratom of the European Council dated 19 July 2011 on the establishment of a community framework for the responsible and safe management of spent fuel and radioactive waste	
EIA	Environmental Impact Assessment	
EPZ	N.V. Elektriciteits-Produktiemaatschappij Zuid-Nederland	(Licence holder, owner and operator of Borssele NPP)
EZK	(Ministerie van) Economische Zaken en Klimaat	(Ministry of) Economic Affairs and Climate Policy
€	Euro	
GKN	Gemeenschappelijke Kernenergiecentrale Nederland	(Licence holder, owner and operator of Dodewaard NPP – in Safe Enclosure)
GRS	Gesellschaft für Anlagen- und Reaktorsicherheit	(German Technical support Organisation)
HABOG	Hoogradioactief AfvalBehandelings- en Opslag Gebouw	High-level Waste Treatment and Storage Building
HASS		High-Activity Sealed Radioactive Sources
HEU	High Enriched Uranium	
HFR	Hoge Flux Reactor	High Flux Reactor (Research Reactor in Petten, tank-in-pool type, 45 MWth)
HLW	High-Level Waste	
HOR	Hoger Onderwijs Reactor	(Research reactor of the Delft University of Technology)
IAEA	International Atomic Energy Agency	
I&W	(Ministerie van) Infrastructuur en Waterstaat	(Ministry of) Infrastructure and Water Management
IGJ	Inspectie Gezondheidszorg en Jeugd	Health and Youth Care Inspectorate
ILT	Inspectie Leefomgeving en Transport	Human Environment and Transport Inspectorate of the Ministry of Infrastructure & Water Management
IMG	Inspectie Militaire Gezondheidszorg	Inspectorate for Military Healthcare
IRRS	Integrated Regulatory Review Service	
ISZW	Inspectie SZW	Inspectorate SZW
JRC	Joint Research Centre of the European Communities	
Kew	Kernenergiewet	Nuclear Energy Act
LCP-S	Landelijk Crisisplan Straling	National Crisis Plan for Radiation Incidents

Acronym	Full term	Translation or explanation
LEU	Low Enriched Uranium	
LFR	Lage Flux Reactor	Low Flux Reactor (Research reactor in Petten, decommissioned in 2019)
LH	Licence Holder, licencee	
LILW	Low- and Intermediate-Level Waste	
LNV	(Ministerie van) Landbouw, Natuur en Voedselkwaliteit	Ministry of Agriculture, Nature and Food Quality
LOG	Laag- en middelradioactief afval OpslagGebouw	Low- and intermediate-level Waste Storage Building
MOX	Mengoxide	Mixed Oxide
MWe	Megawatt electrical	
MWth	Megawatt thermal	
National programme		The national programme for the responsible and safe management of spent fuel and radioactive waste
NDRIS	Nationaal DosisRegistratie en Informatie Systeem	National Dose Registration and Information System
NORM	Naturally Occurring Radioactive Material	
NPP	Nuclear Power Plant	
NRG	Nuclear Research and consultancy Group	(Subsidiary of the ECN Foundation, and licence holder and operator of the HFT)
NSD	Directive 2009/71/Euratom, 'Nuclear Safety Directive'	
NVR	Nucleaire VeiligheidsRegels	Nuclear safety rules (in the Netherlands)
NVWA	Nederlandse Voedsel- en Warenautoriteit	The Netherlands Food and Consumer Product Safety Authority
OPERA	OnderzoeksProgramma Eindberging Radioactief Afval	National Geological Disposal Research Programme
OVV	Onderzoeksraad voor Veiligheid	Dutch Safety Board
QA	Quality Assurance	
RB	Regulatory Body	
RID	Reactor Institute Delft	(Operator of the HOR research reactor in Delft)
RIVM	Rijksinstituut voor Volksgezondheid en Milieu	National Institute of Public Health and the Environment (the Netherlands)
RR	Research Reactor	
SAR	Safety Analysis Report	
SF	Spent Fuel	Fission material that has been irradiated and permanently removed from a reactor core
SodM	Staatstoezicht op de Mijnen	State Supervision of Mines
Sv	Sievert	
SZW	(Ministerie van) Sociale Zaken en Werkgelegenheid	(Ministry of) Social Affairs and Employment
URENCO	Uranium ENrichment Corporation Ltd	
VOG	Verarmd uranium Opslag Gebouw	Storage Building for Depleted Uranium
Wabo	Wet algemene bepalingen omgevingsrecht	Environmental permitting (general provisions) act
Wm	Wet milieubeheer	Environmental protection act
Wvr	Wet veiligheidsregio's	Security Region act
Ww	Waterwet	Water act
WSF	Waste Storage Facility	Waste storage building for legacy waste in Petten
zbo	Zelfstandig bestuursorgaan	Independent administrative body

Abstract

Article 14.1 of the Council Directive 2011/70/EURATOM establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste, requires Member States to report on how they have fulfilled their obligations as formulated by the articles of the Directive.

This third National Report of the Kingdom of the Netherlands. The structure of the report reflects the articles of the Directive and closely follows the 'European Nuclear Safety Regulators Group' (ENSREG) guidelines regarding Member States Reports to the Council Directive.

This report has been prepared by the Authority for Nuclear Safety and Radiation Protection, the ANVS, and the Directorate-general for Environment and International Affairs (DGMI) of the Ministry of Infrastructure and Water Management.

A. Introduction

This introduction explains the purpose of the present report: 'National report of the Kingdom of the Netherlands for the Council Directive 2011/70/EURATOM' (further: national report). It gives an overview of current and potential sources of spent fuel and radioactive waste and provides a description which competent authorities and implementing organizations are involved in the responsible and safe management of spent fuel and radioactive waste.

Purpose of the national rapport

Article 14.1 of the Council Directive 2011/70/EURATOM obliges the Member States to submit a report to the European Commission on a three-yearly cycle on how they have implemented the obligations of the directive. This report is the third in the series of reports of the Kingdom of the Netherlands for the Directive.

This report was drawn up using the guidelines[1] of the 'European Nuclear Safety Regulators Group' (ENSREG). References to radioactive waste in this report also include spent fuel, unless stated otherwise.

Relationship between this national report[2] and the report to the Joint Convention[3]

Article 14.1 directs Member States to take advantage of reporting under the Joint Convention on the Safety of Spent Nuclear Fuel Management and on the Safety of Radioactive Waste Management (i.e. in regards to optimizing the use of resources and to providing coherent information) to assist them in preparing their National Report. Although they have different addressees and some differences in scope, the Directive and Joint Convention have the same overall objective of the safe management of spent fuel and radioactive waste.

Therefore, this national report contains information that is taken directly from the Joint Convention report. However, Member States have obligations under the Directive to fulfil certain requirements that are not covered in the Joint Convention report. Consequently, up-to-date information is added where needed in order to fully report on the progress that has been made in the field of responsible and safe management of spent fuel and radioactive waste.

National nuclear programme

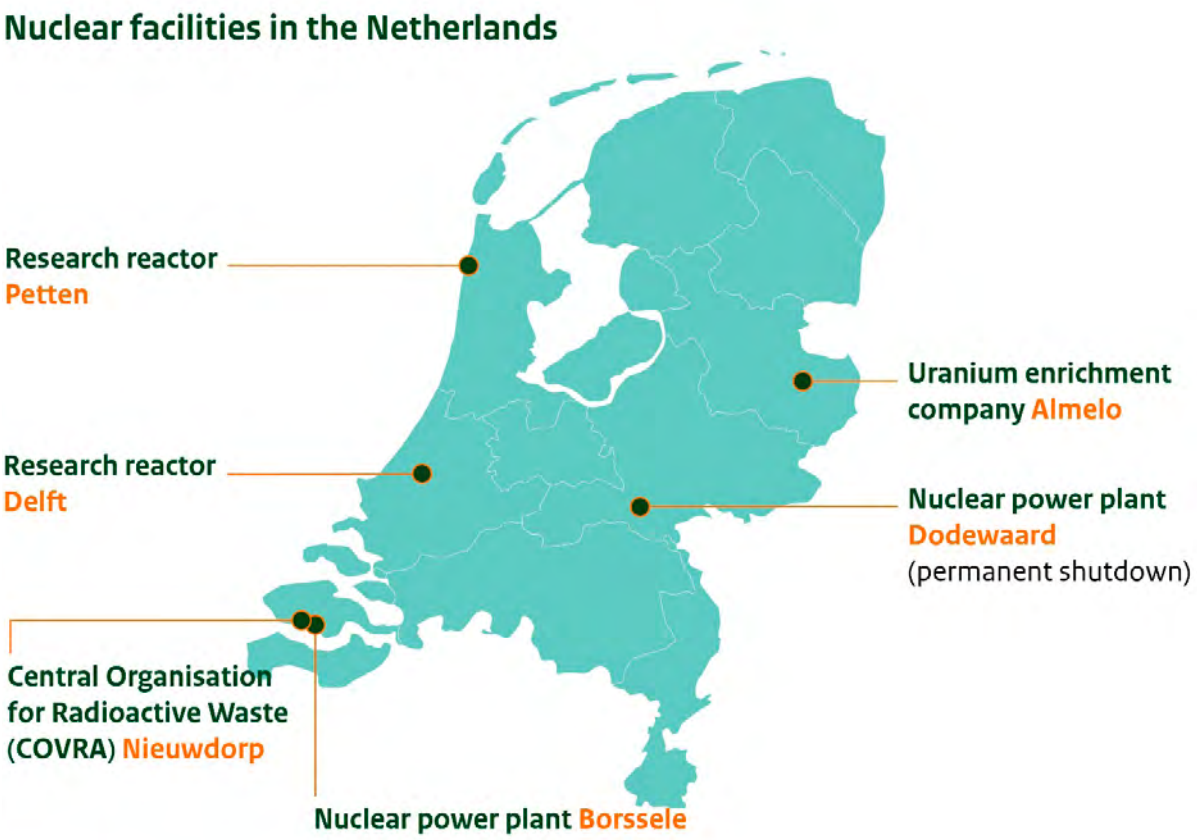
The Netherlands has a small but divers nuclear programme:

- One nuclear power plant (NPP) in operation: the Borssele Pressurized Water Reactor (Siemens/KWU design, net electrical output approximately 490 MWe), operated by N. V. Elektriciteits-Produktiemaatschappij Zuid-Nederland (EPZ).
- One NPP in decommissioning: the Dodewaard Boiling Water Reactor (GE design, 60 MWe), operated by Gemeenschappelijke Kerncentrale Nederland (GKN), was shut down in 1997, and is now in 'Safe Enclosure'.
- Two research reactors in operation:
  - the High Flux Reactor (HFR, 45 MWth) of the EU Joint Research Centre (JRC), operated by licence holder the Nuclear Research & consultancy Group (NRG), and;
  - the Hoger Onderwijs Reactor (HOR, 2 MWth) at the Reactor Institute Delft (RID), of the Delft University of Technology.
- One research reactor has recently been decommissioned: the Low Flux Reactor (LFR, 30 kWth) on the Research Location Petten was taken out of operation in 2010 and was decommissioned in 2019.
- One uranium enrichment company: Urenco Netherlands has facilities for uranium enrichment in Almelo. Licenced capacity is currently 6200 tSW/a.

[1] http://www.ensreg.eu/sites/default/files/attachments/guidelines_for_reporting_on_directive_2011-70-euratom.pdf
[2] All national reports can be found at the website of the ANVS, http://www.anvs.nl
[3] https://www.autoriteitnvs.nl/onderwerpen/joint-convention-reports/documenten/rapporten/2020/11/03/joint-convention-on-the-safety-of-spent-fuel-management-and-on-the-safety-of-radioactive-waste-management

- One national Waste Management Organisation (WMO): Central Organisation for Radioactive Waste (COVRA). COVRA is located at one site in Nieuwdorp and has facilities for the long-term interim storage of low-, intermediate- and high-level waste. The latter category includes spent fuel of research reactors, waste from molybdenum production and waste from reprocessing of spent fuel. COVRA also manages radioactive waste from non-nuclear origin.

Figure 1: Locations of the nuclear installations in the Netherlands



Details on the national nuclear programme of the Netherlands can be found in the national report for the CNS[4].

Sources of spent fuel and radioactive waste in the Netherlands

The spent fuel and radioactive waste are generated by various licence holders. All companies in the Netherlands that hold a licence on the basis of the nuclear energy act are required to tender their radioactive waste to COVRA. The waste produced can be divided into six sectors: nuclear, industry, medical, NORM industry, research and miscellaneous. NORM waste with an activity concentration of up to ten times higher than the clearance levels (95 volume% of the Dutch radioactive waste), need not be entrusted to COVRA but is safely managed as very low level waste at one of the two licenced designated landfills.

An inventory of spent fuel and radioactive waste can be found in section C.

4 https://www.autoriteitnvs.nl/documenten/rapporten/2019/08/06/convention-on-nuclear-safety-cns

The policy in respect of the safe management of spent fuel and radioactive waste

The policy is comprehensively set out in the National Programme[5], and briefly summarized below.

Policy on radioactive waste and spent fuel and links to other policy fields

The policy on radioactive waste and spent fuel is part of the policy on radiation protection, which protects individuals, society and the environment against the risks of exposure to ionising radiation. Exposure to radiation must be justified, optimised (as low as reasonably achievable (ALARA)) and must remain within specified thresholds. Anyone using ionising radiation bears prime responsibility for its use. The same principles are applied to the management of radioactive waste.

The policy applies a graded approach; the greater the risk, the stricter the regime. For example, the requirements imposed on activities involving spent fuel are stricter than for activities involving other radioactive substances.

The policy on radioactive waste ties in with the policy for conventional waste. The policy strives to close raw materials cycles as far as possible, with priority to be given to the most environmentally friendly processing methods. In the policy on radioactive waste, the same preferred order for processing is assumed as for conventional waste: prevention, reuse, and finally safe management of remaining waste substances.

Furthermore, as with management of conventional waste, the principle of isolate, manage and control (IBC-principle[6]) is applied to the management of radioactive waste.

Policy principles for the management of radioactive waste and spent fuel

- Minimising the occurrence of radioactive waste, both in volume as activity. Prevention of waste production, reuse and using radioactive decay are successful policy instruments.
- Safe management of radioactive waste now and in the future. During interim storage at COVRA, the waste is safely managed. Around 2130 geological disposal is foreseen. The design of the geological disposal facility shall allow the retrieval of the waste (via the existing shaft) during the use of the geological disposal facility.
- No unreasonable burden on future generations. Generations that have profited from a specific application of radioactivity, such as nuclear power or medical isotopes, must bear the burdens for managing the waste produced in those activities.
- Those who produce radioactive waste bear the costs for the management of the waste. For all costs involved in the management of the radioactive waste the 'polluter pays' principle applies.

Policy on reprocessing of spent fuel

The policy in the Netherlands on spent fuel management is the following: the decision on whether or not to reprocess spent fuel is, at first, taken by the operator of a nuclear facility. In the case of a new nuclear power plant, the licence holder will have to evaluate the 'back-end' strategy every ten years. Central government will evaluate the 'back-end' strategy every twenty years. Depending on these evaluations, a different strategy may subsequently be imposed on the licence holder. Also in the case of reprocessing, the operator remains responsible for the safe storage of radioactive waste.

Policy on long-term management of radioactive waste and spent fuel

The current policy assumes long-term aboveground storage of the radioactive waste and spent fuel in specially designed buildings (at COVRA) until 2130. During this period the deep geological disposal is prepared financially, technically and socially in such a way that the disposal facility will be ready to receive radioactive waste around 2130. A decision on disposal will be made around 2100. Up to that moment, society may also opt for another management option, depending on insights at that moment, and assuming that other alternatives are possible at that time.

To actually achieve disposal, both a national and an international line are being followed ('dual strategy'). Within this strategy, a national route towards disposal will be elaborated. At the same time the possibility of international collaboration regarding radioactive waste management with other countries will not be excluded. The dual strategy makes it possible to respond appropriately to possible international initiatives regarding management of radioactive waste.

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5 The national programme for the management of radioactive waste and spent fuel: https://zoek.officielebekendmakingen.nl/blg-775466.pdf

6 IBC, Dutch acronym meaning: 'Isoleren, Beheren en Controleren, i.e. isolate, manage and control

The practice of the management of spent fuel and radioactive waste in the Netherlands and the implementing organizations

Current practice on reprocessing

The choice whether or not to reprocess spent fuel is left to the operator. The operators of the two NPPs Dodewaard and Borssele decided in favor of reprocessing.

In 2012, the Republic of France and the Netherlands signed a treaty that regulates the reception and reprocessing of Dutch spent fuel from the Borssele NPP by Areva (now: ORANO) in France, and the return to the Netherlands of the radioactive residues from reprocessing before 31 December 2052.

The operator of the Borssele NPP has arranged for the recycling of its reprocessing products (uranium, plutonium), and has been granted a licence for the use of MOX mid-2011.
Spent fuel from the research reactors is not reprocessed, but directly transported to COVRA.

Current practice COVRA

The national waste management organisation, Central Organisation For Radioactive Waste (COVRA), was established in 1982 at the initiative of the Dutch government. COVRA was first temporarily based in Petten and relocated to Nieuwdorp at the end of the 1980's.

The nuclear programme of the Netherlands is relatively small, but diverse. The total quantities of spent fuel and radioactive waste are modest. Nuclear installations do not have their own (long-term) waste storage facilities. Radioactive waste must be transported to COVRA as soon as reasonably possible. Benefits of economies of scale are optimized by centralizing most of the radioactive waste management activities in the Netherlands in one national WMO (COVRA), and on one site.

There are some exceptions:
- Radioactive wastes with a half-life less than 100 days, are allowed to decay for a maximum period of two years on the production site;
- Large amounts of NORM-waste is reused or disposed of at (designated) landfills;
- Some legacy waste is still present at the research location Petten.

The COVRA site is approximately 25 hectares, dimensioned to handle the expected Dutch demand for interim storage capacity until at least the year 2130. On the COVRA site there are various waste processing facilities and storage facilities for radioactive waste and spent fuel. The storage facilities have been designed to last at least for one hundred years, however if needed they can be refurbished or replaced to accommodate a longer interim storage period.

There are forms of radioactive waste that require several decades to decay below the clearance values. According to regulations, such wastes shall be stored at COVRA followed by disposal. However, the Government aims at a circular economy and wishes to stimulate the market for renewable raw materials and the reuse of scarce materials. Therefore, it is possible to store such radioactive materials unprocessed at COVRA for a maximum period of 50 years.

COVRA includes all estimated costs for processing, storage and disposal in its tariffs, on the basis of the state of the art at that time. Moreover, with the implementation of Directive 2011/70/Euratom, the obligation has been introduced to set off COVRA's research costs for disposal in the charges imposed by COVRA. The final goal is to acquire the financial resources and knowledge needed to achieve disposal around 2130. The accumulated funds are projected to grow during the period of interim storage in order to cover the cost for both long-term interim storage and for the implementation and operation of the (geological) disposal facility for the waste as well as associated research.

After delivery of the radioactive waste, the legal ownership of the waste and the related (financial) liabilities are transferred to COVRA. The fact that COVRA takes full responsibilities for the waste is laid down in the General Conditions of COVRA.

Since 2002, 100% of the shares in COVRA are held by the State and this aids to guarantee a system of long-term institutional control.

Current practice research on disposal

From 2011-2017 a research programme on feasibility of geological disposal in Boom Clay in the Netherlands (OPERA) has been performed. This research programme amounted a total of €10 million of which half is paid by the government and the other half by the nuclear sector. COVRA coordinated OPERA. The results of OPERA were presented to the public, in January 2018. In 2020 COVRA published a detailed research plan for the period of 2020-2025 as part of a long-term research programme for geological disposal of radioactive waste. This programme uses the roadmap developed in the OPERA safety case, thereby using a structured process to select research activities to be carried out over the coming years.

Historical waste at Research Location Petten

Originally the Dutch radioactive waste storage facility was located at the Research Location Petten (1985 – 1992). This explains why a certain amount of historical, or 'legacy', radioactive waste is still stored at the Research Location Petten in the Waste Storage Facility (WSF).
As licence holder of the WSF and owner of most of the stored waste, NRG is responsible for transferring the waste to COVRA as soon as reasonably achievable. This is a complex task that NRG fulfils by elaborating plans for treatment, repackaging and transfer of all types of waste. These plans are regularly updated and reviewed by the regulatory body. In 2018, the Dutch authorities carried out an investigation on the effectiveness and efficiency of these plans and concluded that the chain of waste management from NRG to COVRA should be optimized and that the project planning and budget was not realistic. A mediator was appointed by the government to boost the cooperation between NRG and COVRA and seek for chain optimization. Furthermore, the government provided extra budget as a loan to NRG to cover the increased costs of the historical waste project.

The cooperation between COVRA and NRG has been intensified between 2018-2020. At the Research Location Petten the sorting and repackaging of the waste has been prioritized. This has resulted in a better integrated, more detailed project planning and a more steady transfer of waste from Petten to COVRA.

Up to now, around three quarters of the stored drums have been sorted and repacked. The LLW-fraction that is formed in the process is continuously transferred to COVRA. For the ILW-fractions, plans for the transfer to COVRA are worked out in detail. Furthermore, before the end of 2020 all stored resins from the HFR were transferred to COVRA. The transfer of the resins to COVRA has become a normal, operational route.

In the most recent plan, approved by the regulatory body in 2019, it is planned by NRG that all legacy waste from the WSF in Petten will have been removed before the end of 2026. NRG has to submit an updated plan for approval before 1 July 2022.

The competent regulatory authority or 'Regulatory Body' involved in the responsible and safe management of spent fuel and radioactive waste in the Netherlands

The Regulatory Body is the authority designated by the Government as having legal authority for conducting the regulatory process, including issuing licences, and thereby regulating nuclear, radiation, radioactive waste and transport safety, nuclear security and safeguards.
There is one independent entity, the Authority for Nuclear Safety and Radiation Protection (ANVS) and some smaller entities at various ministries that together constitute the Regulatory Body. However the regulatory tasks related to radioactive waste management which is the subject of this report are within the scope of the ANVS only. Therefore this report often will refer to the ANVS as the Regulatory Body.

The ANVS brings together expertise in the fields of nuclear safety and radiation protection, emergency preparedness and response as well as security and safeguards. For each of these subjects, the ANVS focusses on preparing its own regulations (ANVS Regulations), the awarding of licences, supervision and enforcement and (public) information. The ANVS contributes to safety studies and ensures that the Netherlands are well prepared for possible radiation incidents.

The ANVS can also be requested by responsible ministries to give advice over policy and legislation issues (concerning nuclear safety and radiation protection). All nuclear facilities in the Netherlands, including COVRA, operate under licence, awarded after a safety assessment has been carried out successfully. Licences are granted by the ANVS under the Nuclear Energy Act.

The tasks and mandates of the ANVS are described in Chapter II of the Nuclear Energy Act. In 2017 the ANVS obtained the formal status of an independent administrative body (Dutch acronym 'zbo'). The Authority is the competent authority in matters of nuclear safety, nuclear security, radiation protection, transport safety, and waste management and emergency preparedness and response. This type of independent administration explicitly satisfies the international requirements (EU-radioactive waste management directive and IAEA standards). The Minister of Infrastructure and Water Management bears ministerial responsibility for the ANVS.

Overview matrix of liabilities and current policies and practices

An overview matrix providing the types of liabilities and the current policies and practices for the Netherlands is presented in annex 1.

Procedure for establishment of the national report

This report has been prepared by the Authority for Nuclear Safety and Radiation Protection, the ANVS, and the Directorate-general for Environment and International Affairs (DGMI) of the Ministry of Infrastructure and Water Management.

B. Recent developments - summary of major developments since submission of the previous national report

Recent developments - regulatory framework

- In November 2018 an IRRS-follow-up mission took place. An International Atomic Energy Agency (IAEA) team of experts concluded that the Netherlands has significantly strengthened its regulatory framework for nuclear and radiation safety since the IRRS mission in 2014 and particularly by establishing a single independent regulatory body[7]. The overall result was that of the 45 recommendations, 26 recommendations and suggestions were fully closed, 18 out were closed by the IRRS review team with confidence that they will be implemented within a reasonable time leaving only one recommendation open. The latter deals with the creation of release radiation levels of a greenfield after dismantling of an installation or finalization of an activity. In order to close the recommendation, research has started on an assessment framework on radiological release criteria for release of a site after dismantling of an installation or finalization of an activity. A preliminary study on criteria for release of a facility or site from regulatory control has been performed.

Recent developments - the Regulatory Body

- In 2018 and 2019 two evaluations of the ANVS, one internal and one external, were conducted. The evaluations confirm the findings of the 2018 IRRS-Follow Up mission: the ANVS has been functioning well. To further improve the ANVS, two actions were taken:
  - Reorganization of the structure of the ANVS. This reorganization was completed by January 1st, 2020.
  - Transferring the responsibility for the task 'preparation of policy development' and 'preparation of legislation' to the Ministry of Infrastructure and Water Management. The change came into effect on May 15th 2020. More specifically, this means that the Directorate-general for Environment and International Affairs (DGMI) within the Ministry of Infrastructure and Water Management is now responsible for policy and legislation development with regard to nuclear safety, security and radiation protection. More information is available in section E.

- On four separate occasions in late 2018 and early 2019 (three occasions in the Netherlands and once in Germany) potentially dangerous HASS containing Co-60 were found in scrap metal originating from Africa, purchased on the international scrap metal market. All four events were reported to the IAEA. The radioactive sources were not shielded. Close international collaboration between the IAEA, the Netherlands, Germany and country of shipment, both by the regulatory bodies as well as by the ambassadors, has resulted in an IAEA Fact Finding Mission to the country of shipment. Several points of improvement have been identified. Since the detection on March 7, 2019, no new detections of similar radioactive sources have been reported.

- On 23 December 2019 the Advisory Board issued an advice on what the role of the ANVS around disposal of radioactive waste should be and how the distribution of responsibilities and tasks for the various sub-aspects of policy development, its implementation and realization of the disposal facility should be organised. For more information on this advice, see section F.

- The Decree on Basic Safety Standards for Radiation Protection contains a list of radionuclides with generic clearance levels as specified in Council Directive 2013/59/Euratom. Using the same principles from Council Directive 2013/59/Euratom, the list has been extended with several other radionuclides in the Regulation on Basic Safety Standards for Radiation Protection.

[7] https://www.iaea.org/newscenter/pressreleases/iaea-mission-says-the-netherlands-has-significantly-strengthened-its-regulatory-framework.

- Specific clearance can be established by ANVS for specific applications in which materials exceed the general clearance levels, provided that the cleared materials meet the general (exemption and) clearance criteria. Specific clearance may be authorised for specific materials or specific pathways and additional measures or requirements may apply in order to limit the exposure and the public. Since the introduction of the Bbs in 2018, specific clearance values have been established for several cases.

- For the latest developments regarding the transfer of historical waste from the Research Location Petten to COVRA, see section A.

- At the time of writing this report, there are no indications that the measures taken in the Netherlands to prevent spreading of the COVID-19 virus have had implications on the safety and continuity of the management of radioactive waste and spent fuel.

Recent developments - the Ministry of Infrastructure and Water Management

- The responsibility for the task 'preparation of policy development' and 'preparation of legislation' has been transferred to the Ministry of Infrastructure and Water Management. The change came into effect on 15 May 2020. More specifically, this means that the Directorate-general for Environment and International Affairs (DGMI) within the Ministry of Infrastructure and Water Management is now responsible for policy development and legislation with regard to nuclear safety, security and radiation protection. In order to address these tasks, the Ministry has created a new policy unit.

- In the national programme, the establishment of a consultation group on the management of radioactive waste and spent fuel (Disposal Advisory Platform) was announced. After an exploratory phase into the role, goals and agenda of a Disposal Advisory Platform (DAP), the preparations for the establishment of the DAP started shortly before submitting the previous national report in 2018.

- To further define the mission of this consultation group, a number of interviews with national stakeholders (researchers, local and national government, waste producers and NGO's) were conducted. Lessons learned by countries with experience on public participation were also collected during interviews. The main conclusion of this research was that there is support for the establishment of such a consultation group in the Netherlands but stakeholders agreed that this consultation group should have a more active role than solely acting as a sounding board. Therefore, in order to design the participation process successfully, it was decided to start a project in which a variety of stakeholders can participate.

- From July 2019 till July 2024, the Rathenau Institute will lead this project called "Toekomst Radioactief Afval" (English translation: "Future of Radioactive Waste"[9]). The "Toekomst Radioactief Afval"-project has the following mission: organize a participative process to deliberate on a possible societal decision-making process on disposal of radioactive waste and spent fuel ('participation on participation') and advise relevant stakeholders on the results. The project consists of both the interaction of the dialogue with citizens, stakeholders and experts as well as research activities. The results and experiences will be formalized in an advice to the Minister of Infrastructure and Water Management.

- A project started to update the national inventory of radioactive waste and spent fuel. In this project the waste streams from production via the waste processors to interim storage at COVRA or disposal at the landfill will be investigated and mapped, including an estimate of the inventory in 2130. One of the aims is to separately map the amounts of waste from decommissioning. This information will give the Ministry and the Regulatory Body a better insight in the magnitude of the waste streams coming from decommissioning projects. The results of this project will be used as a basis for future policy making on decommissioning and waste minimization (e.g. by using tools as specific clearance).

- From June 2019 to January 2020, an independent committee explored support and conditions for the required knowledge structure on nuclear technology and radiation applications in the Netherlands. For more information, see section H.

- The Netherlands is a contracting party of The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (hereafter: Joint Convention or JC). One of the requirements of the Joint Convention is to report on the implementation of the widely recognized principles and tools in order to achieve and maintain high standards of safety during management of spent fuel and radioactive waste. The Netherlands published the national report for the Joint Convention in October 2020. The report is the seventh in its series.

Recent developments - COVRA

- The interim storage facility of COVRA for high-level waste (HABOG) is currently being extended. For more information, see Annex 2.

- COVRA is planning to extend the storage capacity for intermediate level waste by realizing a new waste storage building, the so-called multifunctional storage building. The new building is meant to be operational in 2025. The building is designed to accommodate a wide variety of waste streams, including some intermediate historical waste from the Research Location Petten, as well as the expected future decommissioning waste from the current nuclear installations. The project is in pre-licensing phase.

- In 2020 COVRA published a detailed research plan for the period of 2020-2025 as part of a long-term research programme for geological disposal of radioactive waste. This programme uses the roadmap developed in the OPERA safety case, thereby using a structured process to select research activities to be carried out over the coming years.

C. Scope and inventory (Article 2, Article 12.1 (c), Article 14.2 (b))

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:
(...)

(b) 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.

12.1.c Inventory of spent fuel and radioactive waste in the Netherlands

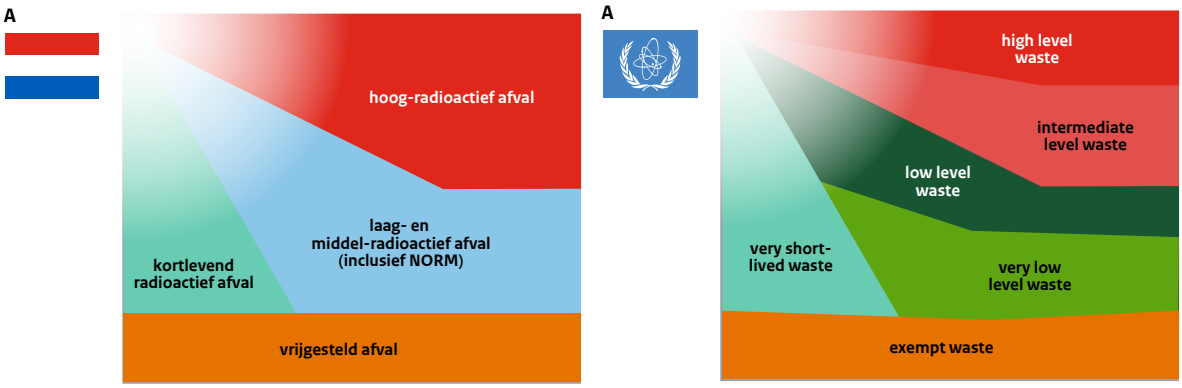
Definition of radioactive waste

The definition of radioactive waste is given in the Decree on Basic Safety Standards for Radiation Protection, the so-called Bbs[8]: *"A radioactive substance can be designated as radioactive waste by the Authority[9], or the commercial operator, if no product or material reuse is planned for the material either by the Authority or by the commercial operator, and there is no question of dumping the material".*

Classification of spent fuel and radioactive waste

In the Netherlands, radioactive waste is divided into four categories: high-level radioactive waste (HLW, non-heat generating and heat generating, "hoogradioactief afval"), low-level and intermediate-level radioactive waste (LILW, including NORM-waste, "laag- en middelradioactief afval"), short-lived waste ("kortlevend radioactief afval") and exempt waste ("vrijgesteld afval"). These categories are based on activity and half-life. Roughly speaking, the IAEA categories high-level waste and intermediate-level waste equate broadly with the Dutch category HLW and the IAEA categories low-level waste and very low-level waste with the Dutch category LILW (see Figure 2).

Figure 2: Classification of spent fuel and radioactive waste in Dutch



Spent Fuel management facilities

Table 1: Spent Fuel management facilities

Location	Spent fuel storage facility	Features
Nieuwdorp	Dry storage in vaults at COVRA.	COVRA facility for treatment and storage of HLW and SF (HABOG).
Borssele	Fuel storage pool at Borssele NPP.	Pool belongs to NPP where SF is stored temporarily before shipment to France for reprocessing.
Petten	Fuel storage pool of RR HFR.	Pool belongs to RR where SF is stored temporarily before shipment to COVRA
Petten	Dry storage in vaults at WSF.	Legacy SF samples from HFR irradiation experiments; stored in drums in concrete-lined vaults. To be transferred to COVRA[10].
Delft	Fuel storage pool of RR HOR.	Pool belongs to RR where SF is stored temporarily awaiting shipment to COVRA.

8 Dutch: Besluit basisveiligheidsnormen stralingsbescherming, Bbs.
9 Authority: Authority for Nuclear Safety and Radiation Protection.
10 More details can be found in section 12(ii).

Inventory of spent fuel

The inventory of spent fuel at 31st December 2020, stored at the COVRA facilities, is summarized below:

SF of NPPs	0 m^3	0 Bq
SF of RRs	8.2 m^3	140.0 PBq
Uranium targets	1.8 m^3	4.2 PBq

Radioactive waste management facilities

In Table 2 (below), a list of the radioactive waste management facilities is given. Small-scale waste management departments of hospitals, research institutes or industries storing radioactive waste for decay or performing simple operations (such as compacting waste awaiting collection by COVRA) are not included in the list.

Waste storage departments of the Borssele NPP and of the research reactors are not specifically mentioned either, because a general licence condition obliges licence holders to limit their inventories by transferring their radioactive waste periodically to COVRA. NRG is not allowed to store new waste in the WSF.

Table 2: Radioactive waste management facilities

Location	Spent fuel storage facility	Features
Nieuwdorp	Dry storage of HLW in canisters.	COVRA facility for treatment and storage of HLW and SF (HABOG).
Nieuwdorp	Dry storage of LILW in conditioned form in drums and containers.	COVRA facilities for treatment and storage of LILW (AVG and LOG).
Nieuwdorp	Dry storage of NORM- waste in containers.	COVRA container storage facility (COG) for material in unconditioned form.
Nieuwdorp	Dry storage of depleted uranium oxide in small containers.	COVRA facility for storage of depleted uranium oxide as U3O8 in unconditioned form to allow for potential future reuse (VOG and VOG-2).
Petten	Dry storage of unconditioned waste in drums at the WSF.	Partly HLW from irradiation experiments. To be transferred to COVRA[11].
Assendelft & Rotterdam	Disposal of NORM-waste between 1 – 10 times clearance levels[12].	Designated landfills.

Inventory of radioactive waste at COVRA

The inventory of radioactive waste at 31st December 2020, stored at the COVRA facilities, is summarized below:

HLW (excluding SF)	100.2 m^3	2.895 PBq
LILW	12,236 m^3	6,712 TBq
NORM-wastes	23,066 m^3	690 TBq

Nuclear facilities in the process of being decommissioned

In Table 3 (below) a list of nuclear facilities in the process of being decommissioned is given.

Table 3 Nuclear facilities being decommissioned

Facility	Date of final shut down	State of decommissioning
Dodewaard NPP	1997	Safe enclosure as of 01/07/2005, decommissioning planned for 2045.
LFR	2010	Decommissioned.

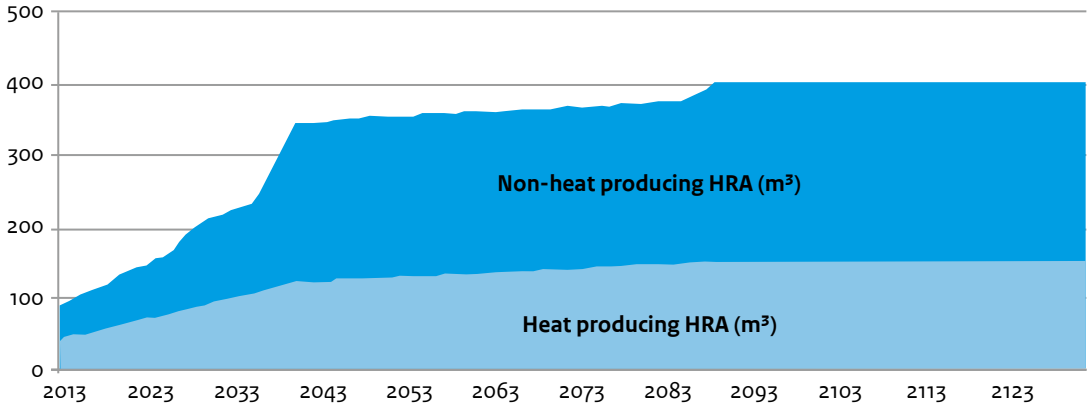
[11] More details can be found in section 12(ii).
[12] And NORM-waste below the specific clearance levels.

14.2.b Future prospects of inventory of radioactive waste and spent fuel

The future volumes of radioactive waste and spent fuel have been estimated as follows in the national programme[13]:

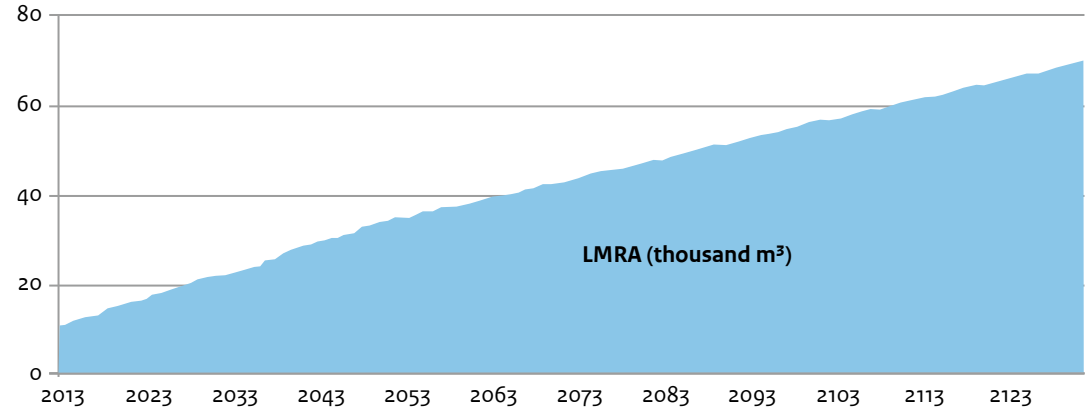
The volume of high-level waste in 2130 is estimated at 400 m³ (Figure 3). Of that volume, almost two thirds is non-heat-producing waste, while more than one third will be heat producing. One uncertainty that influences the volume of HRA is the presence of operational nuclear installations in the Netherlands. In drawing up the inventory, account was taken of the closure of the nuclear power plant in Borssele in 2033 and the dismantling of that plant over the subsequent decades, and the construction of a research reactor in Petten (Pallas). Following the closure and dismantling of the nuclear power plant in Borssele, the volume of HRA produced each year will fall considerably.

Figure 3: Development of the volume of HRA through to 2130



The volume of LMRA in 2130 is estimated at 70,000 m³ (see Figure 4). Of this total, approximately two thirds will decay over the next hundred years to below the exemption threshold. Decayed waste can be disposed of as conventional waste, and does not need to be placed in the geological disposal.

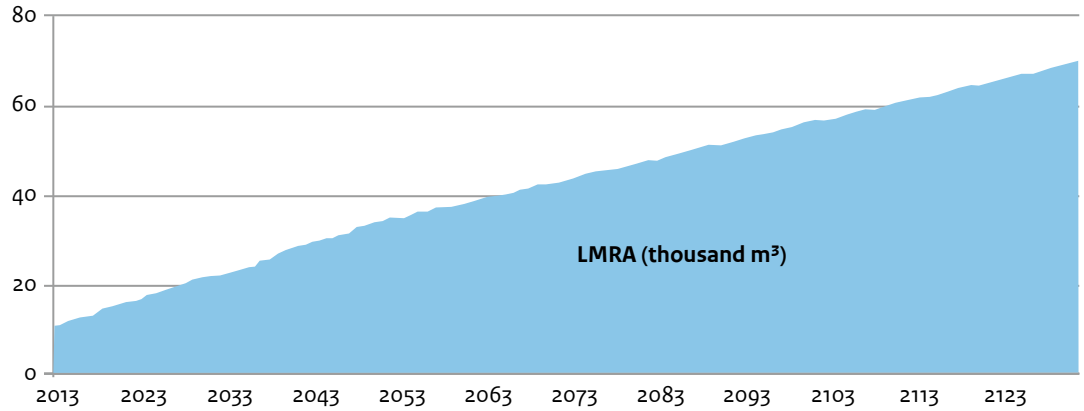
Figure 4: Development of the volume of LMRA through to 2130



[13] Inventaris radioactief afval in Nederland, September 2014, link: Inventaris radioactief afval in Nederland | Publicatie | Autoriteit NVS

The volume of NORM waste in 2130 is estimated at 158,000 m³ (see Figure 5). Because of this huge volume, minor changes in legislation and regulations could bring about major fluctuations in the volume of NORM waste. Current production has been extrapolated into the future.

Figure 5: Development of the stored volume of NORM at COVRA through to 2130



D. General principals and policies (Article 4)

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.

4.1/4.2a Statements about the national policy of the Netherlands in relation to Article 4 of the Directive

The Netherlands has implemented the Directive in national legislation. In accordance with the Directive, the Netherlands bears ultimate responsibility for the management of spent fuel and radioactive waste. This responsibility includes the conditions as formulated in articles 4.2 and 4.4 of the Directive.

The national policy of the Netherlands in respect of the management of spent fuel and radioactive waste is based on the principles as formulated in Article 4.3 of the Directive. See section A for a summary of the national policy on radioactive waste management and below for a summary of the implementation thereof.

The national policy of the Netherlands provides for safe storage of radioactive waste, followed by disposal of all radioactive waste categories in one geological facility.

In Articles 22 and 33 of the Nuclear Energy Act provisions have been made for situations where the owner of, or other person or organisation responsible for fissionable material (including spent fuel) or radioactive material respectively cannot be identified. This applies for example to orphan sources.

In such cases the Regulatory Body has been empowered to impound such material and have it transferred to designated institutes, which are equipped and licenced to manage these materials. For fissionable materials two institutes have been designated by a special decree[14]: NRG in Petten and COVRA in Nieuwdorp. The same institutes as well as the RIVM in Bilthoven have been designated for the management of radioactive materials.

Political decisions in relation to Article 4 of the Directive, that form the basis for the national policy

The national programme describes the Dutch policy on the management of radioactive waste, including the route to disposal. The basis of the national policy on radioactive waste management was laid down in a policy statement in 1984. The policy has undergone minor changes over the past 30 to 40 years, and complies with the requirements of Article 4.

Directive 2011/70/Euratom has been fully implemented in the Decree on Basic Safety Standards for Radiation Protection (Bbs, Article 10.1) and in the Nuclear Installations, Fissionable Materials and Ores Decree (Article 40a).

4.3 Summary of implementation of policy principles

In the Netherlands, the policy on the management of radioactive waste also applies to spent fuel.

4.3.a Minimization of radioactive waste

Minimization of the generation of radioactive waste is part of the policy on the management of radioactive waste, as referred to in section A. Furthermore, according to the Decree on Basic Safety Standards for Radiation Protection (Bbs), a licence holder in possession of radioactive material is obliged to prevent or to limit, as far as reasonably achievable, the generation of radioactive waste. The licence holder is in principle free to choose its measures to achieve this goal.

Also by reuse and reprocessing the quantity of radioactive waste is minimized. See Current practice reprocessing (section A) for information on reprocessing.

4.3.b Interdependencies in spent fuel and radioactive waste generation and management

The basic steps in spent fuel management are not fundamentally different from those in radioactive waste management. For radioactive waste management the steps identified are generation, collection, treatment, conditioning, storage and disposal.

[14] Decree on the designation of institutes as meant under articles 22 sub 4 and 33 sub 4 of the Nuclear Energy Act, Bulletin of Acts and Decrees 1996, 528

By spent fuel management is meant under 'pre-treatment' the temporary storage of spent fuel with the aim of cooling down in the storage pool at the reactor site. Treatment is to be understood as reprocessing at the reprocessing plant ORANO in France.
After spent fuel has been shipped to the reprocessing plant, the spent fuel is allowed to further cool down for some five to eight years in pools. Then the fuel is removed from the matrix and sheared into pieces for further processing.

Solvents are used to separate uranium, plutonium and fission products. The fission products and other reprocessing residues are conditioned in packages that facilitate their long-term storage without significant maintenance. It is then transferred to COVRA.

The fuel from the research reactors is not reprocessed. It is packed in sealed canisters consistent with maintenance- free storage and stored at COVRA. The final step in waste management is geological disposal.

4.3.c Safe Management in the long term, passive safety features

The Netherlands foresees geological disposal in 2130. Geological disposal is one of the management options that following closure offers passive safety. In the meantime, for the long-term safe storage of high-level waste, the HABOG is as far as possible equipped with passive safety features (see Annex 2).

4.3.d Graded approach

The policy on management of radioactive waste follows a graded approach (see Table 4 below). COVRA has dedicated buildings for high-level waste (HABOG), low and intermediate level waste and NORM waste (for instance VOG-2).

Table 4: Categories of radioactive wastes and their management options

Category radioactive waste	Interim management	Long-term management
HLW	Storage at COVRA	Geological disposal[15]
LILW	Storage at COVRA	
NORM, subject to licensing	Storage at COVRA	
NORM, subject to notification (i.e.: up to 10x the general clearance level)	-	Designated landfill
Radioactive waste with T1/2 < 100 days decaying below clearance levels in 2 years	-	Reuse or reprocessing as conventional waste
Radioactive waste decaying below clearance levels in 50 years	Storage at COVRA	
Radioactive waste below clearance levels	-	
When applicable: radioactive waste between general and specific clearance levels	As specified in the requirements for the specific clearance	As specified in the requirements for the specific clearance

4.3.e Costs for the management of spent fuel and radioactive waste: polluter pays

One of the policy principles is that the 'polluter pays' for the costs of radioactive waste management.

This is implemented as follows:

1. Some of the buildings at COVRA are "dedicated" for the waste of large clients, and commissioned on their behalf. These buildings are invoiced, and not activated on COVRA's balance sheet. An example is the expansion of the HABOG, which is paid for by EPZ and the new building for depleted uranium (VOG-2), which is paid for by Urenco. The financial construction risk is therefore taken away from COVRA.

[15] Radioactive waste that has decayed till below exemption levels at the time of disposal will be treated as conventional waste.

2. Upon delivery of the waste, the supplier pays COVRA the stipulated price (contractual) tariff, which is meant to cover the costs arising from the services over the entire management cycle (from transport, processing, storage to final disposal) on the basis of the current insights. With the implementation of the Directive, the obligation has been introduced to set off the research costs into waste management in the charges imposed by COVRA. After payment, COVRA takes over the legal ownership and thereby the responsibility for the radioactive waste. This policy prevents waste suppliers from being unable to meet their obligations in the future in the event of financial problems or termination of the business operations. COVRA thus mitigates the risks that could arise from (for example) a possible future bankruptcy of waste producers.

4.3.f Evidence-based and documented decision-making processes

The reversible structuring of the process for (definitive) disposal must relieve future generations from the burden of decisions taken in the past. This means that during the entire process of preparation for disposal, the building of the disposal facility and actual disposal of the waste, consideration will have to be given to whether the next step should definitively be taken, or whether a step back should be taken in the process.

4.4 Transboundary movement

The Netherlands, as a member state of the European Union, has implemented Council Directive nr. 2006/117/Euratom[16] in its national legislation[17].

Under these regulations, imports and exports of radioactive waste require a licence to be issued by the ANVS. Licence applications for a transboundary shipment of radioactive waste should be made to the ANVS using the standard document as stated in Council Directive 2006/117/Euratom.

Spent fuel destined for reprocessing is not classified as radioactive waste. However, with a view to the quantities and high radioactivity levels, these shipments are also subject to the provisions of Directive 2006/117/Euratom and need an import and export licence.

In addition to that, for transports inside the Netherlands, depending on the material, a transport licence or transport notification is required, based on the Nuclear Energy Act. The transport shall be in compliance with the international transport regulations covering aspects such as transport safety, radiation protection, package design approval certificates and physical protection measures.

The Netherlands has implemented the international agreements on the transport of radioactive materials for the different modes of transport as released by ICAO (air transport), IMO (sea transport), ADR (road transport), RID (rail transport) and ADNR (transport over inland waterways).

[16] Directive Nr. 2006/117/Euratom of the Council of the European Communities of 20 November 2006 on the supervision and control of shipments of radioactive waste between Member States and into and out of the Community.

[17] Decree on the import, export and transit of radioactive waste and spent fuel, Bulletin of Acts and Decrees, 2009, 168.

E. National framework (Article 5)

Article 5 – National framework

5.1. 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:

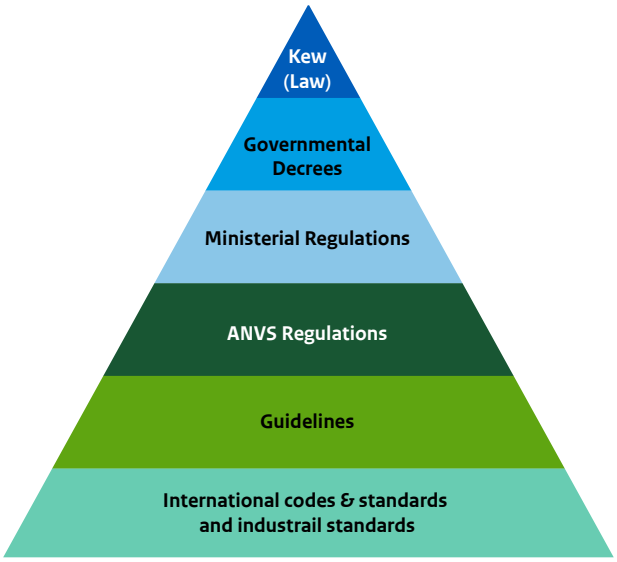
(a) a national programme for the implementation of spent fuel and radioactive waste management policy;
(b) national arrangements for the safety of spent fuel and radioactive waste management. The determination of how those arrangements are to be adopted and through which instrument they are to be applied 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.

5.2. 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.

5.0 Overview of national legislative framework

Simplified representation of the hierarchy of the legal framework for applications of nuclear technology
The legal framework in the Netherlands with respect to nuclear installations can be presented as a hierarchical structure (see Figure 6).

Figure 6: Dutch legal framework in a hierarchical structure



The Nuclear Energy Act (Kew) is the most prominent law.

Governmental Decrees contain additional regulation.

Ministerial Decrees contain additional regulation.

ANVS Regulations give additional rules for certain topics.

Guidelines are safety requirements referenced in the licence of the NPP.

Various industrial codes and standards are essential references for for licensing.

In addition to the levels shown in this figure, there are international conventions and other legal instruments related to nuclear safety that also apply. For more information, see below.

The ANVS is authorized to issue 'ANVS – Regulations'. The ANVS has the competence to do this so if:
- those rules pertain to technical or organisational issues,
- those rules are needed for nuclear safety, radiation protection and security and
- Governmental Decrees or Ministerial Decrees refer to guidance to be provided in ANVS Regulation.

In the hierarchy of the legal framework the ANVS Regulations are positioned between the Ministerial Decrees and the NVR's.

Governmental framework

The Netherlands is a parliamentary democracy. On behalf of the Dutch people, Parliament oversees the Dutch government and adopts laws and can propose law making to the government. The parliament of the Netherlands, called the States-General, consists of two chambers: the House of Representatives (in Dutch: 'Tweede Kamer der Staten-Generaal') and the Senate ('Eerste Kamer der Staten-Generaal'). General elections for the House of Representatives are held at least every four years. The government comprises the King, the Prime Minister, and the other ministers. The Cabinet is the government, excluding the King, but including the State Secretaries. The Cabinet formulates and is accountable for the government's policies.

Process of establishing arrangements such as laws and other requirements

The Constitution of the Netherlands describes how laws are established, and how the Constitution itself can be amended. The national legal framework consists of laws, Governmental Decrees and Ministerial Decrees. The majority of laws are introduced to the Parliament by the Government. The members of Parliament can adopt, reject or amend a bill. Certain laws, such as the Nuclear Energy Act (Kew), are a so-called 'framework act' whereby the establishment of the underlying detailed requirements is delegated to the Government, ministers or specific administrative bodies.

The Advisory Division of the Council of State[18] provides the Government with independent advice on proposals for new laws and Governmental Decrees.

There is also a procedure employed for draft Governmental Decrees whereby Parliament is offered an opportunity to examine and debate these decrees. It is up to the responsible Minister to decide how to use this input. Governmental Decrees do not require a vote in Parliament. Ministerial regulations are issued by a Minister. These regulations also are not submitted to Parliament for input or vote.

Ministry of I&W – Directorate-general for the Environment and International Affairs

The Minister of Infrastructure and Water Management (I&W) is responsible for policy and legislation on nuclear safety, security and radiation protection. In the current cabinet these responsibilities are entrusted to the State Secretary of I&W. The Directorate-general for Environment and International Affairs (dgMI) is responsible for the development thereof.

Regulatory body

The Regulatory Body is the authority designated by the government as having legal authority for conducting the regulatory processes, including issuing authorizations, supervision and enforcement, and thereby regulating nuclear safety, security and safeguards, radiation protection, radioactive waste management and transport safety. The regulatory tasks related to the management of radioactive waste and spent fuel are in the scope of the tasks of the ANVS. As stated before, since 15 May 2020 the responsibility for preparing policy development and legislation concerning radioactive waste and spent fuel has been transferred to the Ministry of Infrastructure and Water Management, i.c. the dgMI.

Several other ministers also have responsibilities in specific areas related to the use of radioactivity and radiation protection. Therefore some departments of ministries or inspectorates thereof can be considered to be part of the Regulatory Body under the Nuclear Energy Act.

For more information on the Regulatory Body, see section F.

Primary legislative framework: laws

The following are the main laws to which nuclear facilities in the Netherlands, including COVRA, are subject[19]:

- The Nuclear Energy Act ('Kernenergiewet', Kew);
- The Environmental Protection Act ('Wet milieubeheer', Wm);
- The General Administrative Act ('Algemene wet bestuursrecht', Awb);
- The Water Act ('Waterwet, Ww);
- Environmental permitting (general provisions) Act ('Wet algemene bepalingen omgevingsrecht', Wabo).

Other important Acts with relevance for the licencing and operation of nuclear installations are the Act on Government Information ('Wet openbaarheid van bestuur', Wob) and the Dutch Safety Regions Act (Wet veiligheidsregio's). In this section, the main elements of several acts are elaborated. For more information on secondary legislation, like the aforementioned decrees and NVR's, see further below.

Nuclear Energy Act

The basic legislation governing nuclear activities is contained in the Nuclear Energy Act (Dutch: Kernenergiewet, Kew). It is a framework law, which sets out rules on the application of nuclear technology and materials, makes provision for radiation protection, designates the competent authorities and outlines their responsibilities. More detailed legislation is provided by associated decrees.

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[18] The 'Raad van State', the 'Council of State' has two primary tasks, carried out by two separate divisions. The Advisory Division, as its name implies, advises the government and Parliament on legislation and governance, while the Administrative Jurisdiction Division is the country's highest general administrative court. The basis for these responsibilities can be found in articles 73 and 75 of the Dutch Constitution.

[19] Disposal facilities would also fall in this category. However, there are currently no such facilities in the Netherlands.

With regard to nuclear facilities, the purpose of the Nuclear Energy Act, according to its section 15b, is to serve the following interests:

- the protection of people, animals, plants and property;
- the security of the State;
- the security and safeguarding of nuclear material;
- the liability for damage or injury caused to third parties;
- the compliance with international obligations.

Within the framework of the Nuclear Energy Act, fissionable materials are defined as materials containing up to a certain percentage of uranium, plutonium or thorium (i.e. 0.1% uranium or plutonium and 3% thorium by weight). All other materials containing radionuclides and exceeding the exemption levels, are defined as radioactive materials.

Three areas of application of the Nuclear Energy Act

As far as nuclear facilities are concerned, the Nuclear Energy Act covers three distinct areas relating to the use of fissionable materials, including spent fuel, and ores: (1) registration, (2) transport and management of such materials, and (3) the operation of facilities and sites at which these materials are stored, used or processed:

1. The registration of fissionable materials and ores is regulated in sections 13 and 14 of the Nuclear Energy Act; further details are given in a special Decree issued on 8 October 1969 (Bulletin of Acts and Decrees 471). The statutory rules include a reporting requirement under which notice must be given of the presence of stocks of fissile materials and ores. The ANVS is responsible for maintaining the register.

2. A licence is required in order to transport, import, export, be in possession of or dispose of fissionable materials and ores. This is specified in section 15, sub a of the Act. The licensing requirements apply to each specific activity mentioned here.

3. Licences are also required for building, commissioning, operating and decommissioning nuclear installations (section 15, sub b).

In theory, a licence to build a nuclear installation may be issued separately from a licence to actually commission it. However, the licensing of the construction of a radioactive waste or spent fuel management facility addresses more than the construction work. Account will have to be taken of all activities to be conducted in the installation, during and after its construction. The authorities need to decide whether the location, design and construction of the installation are suitable, offering sufficient protection of the public and the environment from any danger, damage or nuisance associated with the activities to be conducted in the installation.

Amendments to a licence will be needed where planned modifications of an installation invalidate the earlier description of it. The licence for the decommissioning of nuclear facilities is regarded as a special form of modification and is treated as such. See further below in this section for information on the Bkse, that provides more guidance on decommissioning issues.

The Nuclear Energy Act includes a separate chapter (Chapter VI) on intervention and emergency planning and response.

Environmental Protection Act (Wm)

In the case of non-nuclear facilities, the Environmental Protection Act (Dutch: Wet milieubeheer, Wm) regulates environmental issues (e.g. chemical substances, smell and noise).

According to this Act and the associated Environmental Impact Assessment Decree, the licensing procedure for the construction of a nuclear facility includes a requirement to draft an Environmental Impact Assessment (EIA) report. An assessment on the significance of the environmental impact is required, for instance, in situations involving:

- a change in the type, quantity or enrichment of the fuel used;
- an increase in the release of radioactive effluents;
- an increase in the on-site storage of spent fuel;
- decommissioning.

The Environmental Protection Act states that under certain conditions (depending on size and nature of modifications), an independent Commission for Environmental Assessments must be established - and in these cases it should be consulted when it is decided that an EIA needs to be submitted. The dedicated organisation for this procedure, is called 'Commissie voor de m.e.r.' (Cmer[20]). The types of activities for which such assessments are required are specified in the Decree. The Cmer can be asked to advise on the requirements of all EIAs conducted in the Netherlands, including those related to nuclear facilities.

The general public and interest groups often use EIAs as a basis for commenting on and raising objections to decisions on nuclear activities.

General Administrative Act (Awb)

The General Administrative Act (Dutch: Algemene wet bestuursrecht, Awb) is the law that governs the activities of administrative agencies of government and the interaction of the public in the procedures (i.e. objections and appeals). The Awb applies to virtually all procedures in administrative law. It thus also details the general procedures for the oversight and the enforcement and related to the latter the possible sanctions.

The Awb also provides for procedures regarding publication of information of draft decisions, like those needed to award a licence. These need to be published in the Dutch Government Gazette ('Staatscourant'), and in the national and/or local press. Under the Awb, documents provided with an application for a licence are to be made available for inspection by the public. Any stakeholder is free to lodge written or oral opinions, or by email on the draft decision and to ask for a hearing. All views made to the draft version of the decision are taken into account in the final version. Any stakeholder that has expressed views to the draft decision is free to appeal to the Council of State (the highest administrative court in the Netherlands) against the decision by which the licence is eventually granted, amended or withdrawn.

Specific requirements for the publication of new regulations are also laid down in the Publication Act (Bekendmakingswet). All new acts and governmental decrees are published on the internet and in the Official Journal ('Staatsblad') after enactment by the parliament. Announcements of new regulations have to be published in the Government Gazette.

Act on Government Information (Wob)

Under the Dutch Government Information (Public Access) Act (Dutch: Wet openbaarheid van Bestuur, Wob), as a basic principle, information held by public authorities is public, excluding information covered by the exceptions enumerated in the Act in its Article 10[21]. The act requires authorities to provide information unsolicited as it is in the interest of good and democratic governance, without prejudice to provisions laid down in other statutes. According to Article 3 of the Wob, any person can request information related to an administrative matter as contained in documents held by public authorities or companies carrying out work for a public authority.

[20] http://www.commissiemer.nl/english

[21] Examples of such exceptions are concerns regarding national security, privacy, and confidentiality of company information submitted to authorities.

Water Act (Ww)

The purpose of the Water Act (Dutch: Waterwet, Ww) is to prevent and where necessary, limit flooding, swamping and water shortage. Furthermore, it is meant to protect and improve the chemical and ecological status of water systems and to allow water systems to fulfil societal and ecological functions.

Nuclear installations need a permit under the Water Act to licence their direct (nonradioactive) discharges to the surface water.

Environmental Permitting (General Provisions) Act (Wabo)

Some 25 existing systems for issuing permits, licences, exemptions and so on for location bound (non-nuclear) activities, which have an impact on our physical environment, have been replaced (October 2010) by a single environmental licence. The main purpose is to establish a single, straightforward procedure with one set of rules for persons or businesses seeking permission for activities which affect the physical environment. This includes one application form to fill in, one single competent authority, one supervision and enforcement authority and one procedure for objections and appeals. The goal is to simplify licensing systems and reduction of expenses for the applicants.

The civil engineering part of the construction of a nuclear installation and local spatial planning aspects will be licenced under the Wabo or the Spatial Planning Act ('Wet ruimtelijke ordening') by local authorities on the level of towns or rural municipalities. The nuclear safety and radiation protection aspects will be licenced under the Nuclear Energy Act by the Regulatory Body.

Safety Regions Act ('Wet veiligheidsregio's', Wvr)

The Safety Regions Act (Dutch: Wet veiligheidsregio's', Wvr) seeks to achieve an efficient and high-quality organisation of the fire services, medical assistance and crisis management under one regional management board.

Ratification of international conventions and legal instruments related to the management of radioactive waste and spent fuel

In addition to the JC, the Netherlands is party to many other Treaties and Conventions relating to the use of nuclear technology and radioactive materials. This is illustrated by the following list.

Non-proliferation: the Netherlands is party to the 'Treaty on the Non-Proliferation of Nuclear Weapons', the non-proliferation treaty of the UN. Related to this are the guidelines from the 'Nuclear Suppliers Group' that lay down restrictions on the transfer of sensitive nuclear techniques such as enrichment and reprocessing.
Furthermore, the Netherlands is a party to the safeguards agreement between the IAEA, Euratom and Euratom's non-nuclear weapon Member States (INFCIRC/193) and has in force the Additional Protocol (AP, INFCIRC/540) and the Comprehensive Safeguards Agreement (CS, INFCIRC/153). In addition, the Netherlands is affiliated to the 'Proliferation Security Initiative' (PSI), based on Resolution 1540 of the UN Security Council for the Non-proliferation of Weapons of Mass Destruction[22].

Nuclear safety: the Netherlands is party to the UN Convention on Nuclear Safety, the CNS.

(Radioactive) Waste management: the Netherlands is party to the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive waste `management[23].

Physical protection: the Netherlands is party to the Convention on Physical Protection of Nuclear Material and Nuclear Facilities[24]. In addition, the Netherlands has also expressed its support for the following 'Codes of Conduct':
- 'Code of Conduct on the Safety and Security of Radioactive Sources' (published 2004, IAEA);
- 'Code of Conduct on the Safety of Research Reactors' (published 2004, IAEA).

[22] UN Security Council Resolution 1540 (UNSCR 1540) for the non-proliferation of Weapons of Mass Destruction (WMD).
[23] Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, (JC).
[24] Convention on Physical Protection of Nuclear Material and Nuclear Facilities. This is the amended version of the Convention on Physical Protection of Nuclear Material (CPPNM), the amendment having entered into force on 8 May 2016.

For all EU countries, EU legislation has a large impact on the national legislation. Examples are given below.

The Netherlands has implemented Council Directive 2009/71/Euratom of 25 June 2009 on nuclear safety in its national legislation[25] in 2011. The safety objectives of the Directive cover those of the Nuclear Safety Convention and are in some regards more specific and have a larger scope.

The Directive 2009/71/Euratom ('Nuclear Safety Directive', NSD) prescribes the systematic evaluation and investigation of the nuclear safety of nuclear installations during their operating life possibly leading to improvements in the installation ('continuous improvement').
Also, the regulation prescribes inter alia that:

- Licence holders should give sufficient priority to nuclear safety systems;
- Licence holders must provide adequate human and financial resources to meet the obligations on the nuclear safety of a nuclear installation;
- All parties, including the licence holder, are required to provide a mechanism for educating and training their staff responsible for the safety of nuclear installations to meet the expertise and competence in the field of nuclear safety to be maintained and developed.

After the accident in Fukushima, the EU amended its NSD in 2014[26]. The amended Directive was developed considering various reviews, and reinforces several provisions of the 2009 NSD, such as[27]:

1. Strengthens the role of national regulatory authorities by ensuring their independence from national governments. EU countries must provide the regulators with sufficient legal powers, staff, and financial resources.
2. Creates a system of topical peer reviews. EU countries choose a common nuclear safety topic every six years and organise a national safety assessment on it. They then submit their assessment to other countries for review. The findings of these peer reviews are made public.
3. Requires a safety re-evaluation for all nuclear installations to be conducted at least once every 10 years.
4. Increases transparency by requiring operators of nuclear installations to release information to the public, both in times of normal operation and in case of incidents.

The transposition of the amended Nuclear Safety Directive in Dutch legislation was prepared in 2016 and was completed in 2017[28] and resulted in a new Ministerial Decree on Nuclear Safety (MD-NV).

The Netherlands has implemented Council Directive 2011/70/Euratom of 19 July 2011 'establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste'. Directive 2011/70/Euratom has been fully implemented in the Decree on Basic Safety Standards Radiation Protection (Bbs) and in the Nuclear Installations, Fissionable Materials and Ores Decree (Bkse). The Netherlands has drafted the required 'National Programme on radioactive waste and spent fuel' according to the definition provided by this Directive.

The Netherlands has implemented Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom,90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom. For more information on the Basic Safety Standards Radiation Protection Decree, see further below.

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[25] Regulation of the Minister of Economic Affairs, Agriculture (EL&I) and Innovation and the Minister of Social Affairs and Labour of 18 July 2011, No WJZ/11014550, concerning the implementation of Directive No 2009/71/Euratom of the Council of the European Union 25 June 2009 establishing a Community framework for nuclear safety of nuclear installations (PB EU L 172/18). In 2011, implementation was done via a temporary ordinance (Stcrt. 2011, nr.12517), which was made permanent in 2013 (Stcrt. 2013, nr. 14320).

[26] The Safety Directive was amended by 'Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations'.

[27] 2015, Report of ENSREG, HLG_p(2015-31)_145.

[28] https://eur-lex.europa.eu/legal-content/NL/NIM/?uri=CELEX:32014L0087.

Special agreements

Special agreements – reprocessing spent fuel
For more information on the special agreements on reprocessing of spent fuel from the Borssele NPP, see section A.

Provisions in the legislative and regulatory framework

National safety requirements and regulations

This section describes the regulatory framework, focusing on all levels below the top-level (Law) as portrayed in aforementioned legal hierarchy (Figure 6).

In short, the following categories will be discussed in this section:
- (Governmental) Decrees (Dutch: 'Besluiten');
- Ministerial Decrees (Dutch: 'Ministeriële regelingen');
- ANVS regulations;
- Dutch Safety Requirements, like the 'Nucleaire Veiligheidsregels', NVR's. NVR's are amended IAEA Requirements or Guides. Since they are not included in a Ministerial Decree or in the licence of a nuclear installation, they are not legally binding, and they should then be considered as Guidelines. This is applicable for new NPP or RR projects. Apart from amended IAEA standards, there are also other Guidelines (see next category);
- Guidelines on various issues, non-binding documents published by the ANVS to aid licence holders to meet the Regulatory Body's expectations. When needed, like NVR's these can be referred to in the licence conditions and as such become a legally binding part of these. Guidelines can also be applied to existing nuclear installations as a reference (e.g. in PSRs);
- Codes and Standards of industry.

Governmental Decrees ('Besluiten')

A number of Governmental Decrees[29] have been issued containing additional regulations and these continue to be updated in the light of ongoing developments. Important examples of these in relation to radioactive waste and spent fuel and the safety aspects of nuclear installations are:
- the Transport of Fissionable Materials, Ores and Radioactive Substances Decree (Bvser);
- the Decree on the Import, Export and Transit of radioactive Waste and Spent Fuel (Biudrabs);
- the Environmental Impact Assessment Decree;
- the Reimbursement Decree;
- the Basic Safety Standards Radiation Protection Decree (Bbs);
- the Nuclear Installations, Fissionable Materials and Ores Decree (Bkse);
- the Radioactive Scrap Detection Decree.

The Nuclear Energy Act and the aforementioned Decrees are fully in compliance with the relevant Euratom Directive.

Transport of Fissionable Materials, Ores and Radioactive Substances Decree (Bvser)
The Transport of Fissionable Materials, Ores and Radioactive Substances Decree (Bvser) deals with the import, export and domestic transport of fissionable materials, ores and radioactive substances, including radioactive waste and spent fuel, by means of a reporting and licensing system.

Decree on the import, export and transit of radioactive waste and spent fuel (Biudrabs)
The import, export and transit of radioactive waste and spent fuel is regulated by the Decree on the import, export and transit of radioactive waste and spent fuel. This Decree is the implementation of the Euratom directive 2006/117, and is aimed to control shipments of waste between EU Member States and between EU Member States and countries outside the EU.

[29] In Dutch legislation they belong to the category: 'Algemene maatregelen van bestuur'

Environmental Impact Assessment Decree

The Environmental Impact Assessment Decree, in combination with the Environmental Protection Act, stipulates that in certain circumstances a licence application for a nuclear installation shall be accompanied by an EIA. This complies with EU Council Directive 97/11/EC.

Reimbursement Decree

Under current regulation the costs of the Regulatory Body for oversight and licencing are partially reimbursed. Applicants and licensees pay for indicated licensing activities and the licence holders of nuclear installations pay an annual fee for oversight.

Decree on Basic Safety Standards Radiation Protection (Bbs)

The Bbs regulates the protection of the public (including patients) and workers against the hazards of all ionising radiation. It also establishes a licensing system for the use of radioactive materials, including radioactive waste, and radiation-emitting devices, and prescribes general rules for their application.

The Netherlands has implemented Council Directive 2013/59/Euratom[30], laying down basic safety standards for protection against the dangers arising from exposure to radiation, in its national legislation. On 6 February 2018, the Decree on Basic Safety Standards for Radiation Protection (In Dutch: "Besluit basisveiligheidsnormen stralingsbescherming") and the following underlying regulations have come into force:

- Regulation on Basic Safety Standards for Radiation Protection (in Dutch: "Regeling basisveiligheidsnormen stralingsbescherming");
- Regulation on Radiation Protection for Occupational Exposure (in Dutch: "Regeling stralingsbescherming beroepsmatige blootstelling");
- Regulation on Radiation Protection for Medical Exposure (in Dutch: "Regeling stralingsbescherming medische blootstelling");
- ANVS-regulation on Basic Safety Standards for Radiation Protection (In Dutch: "ANVS-Verordening basisveiligheidsnormen stralingsbescherming").

The implementation led to the introduction of a situation based approach (planned, emergency and existing situations), as prescribed in the Basic Safety Standards Directive. Another change was the introduction of "registration" as one of the two instruments to authorise practices using ionising radiation. Licensing is the other instrument to authorise practices.

This Decree also regulates the requirements for the recycling or disposal of unsealed or sealed sources that are no longer used. Additional requirements for High-Activity Sealed Sources and orphan sources are also laid down in this Decree.

The Bbs and dose criteria for normal operation

Main elements of the Bbs are: (1) justification of the activity, (2) optimization - ALARA and (3) dose limits. Practices involving ionizing radiation should be justified. Dutch regulation features a list of 'justified and not justified practices'.

The exposure to ionising radiation should be kept As Low As Reasonably Achievable (ALARA). The ALARA principle is also recorded in the Nuclear Energy Act (article 15c sub3 and 31), the Bbs Decree and in the Bkse Decree.

The dose limit for members of the public is a maximum total individual dose of 1 mSv for members of the public and 20 mSv for workers in any given year as a consequence of normal operation from all anthropogenic sources emitting ionising radiation (i.e. NPP's, isotope laboratories, sealed sources, X-ray machines, industries), thus excluding natural background and medical exposures. For a single source (for instance a single NPP), the maximum individual dose is set at 0.1 mSv per annum. An application for authorisation will always be refused if the practice results in an effective public dose higher than 0.1 mSv per year.

[30] Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom.

The Nuclear Installations, Fissionable Materials and Ores Decree stipulates that the relevant sections of the Bbs and the underlying regulations about the protection against ionizing radiation also apply to fissionable materials, including spent fuel.

The Bbs and radioactive waste

The Bbs also regulates general radioactive waste requirements. When applying for a licence for the use of radioactive sources or equipment, the applicant must include a decommissioning plan, which describes the way the licence holder will end the use of the radioactive materials and the disposal thereof. Radioactive material for which no further use is foreseen, can be classified as radioactive waste. For the disposal of radioactive waste a licence is required. However, an authorized user of radioactive material is allowed to remove the radioactive material from the site without a licence, in a limited number of ways:

- if the (activity) concentration is below the general clearance levels, as applicable;
- in the case of sealed sources, if return of the source to the manufacturer or supplier of the source is agreed and contracted;
- in case of NORM, there are some possibilities to enable reuse of these materials; by transfer to another individual or legal person for use, reuse or recycling of this radioactive material or for collection and pre-treatment of radioactive waste, provided that this person holds a valid licence for this material;
- by transfer to a recognised waste management organisation. COVRA is the only recognized organisation for the collection, treatment and storage of radioactive waste;
- by transfer to another designated organisation (landfills) for the collection of radioactive waste;
- In the case of specific clearance, other options than a transfer to COVRA are possible when the material is below specific clearance levels and the exposure of workers and the public is limited by additional measures or by permitting, for example, only one specific application (conditional clearance).

Licence holders are required to deliver their radioactive waste or fissionable materials for which no further use is foreseen or spent fuel which is not destined for reprocessing, to COVRA. The underlying philosophy is that, because of the relatively small amounts of waste to be managed, only a centralised approach can ensure an adequate level of professionalism in the management of the waste. Therefore most requirements are established in the licence of COVRA and only a few generic rules exist for spent fuel and radioactive waste management facilities.

Nuclear Installations, Fissionable Materials and Ores Decree ('Besluit kerninstallaties, splijtstoffen en ertsen', Bkse)

The Bkse and licensing construction, commissioning & operation

The Bkse sets out additional regulations in relation to nuclear facilities and fissionable materials in a number of areas, including the licence application for the construction, commissioning and operation of a facility for the storage of fissionable materials, including spent fuel , and associated requirements. According to article 8 of Bkse, for such an application, applicants are required to submit (among others) the following information:

- a description of the site where the installation is to be located, including a statement of all relevant geographical, geological, climatological and other conditions;
- a statement of the chemical and physical condition, the shape, the content and the degree of enrichment of the fissionable materials which are to be used in the installation, specifying the maximum quantities of the various fissionable materials that will be present at any one time;
- a description of the measures to be taken either by or on behalf of the applicant so as to prevent harm or detriment or to reduce the risk of harm or detriment, including measures to prevent any harm or detriment caused outside the installation during normal operation, and to prevent any harm or detriment arising from the Postulated Initiating Events (PIEs) referred to in the description, as well as a radiological accident analysis concerning the harm or detriment likely to be caused outside the installation as a result of those events (safety analysis report);
- a risk analysis concerning the harm or detriment likely to be caused outside the installation as a result of severe accidents (Probabilistic Safety Analyses).

The Bkse and decommissioning

The Bkse includes legislation on decommissioning and financial provisions for the costs of decommissioning of nuclear installations. An important part of this legislation was based on the WENRA Reference Levels[31].

Safety Reference Levels on decommissioning

The Bkse requires the licence holder to have and periodically (every five years) update a decommissioning plan during the lifetime of the facility and submit it to the authorities for its evaluation and decision of approval of the ANVS. The Bkse specifies the minimum requirements on the content of the decommissioning plan. The decommissioning plan sets out safety conditions for all the activities carried out during the decommissioning phase, and it provides the basis for the financial provisions for the decommissioning costs.

For the application for a decommissioning licence, according to the Bkse, the licence holder shall submit the following information to the authorities:

- A copy of the operating licence;
- A decommissioning plan;
- A description of the measures to be taken either by or on behalf of the applicant so as to prevent harm or detriment or to reduce the risk of harm or detriment, including measures to prevent any harm or detriment caused outside the facility during normal operation, and to prevent any harm or detriment arising from the Postulated Initiating Events (PIEs) referred to in the description, as well as a radiological accident analysis concerning the harm or detriment likely to be caused outside the installation as a result of those events (Safety Analysis Report);
- A risk analysis concerning the harm or detriment likely to be caused outside the installation as a result of severe accidents.

The Bkse and the risk criteria for incidents and accidents

In the Netherlands a "risk policy" applies aiming at reducing risks posed by any hazardous activity and including nuclear installations[32]. This policy is primarily incorporated in the Bkse.

As far as the radiological hazard is concerned, the regulations can be seen as implementing the IAEA Fundamental Safety Standards (IAEA SF-1), in particular implementing the primary 'Safety Objective': 'The fundamental safety objective is to protect people and the environment'.
The application according to Bkse of this objective requires the licence holder to:

- Verify that pre-set criteria and objectives for individual and societal risk have been met. This includes identifying, quantifying and assessing the risk;
- Reduce the risk, if required, until an optimum level is reached (based on the ALARA principle);
- Exercise control, i.e. maintain the level of risk at this optimum level.

Ministerial Decrees ('Ministeriële Regelingen, MR')

In this section, only a selection of Ministerial Decrees relevant for this Directive, and as far as not mentioned previously, is discussed. The here mentioned ministerial decrees are issued by the Minister of Infrastructure and Water Management.

Ministerial Decree on 'Nuclear Safety'

Notable is the transposition of the Council Directive 2014/87/Euratom of 8 July 2014, amending Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations. The transposition of the amended Nuclear Safety Directive resulted in a new Ministerial Decree on Nuclear Safety on 14 June 2017 (the 'MRNV').

[31] Western European Safety Regulators Association, WENRA.
[32] Formulated by the former Ministry of VROM, for the scope of the Joint Convention, the predecessor of the Ministry of Infrastructure and Water Management.

Ministerial Decree on the Decommissioning of Nuclear Facilities

This ministerial decree contains:

- Additional requirements for the content of the decommissioning plans for nuclear facilities,
- Additional rules pertaining the decommissioning of nuclear facilities and
- Additional requirements for the application of the approval for the financial provisions of the decommission of nuclear power plants and research reactors.

Regulations and guides issued by Regulatory Body

The Nuclear Safety Rules (NVR's)

The Nuclear Safety Rules (Dutch: 'Nucleaire VeiligheidsRegels', NVR's) are legally binding for an installation or nuclear facility, when they are referred to in licences through a licence condition. This mechanism allows the ANVS to enforce the NVR's. The practice of including requirements in the licence instead of general rules is a suitable approach for a country like the Netherlands with a very small number of nuclear facilities and only one operating NPP. NVR's are part of the licence of the NPP for already more than 30 years.

NVR's, adapted to the use in the Dutch nuclear facilities

The NVR's are based on the Safety Standards and Guides issued by the IAEA. These IAEA documents have been assessed to determine how they can be applied in the Netherlands. This has resulted in a series of adaptations (termed 'amendments') to the IAEA documents, which then have become the NVR's. The amendments have been formulated for various reasons: to allow a more precise choice out of different options, to give further guidance, to be more precise, to be more stringent, or to adapt the wordings to specific Dutch circumstances like risk of flooding, population density, seismic activity and local industrial practices.

At the Safety Requirements level, the NVR's are strict requirements which must be followed thoroughly. At the Safety Guides level, the NVR's are less stringent: alternative methods may be used to achieve the same safety levels.

NVR's, consistency and recent update, 2014 - present

During the IRRS mission in late 2014 it was suggested to apply the NVR's to all nuclear installations. Recently the ANVS has studied ways to further implement IAEA Safety Requirements and Safety Guides in the regulatory framework. It was decided that in future, IAEA Safety Requirements will be implemented in the licences of all nuclear installations through licence conditions and in a ANVS policy rule for i.a. licence applicants. The IAEA Safety Guides will be used as guidelines. In the required implementation process, the WENRA Reference Levels will be considered as well. The timing of the process for implementation in the licences will be determined by the time table for the several licensing procedures.

Adopted international nuclear codes and standards

The experience with the IAEA-based NVR's has been generally positive, although improvements are still possible. Strong points are the clear top-down structure of the IAEA hierarchy of nuclear and radiation safety Standards and their comprehensiveness. However, given that they are the result of international cooperation, the standards cannot cover all aspects in the detail sometimes offered by some national (nuclear) regulatory systems. To cope with this difficulty, inspectors and assessors involved with their application, need to have an adequate knowledge of the current state of technology in the various areas relevant to safety. In addition, sometimes additional material is needed to define the licensing basis. Nuclear codes and standards of other countries are often used. Examples are the US Code of Federal Regulations, the US NRC Regulatory Guides, the US NRC Standard Review Plan, and the German RSK recommendations. However, careful consideration needs to be given to application of these foreign standards, since using them out of their original context may lead to difficulties.

WENRA Safety Reference Levels

The Western European Nuclear Regulators Association (WENRA) has introduced WENRA Safety Reference Levels (SRLs), aiming to harmonise reference levels for nuclear safety, the safe management of spent fuel and radioactive waste and for decommissioning. In the framework of the Joint Convention, especially the WENRA Safety Reference Levels for storage of radioactive waste and spent fuel and for decommissioning are relevant; these have to be implemented in the Dutch regulatory framework. An example is the regulation on decommissioning and financial provisions for the costs

of decommissioning in the Governmental Decree Bkse, an important part of which was based on the WENRA SRLs. The ANVS participates in the WENRA Working Group on Waste and Decommissioning.

Adopted industrial standards

The Safety Guides in the NVR series give guidance on many specific subjects. However, they do not replace industrial codes and standards. Applicants are therefore required to propose applicable codes and standards, to be reviewed by the Regulatory Body as part of their applications. Codes and standards in common use in major nuclear countries are generally acceptable (e.g. ASME, IEEE and KTA). The Regulatory Body has the power to formulate additional requirements if necessary.

5.1 Member states shall establish a national legislative, regulatory and organization framework (national framework)

5.1.a National programme for the implementation of the policy on the management of spent fuel and radioactive waste – provisions in a legal framework

A national programme has been drafted[33] according to articles 11 and 12 of the Council directive 2011/70/Euratom. Both the public and the Netherlands Commission for Environmental Assessment have been consulted on the draft national programme. The redraft was approved by the Council of Ministers and subsequently submitted to Parliament.

This section does not provide a description of the content of the national programme. The legal framework with its provisions relating to the implementation of the national policy via a national programme is described above.

More information about the national programme in this report is available in section A and D.

5.1.b National arrangements for the safety of the management of spent fuel and radioactive waste

See the previous section. Apart from the legal instruments mentioned there are no national arrangements.

5.1.c A system of licensing of spent fuel and radioactive waste management activities

As discussed above, the Nuclear Energy Act stipulates (in Article 15, sub b) that a licence must be obtained to construct, commission, operate, modify or decommission a nuclear facility.

Similarly, the Act states (in Article 15, sub a) that a licence is required to import, export, possess or dispose of fissionable material. Under Article 29 of the same Act, a licence is required in a number of cases (identified in the Decree on Basic Safety Standards Radiation Protection (Bbs)) for the preparation, transport, possession, import or disposal of radioactive material, including radioactive waste.

The procedures to obtain a licence under the Nuclear Energy Act (and other acts), follow the procedures specified in the General Adminisooootrative Act (Awb). These procedures allow for public involvement in the licensing process. Any stakeholder is entitled to express his views regarding a proposed activity. The Regulatory Body shall take notice of all views expressed and respond to them with careful reasoning. If the reply is not satisfactory, the decision of the Regulatory Body can be challenged in court.

In line with its policy on transparency, the ANVS has published a document on its website, that describes its licensing policy. It also has published a document on its supervision and enforcement policy. There are more guidance documents, that aid licence holders and applicants in submitting licence applications. This all aids to improve the interaction between the ANVS and the licence holders, and make it more efficient.

[33] https://english.autoriteitnvs.nl/documents/report/2016/08/09/the-national-programme-for-the-management-of-radioactive-waste-and-spent-fuel

The national legislative framework provides the generic nuclear safety and radiation protection objectives that apply to all nuclear installations.

The Netherlands has a small nuclear programme. Nevertheless there are many different nuclear facilities and activities. Because of the diversity present, detailed requirements are listed in the licence requirements which are tailored to the characteristics of the facilities and activities. In the licences, the Nuclear Safety Rules (NVR's) can be referred to as well as other nuclear codes and standards. If necessary a tailor-made approach can be employed.

Principal responsible authority

The authorities relevant with respect to the regulatory process under the Nuclear Energy Act have been described in section E. In addition to the Nuclear Energy Act, several types of regulation may apply to a nuclear facility and the activities conducted in it and/or supporting it. Therefore, often there are several authorities, sometimes at several levels in the governmental organisation, involved in the licencing procedures.

Advisory bodies

The Health Council of the Netherlands (Gezondheidsraad) is an independent scientific advisory body established under the terms of the Public Health Act. Its remit is to advise the government and Parliament on the current level of knowledge with respect to public health issues and health (services) research, including radiation protection. To date there is no standing advisory committee on nuclear safety for the licensing process; an advisory committee can be formed on an ad hoc basis as required. The Regulatory Body at any time can install a Commission dedicated to any required issue. However, there is an Advisory Board which has the task of providing the ANVS with solicited and unsolicited advice on matters related to the tasks of the ANVS. Refer to section F for more information on this.

With a licence application for nuclear facilities, it very often is compulsory to conduct an Environmental Impact Assessment or EIA (Dutch: milieu-effectrapportage, m.e.r.). It is compulsory for facilities for the treatment, storage or disposal of spent fuel or radioactive waste. The Netherlands has a permanent commission, the Commission for the Environmental Assessment ('Commissie voor de m.e.r.', Cmer) that advises the Regulatory Body on the requirements of all EIAs conducted in the Netherlands, including those related to nuclear facilities.

Specific licensing issues in the Nuclear Energy Act

Article 15b of the Nuclear Energy Act enumerates the interests for the protection of which a licence may be refused. These interests are listed earlier in this section. The licence itself lists the restrictions and conditions imposed to take account of these interests. The licence conditions may include an obligation to satisfy further requirements that may be set later by the ANVS.

In the case of very minor modifications, the licence holders may use a special provision in the Act (Article 17) that allows such modifications to be made with a minor licence change. With its licence application, the licence holder needs to submit a report describing the intended modification and its environmental impact. This instrument can only be used if the consequences of the modification for man and the environment are within the limits of the licence in force. There is no obligation to request views before the definitive licensing decision is issued. The licence is published in the Government Gazette and on the website of the ANVS. Stakeholders disagreeing with the decision may submit a complaint to the ANVS. If a stakeholder is not satisfied with the response by the ANVS, he may appeal to the Council of State (Dutch: 'Raad van State') against the licensing decision.

The ANVS conducts regular reviews to establish whether the restrictions and conditions under which a licence has been granted are still sufficient to protect workers, the public and the environment, taking account of any developments in nuclear safety that have occurred in the meantime. It should be noted that the regular reviews are not the same as the Periodic Safety Reviews (PSRs), which the licence holder is required to perform periodically (according to its licence). Article 19.1 of the Nuclear Energy Act empowers the ANVS to modify, add or revoke restrictions and conditions in the licence in order to protect the interests as laid down in Article 15b of the Act. Article 20a of the Act stipulates that the ANVS is empowered to withdraw the licence, if this is required in order to protect those interests. Article 18a of the Nuclear Energy Act empowers the ANVS to compel the licence holder to cooperate in a process of total revision and updating of the licence. This will be necessary if, for instance, the licence has become outdated in the light of numerous technical advances or if new possibilities to even better protect the population have become available since the licence was issued.

5.1.d System of inspections, audits, assessments and evaluation

See section 5.1.e.

5.1.e Institutional control, regulatory inspection and documentation and reporting

Entities performing assessments and inspection

Article 58 of the Nuclear Energy Act provides the basis for entrusting designated officials with the task of performing nuclear safety supervision: safety assessment, inspection and enforcement. This is mainly the task of the inspectors of the ANVS in the Netherlands. Refer to section F for a detailed description of the ANVS, its functioning, as well as recent developments.

Regulatory assessment process

With a licence application, the ANVS reviews and assesses the documentation submitted by the applicant. This might be the Environmental Impact Assessment (EIA) report and the Safety Analysis Report (SAR) with underlying safety analyses submitted in the context of a licence renewal application or modification request, proposals for design changes, procedural changes such as the introduction of Severe Accident Management Guidelines (SAMGs).

There are proposed changes that are within the boundary of the licence, like requests for minor modifications and changes to the Technical Specifications. The assessments of these are carried out by the ANVS and have no need of a licence modification. During the licensing phase the ANVS assesses among others, whether the applicable NVR's (i.e. requirements and guidelines for nuclear safety and environment), the requirements and guidelines for security and the regulation for non-nuclear environmental protection have been met and whether the assessments (methods and input data) have been prepared according to the state-of-the-art. The ANVS assesses the radiological consequences associated with postulated transients and accidents in the various installation plant categories. The ANVS will verify in particular if the results are permissible in view of the regulations. Its expertise enables the ANVS to determine the validity of the (system) analyses and the calculations. The ANVS receives support from a foreign TSO in these activities.

The ANVS lays down the guidelines for the required calculations (e.g. data for food consumption, dispersion). In the final stage of the licencing procedure, the inspectors of ANVS are asked to verify the draft licence including its licence conditions and requirements regarding its appropriateness for among others enforcement.

Article 58 of the Nuclear Energy Act gives the basis for entrusting designated officials with the task of performing assessment, inspection and enforcement. The Decree on Supervision identifies the bodies that have responsibilities in this regard. More about the organisation of the Regulatory Body can be found in section F.

Inspections are planned and results of inspections are reported on by the Regulatory Body. The function of regulatory inspections is:

- to check that the licence holder is acting in compliance with the regulations and conditions set out in the law, the licence, the safety analysis report, the Technical Specifications and any self-imposed requirements;
- to report any violation of the licence conditions and, if necessary, to initiate enforcement action; to check that the licence holder is conducting its activities in accordance with its quality assurance (QA) system;
- to check that the licence holder is conducting its activities in accordance with the best technical means and/or accepted industry standards.

In addition to inspection activities, international safety review missions take place. An important piece of information for inspection is the safety evaluation report, which is to be periodically updated. In this report the licence holder presents its self-assessment of all the relevant technical, organisational, personnel and administrative matters.

The management of inspection is supported by a yearly planning, the reporting of the inspections and the follow-up actions. Depending on the type of facility and with a certain periodicity, meetings between facility management and Regulatory Body are held. These meetings are devoted to inspections and inspection findings during which any necessary remedial actions are established and the progress made with their execution is discussed.

The ministerial decree on nuclear safety of nuclear installations requires continuous improvement of (nuclear) safety and the execution of periodic safety reviews. In line with this, a licence holder carries out periodic safety reviews as required by their licence:

- Every 5 years an assessment of the activities and accomplishments in the area of safety, waste management and radiation protection is performed against the licence requirements to conclude about eventual shortcomings and possibilities to improve;
- Every 10 years an comprehensive assessment is performed, where the design, operation, procedures and organisation is compared with current/modern (inter)national standards in order to find reasonably achievable improvements.

The enforcement of applicable regulations and of the terms of the licences

If the ANVS judges there are serious shortcoming in the actual operation of a nuclear installation, the ANVS is empowered under Article 37b of the Nuclear Energy Act to take all measures as deemed necessary.

Article 19 sub 1 of the Nuclear Energy Act empowers the ANVS to modify, add or revoke restrictions and conditions in the licence in order to protect the interests as laid down in Article 15b of the Act. Article 20a of the Act stipulates that the ANVS is empowered to withdraw the licence, if this is required in order to protect those interests. Articles 22.3, 33.3, 66 and 83a (the latter with a reference to the Wabo) offer the possibility of using administrative enforcement.

Articles 5:21 through to 5:31c of the General Administrative Law Act (Awb) provide a further description of the imposition of such a measure called 'Order subject to administrative enforcement'. Article 5:32 grants the authority the power to impose an order subject to a penalty. Article 18a of the Nuclear Energy Act empowers the ANVS to compel the licence holder to cooperate in a process of total revision and updating of the licence. This will be necessary if, for instance, the licence has become outdated in the light of numerous technical advances or if new possibilities to even better protect the population have become available since the licence was issued.

The ANVS has published its 'Supervision and Intervention Strategy' on its website in 2017, to inform all licence holders. It among others describes the means of intervention available, a set of administrative proceedings and criminal proceedings. Examples of administrative proceedings described in the document are: formally addressing licence holder, to place under intense supervision, impose an order subject to a penalty for noncompliance, administrative enforcement order and revoking of the licence. As part of the criminal proceedings, staff of the ANVS can impose a fine on a licence holder or prepare an official report for the public prosecutor, should the need occur.

5.1.f A clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management

The Regulatory Body is described in detail in section F.

The licence holders hold prime responsibility for the safe management of spent fuel and radioactive waste generated by them. However as soon these materials are transferred to COVRA, responsibility for safe management lies with this organisation. This ensures there is clarity on the responsibility for those stages. The central collection, processing and storage of radioactive waste also ensures implementation of key aspects such as environmental hygiene, cost effectiveness and industrial hygiene.

Almost all of the waste management activities have been centralised in one waste management organisation, COVRA. COVRA collects and manages the funds for the long-term interim storage and disposal.

5.1.g National requirements for public information and participation

See section E, Primary legislative framework: laws, General Administrative Act (Awb).

5.1.h Financing schemes for the management of spent fuel and radioactive waste – legal framework

Part of Dutch policy in respect of the financing of waste management is the principle that 'the polluter pays'. This principle also applies to the management of spent fuel and radioactive waste.

For the legislation on decommissioning and financial provisions for the costs of decommissioning of nuclear installations, see section E, The Bkse and decommissioning and Safety Reference Levels on decommissioning.

For more information on financial and human resources at the licence holder, see section G.

With the national implementation of the Euratom Basic Safety Standard Directive (Council Directive 2013/59/Euratom) in Article 10.8(1) of the Decree on Basic Safety Standards for Radiation Protection, licence holders of designated categories of non-nuclear facilities[34] (e.g. cyclotrons and coal-fired power stations) are obliged to have a decommissioning plan. This decommissioning plan describes the measures that are to be taken when sources of radiation are definitely no longer used. The decommissioning plan must include a financial paragraph.

Council Directive 2003/122/Euratom[35] aims to further restrict exposure of the population to ionizing radiation from high activity sealed sources (HASS), including orphan sources. This Directive requires that the possession and use of each high activity sealed source is licenced, that it is uniquely identified with a number embossed or stamped on the source and that countries keep a registry of all licence holders and sources. It further provides for financial arrangements to ensure that the costs for management of disused sources are covered by the licence holder. In cases where no owner can be identified, the State will cover the costs. The provisions of this Directive are fully implemented in the Basic Safety Standards Radiation Protection Decree (Bbs) and subordinate regulation. After Council Directive 2013/59/Euratom was implemented (February 2018), the transport of HASS is subject to licensing.

5.2 Improvement of the national framework

Operational experience, national and international

The ANVS continuously monitors its own activities. The ANVS monitors and evaluates the operations of the Dutch licence holders. Wherever conclusions can be drawn, lessons learned must be used for developing new policy, new regulations or amending licensing conditions.

International operational experience feedback is obtained by the Regulatory Body from the IAEA FINAS database. The Netherlands is an active participant in FINAS Technical Meetings and workshops.

There are regular bilateral contacts with authorities in European countries and the United States, whereby operational experience is exchanged. Within the EU, via the ANVS, the Netherlands is represented in the working groups of WENRA, ENSREG and HERCA. Representatives of the authority also participate in the activities of other international working groups under the auspices of the IAEA and/or NEA. The ANVS also participates in international Peer Review activities, see section L.

Documented decision-making processes

See section F, 6.1 Competent Regulatory Authority – ANVS, independence in decision-making.

Technological developments and results of relevant research

The Nuclear Energy Act offers the competent Regulatory Body the possibility to take the initiative to adapt the scope of a licence and the accompanying licensing conditions, if new technological insights make this necessary in the judgement of the authority.

Results of self-assessments and Peer Reviews

See section L, article 14.3.

[34] The designated categories are named in Article 10.1 of the Regulation on Basic Safety Standards for Radiation Protection.

[35] Council Directive 2003/122/Euratom, of 22 December 2003, on the control of high activity sealed radioactive sources and orphan sources, OJEC, 31/12/03, L346/57.

F. Competent regulatory authority

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).

6.1 Competent regulatory authority – ANVS

The Regulatory Body is the authority designated by the Government as having legal authority for conducting the regulatory process, including issuing licences, and thereby regulating nuclear, radiation, radioactive waste and transport safety, nuclear security and safeguards.

There is one independent entity, the Authority for Nuclear Safety and Radiation Protection (ANVS) and some smaller entities at various ministries that together constitute the Regulatory Body. However the regulatory tasks related to radioactive waste management which is the subject of this report are within the scope of the ANVS only. Therefore this report often will refer to the ANVS as the Regulatory Body.

The ANVS brings together expertise in the fields of nuclear safety and radiation protection, emergency preparedness and response as well as security and safeguards. For each of these subjects, the ANVS focusses on preparing its own regulations (ANVS Regulations), the awarding of licences, supervision and enforcement, and (public) information. The ANVS contributes to safety studies and ensures that the Netherlands are well prepared for possible radiation incidents. The ANVS can also be requested by responsible ministries to give advice over policy and legislation issues (concerning nuclear safety and radiation protection). All nuclear facilities in the Netherlands, including COVRA, operate under licence, awarded after a safety assessment has been carried out successfully. Licences are granted by the ANVS under the Nuclear Energy Act.

Legal status

The tasks and mandates of the ANVS are described in Chapter II of the Nuclear Energy Act. In 2017 the ANVS obtained the formal status of an independent administrative body (Dutch acronym 'zbo'). The Authority is the competent authority in matters of nuclear safety, nuclear security, radiation protection, transport safety, and waste management and emergency preparedness and response. This type of independent administration explicitly satisfies the international requirements (EU-radioactive waste management directive and IAEA standards). The Minister of Infrastructure and Water Management bears ministerial responsibility for the functioning of the ANVS.

Advisory Board

The ANVS appointed an Advisory Board on 17 April 2018. The board has the task of providing the ANVS with solicited and unsolicited advice on matters related to the tasks of the ANVS. It has six members, with expertise relevant to the tasks of the ANVS. Thus far, the Advisory Board has presented two advices relevant to radioactive waste and spent fuel:

- Advice on knowledge at the ANVS
  The ANVS asked the Advisory Board to advise on how to ensure that sufficient knowledge remains available at the ANVS in an environment in which nuclear activities in Europe are being phased out. On March 25, 2019 the Board recommended the authority to promote a national nuclear knowledge management programme in the Netherlands in co-operation with relevant stakeholders. The programme should:
  1. Promote the education of students with expertise relevant to the programme and their graduation in sufficient numbers;
  2. Develop appropriate additional expertise;
  3. Promote and maintain in particular the expertise on decommissioning.

For more information on the current status of this project, see section H - *Adequate education and scientific knowledge on nuclear technology and radiation applications*.

- *Advice on role ANVS concerning disposal*
  On 23 December 2019 the Board issued an advice on what the role of the ANVS around disposal of radioactive waste should be and how the distribution of responsibilities and tasks for the various sub-aspects of policy development, its implementation and realization of the disposal facility should be organised. In dialogue with the ANVS, the Board has identified three aspects that require special attention:
  1. The role of the ANVS in policy preparation for a national disposal facility;
  2. The role of the ANVS in securing and supervising financial resources;
  3. The role of the ANVS in policy preparation for a possible multinational disposal.

The Board has carried out a reflection on each aspect, providing recommendations and advise for next steps. The transfer of the responsibility for policy preparation (including the participation process) of disposal from ANVS to the Ministry of Infrastructure and Water Management is an important step forwards, the transfer ensures that the ANVS can focus on the regulation of safety aspects.

Entities of the Regulatory Body

Below the status and tasks of the entities of the Regulatory Body are summarized:

- Since 2017, the ANVS is an independent administrative authority (zbo). The ANVS is involved in regulatory requirements, licensing and independent supervision (safety assessment, inspection and enforcement) of compliance by the licence holder(s) and other actors with the requirements on the safety, security and safeguards. The ANVS can also be requested to give advice about legislation and policies on nuclear safety and radiation protection. Furthermore it has responsibilities regarding advising in the area of emergency preparedness and response, and public information and communication.
- The Inspectorate SZW has tasks in the area of protection of workers against exposure to radiation.
- The Health and Youth Care Inspectorate (Ministry of VWS) has tasks in the area of protection of patients against undesirable effects of exposure to radiation.
- The Dutch State Supervision of Mines (SodM, part of Ministry of Economic Affairs and Climate Policy, EZK) oversees the safe and environmentally sound exploration and exploitation of natural resources in the underground like natural gas and oil.
- The Netherlands Food and Consumer Product Safety Authority (NVWA) monitors the quality of food and consumer products to safeguard human health and animal health and welfare. The NVWA supervises the whole production chain, from raw materials and processing aids to end products and consumption. The NVWA is an independent agency, part of the Ministry of Agriculture, Nature and Food Quality (LNV), and a delivery agency for the Ministry of Health, Welfare and Sport.
- The Inspectorate of the Ministry of Infrastructure and Water Management (ILT) has general supervision responsibilities for the compliance with the requirements of modal transport regulations.
- The Inspectorate Military Healthcare (IMG) of the Ministry of Defence oversees a healthy and safe work environment for its civilian and military staff. Its scope includes applications of ionizing radiation and accounting for the use of radioactive sources within the military.

Apart from the ANVS, most entities of the Regulatory Body employ only a limited number of staff for the Nuclear Energy Act-related tasks. In addition to day-to-day contacts between the entities of the Regulatory Body, there are periodic meetings at managers and directors levels.

Cooperation agreements

As the Regulatory Body consists of several entities each covering specific aspects of radiation protection, a Cooperation Agreement for Radiation Protection (signed in 2017) was set up between the ANVS and the policy departments and inspectorates of other ministries with tasks under the Nuclear Energy Act. The purpose of the Cooperation Agreement is to promote the cooperation between the various parties which have statutory duties in the area of radiation protection. This purpose is achieved by making working arrangements and by setting out the framework, these arrangements (made between two or more parties on the basis of the Cooperation Agreement) have to comply with. The working arrangements relate to interdepartmental (execution) policy development and –implementation, licensing, supervision and enforcement, communication, research and education, and participating and representation in international fora. The following parties signed the agreement: the ANVS, the Ministers of Infrastructure and Water Management (IandWM), Social Affairs and Employment (SZW), Health, Welfare and Sport (VWS), Defence, the Human Environment and Transport Inspectorate (ILT), the Inspectorate SZW (ISZW), the Healthcare Inspectorate (IGJ), the Inspectorate for Military Healthcare (IMGZ), the State Supervision of Mines (SodM), and the Netherlands Food and Consumer Product Safety Authority (NVWA).

In 2019 a working arrangement was concluded between the Ministries of VWS, SZW and ANVS regarding (execution) policy development and -implementation, exchange of information, external communication and participation in international fora. Also, a Covenant is concluded in 2018 between the ANVS, the Minister of Infrastructure and Water Management, and the Minister of Finance, regarding the legal tasks of the ANVS that are conducted by the Customs.

With this Covenant, legal requirements will be met regarding the non-fiscal tasks that Customs undertake in order to control European cross border transport of goods under the scope of the Nuclear Energy Act. Furthermore, a covenant between the Police and the ANVS was concluded in the 1990's on secured nuclear transport.

In 2020 working arrangements between ANVS and the ministry of Defence are concluded, in spring 2021 a working arrangement has been concluded between ANVS and SoDM. Working arrangements between the ANVS and the inspectorates ISZW, IGJ and ILR are scheduled for 2021-2022.

The ANVS has agreements with several foreign Regulatory Bodies. Examples are a MoU with Belgian counterpart FANC (2017), a cooperation agreement with the Australian counterpart ARPANSA (2018) and an extension Arrangement with the US NRC. The latter is an extension of an agreement signed in 2013.

Responsibilities for safety of spent fuel management and radioactive management facilities
Prime responsibility for nuclear safety of a nuclear facility rests with the licence holder. The Netherlands have implemented European Council Directive 2009/71/Euratom which specifies this requirement. Furthermore in June 2017 an update on this directive, the Directive 2014/87/Euratom, was implemented in Dutch regulation with the publication of a new Ministerial Decree on the safety of nuclear facilities .

The Netherlands have implemented European Council Directive 2011/70/Euratom establishing a community framework for the safe management of spent fuel and radioactive waste. The Directive requires that each Member State shall establish and maintain national policies on spent fuel and radioactive waste management. Each Member State shall also have ultimate responsibility for management of the spent fuel and radioactive waste generated in it. It shall establish and maintain national policies and frameworks, and to assure the needed resources and transparency.

This Directive requires 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. An example of the latter is COVRA which takes over responsibility after accepting spent fuel or radioactive waste from licence holders.

Implementation of the national safety framework by the Regulatory Body and other organisations
Nuclear facilities, such as a waste storage facility like COVRA, operate under licence, awarded after a safety assessment has been carried out and approved. The licence is granted by the ANVS under the Nuclear Energy Act. The ANVS is responsible for handling the licence applications and performing related review and assessment.

The Regulatory Body is also responsible for review and assessment activities in relation with its oversight activities. The Regulatory Body may seek expertise by contracting TSOs and other national and/or foreign expert organisations; this is a common practice.

Regulatory Body – tasks

The ANVS has, regarding nuclear safety and radiation protection and associated emergency preparedness and response, and security and safeguards, as meant in conventions of the IAEA, the following statutory duties:
- Granting licences; all nuclear facilities in the Netherlands, operate under licence, awarded after a safety assessment has been carried out successfully. Licences are granted by the ANVS under the Nuclear Energy Act;
- Regulating all other radiation practices by licensing or notification and registration;
- Supervising and enforcing compliance with requirements by or under the Nuclear Energy Act;
- Advise to the Ministry of Infrastructure and Water Management on policies and Acts and regulations;
- Together with various partners maintaining an Emergency Preparedness and Response organisation;
- Informing interested parties and the general public;
- Participating in relevant activities of international organisations, as far as related to tasks related to the Nuclear Energy Act;
- Maintaining relationships with comparable foreign authorities and relevant national and international organisations;
- Supporting national organisations with the provision of expertise and knowledge;
- Undertaking research in support of the implementation of its tasks.

These tasks encompass the tasks a regulatory body is required to have according to the Euratom directives for radioactive waste, nuclear safety and basic safety standards.

Further integration of safety and security inspections is being stimulated and practiced.
The basic key to deploying staff to the different types of nuclear installations is the potential safety risk. But other factors also have an impact, like operational occurrences and incidents, inspection findings or public attention.

Organisation of the ANVS

The ANVS is led by a Board with two Members: a chairman and a vice-chairman, and has six departments. In implementing its tasks, the ANVS can rely on support from various organisations, listed below.

- The Board Members have been officially appointed as the independent Regulatory Body (ZBO);
- The staff of the ANVS are civil servants of the Ministry of Infrastructure and Water Management, and are available to the board as ANVS staff members. The staff works under the authority of the Board and is only accountable to the Board.

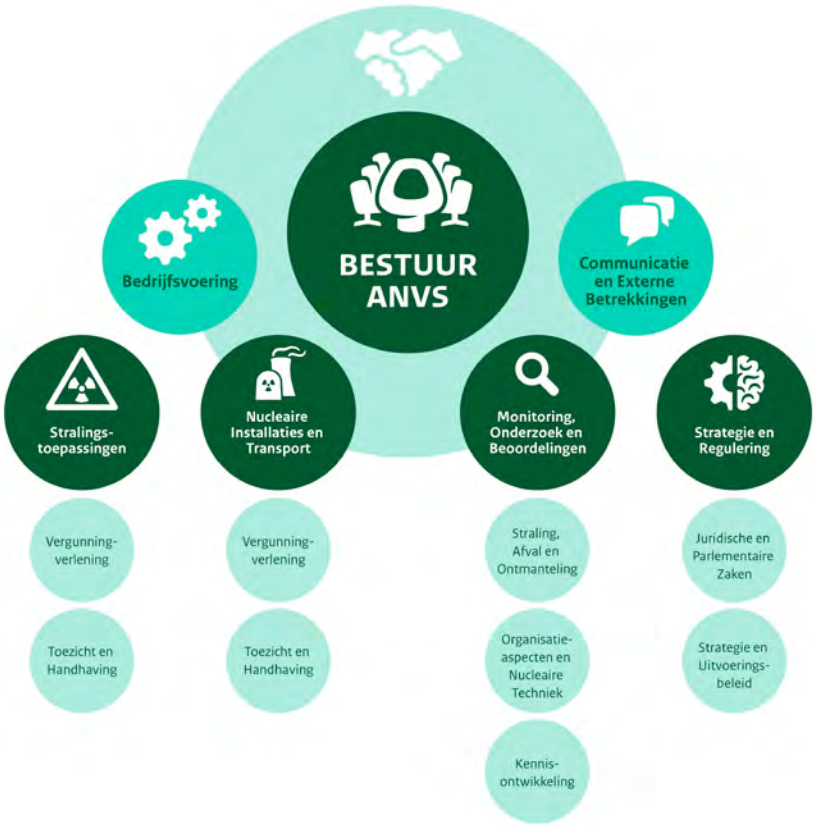
In 2018 and 2019 two evaluations of the ANVS, one internal and one external, were conducted. Periodic external evaluations of independent administrative bodies like the ANVS are a legal obligation. This external evaluation was conducted under the auspices of the Ministry of Infrastructure and Water Management.

To further improve the ANVS, two actions were taken:

- Reorganization of ANVS. This reorganization was completed by January 1st, 2020, leading to the new structure with six departments;
- Transferring the responsibility for the task 'Policy preparation' to the Ministry of Infrastructure and Water Management. The change came into effect on May 15th 2020.

Below (see Figure 7), the organisation chart of the ANVS is presented.

Figure 7: Organisation chart of the ANVS



The structure aims to achieve the following goals:
- Improving the connection to parties relevant to the ANVS;
- Improve internal cooperation within the ANVS by strengthening interdependencies between the departments and building on trust;
- Strengthen the image of the ANVS and its role as a regulatory body;
- Strengthen the ANVS' knowledge management function;
- Transfer from optimisation of work in the task areas 'Nuclear Safety' and 'Radiation Protection' to optimisation of ANVS-wide issues;
- Make certain functions (licensing versus supervision, policy preparation versus policy execution) more distinct from each other;
- Pursue unity within ANVS: broad thinking and working with flexible deployment of staff within the ANVS-organisation.

The Minister of Infrastructure and Water Management has informed the Dutch Parliament in January 2020 about the external evaluation and the consequences of the recommendations therein. In particular, the Minister mentions that, as a consequence of the transfer of the responsibility for preparation of policy development and legislation, the Ministry of Infrastructure and Water Management will create a new entity within the Ministry and that the shape and size have been established in consultation with the ANVS to avoid fragmentation of the expertise that continues to be needed within ANVS.

The new policy unit 'Nuclear Safety and Radiation Protection' resides within the existing directorate-general for Environment and International Affairs (DGMI). The change came into effect on 15 May 2020. A number of ANVS staff members has moved to this entity. This further supports the aim of the ANVS and the new entity at the Ministry of Infrastructure and Water Management to strengthen the professional relation and cooperation.

ANVS licensing, supervision and enforcement policies

The ANVS has documented its policies on licensing, supervision and enforcement. The top-level documents have been published on the ANVS website, to fulfil the ANVS' principle of 'openness and transparency of regulatory activities'. In this way licence holders and the public are informed about the approach taken by the ANVS and its guiding principles. For ANVS staff, there is more detailed information on working procedures available as well (also see paragraph on quality management below).

In the Netherlands, supervision and enforcement in the field of nuclear safety is conducted by the ANVS. Supervision and enforcement in the field of radiation protection is conducted by the ANVS together with various Inspectorates, to the extent that this is within their authority. The ANVS also cooperates with the Dutch Customs. Some of ANVS' guiding principles regarding licensing, as well as supervision and enforcement are:
- Priority to safety, all the efforts of the ANVS serve the protection of people, animals, plants and property. This is more than just verifying compliance with regulatory requirements. Also, security and prevention of the proliferation of knowledge and radioactive materials (for unauthorized purposes) are an essential element of safety.
- Responsibility of the licence holder and justified trust. The licence holder is responsible for (nuclear) safety. This responsibility cannot be transferred to the Regulatory Body, but the ANVS supervises the licence holders and assesses if the trust vested in the licence holders is justifiable.
- Emphasis on continuous improvement. The safety must remain 'state-of-the-art'. A changing environment, technological advances, lessons learnt from incidents and accidents, all may lead to improvements. The ANVS also requires the licence holders to keep risks as low as reasonably achievable (ALARA).
- Risk-oriented approach or graded approach in the execution of the ANVS' tasks to aid efficient management of available resources at the ANVS.
- Coordination and cooperation with partners and stakeholders is essential for the proper execution of the tasks of the ANVS.

With regard to licensing, the ANVS applies the 'comply or explain' principle, meaning the applicant must demonstrate compliance with published regulation. If the applicant cannot meet these requirements as prescribed, he will need to demonstrate how he will meet the objectives of the requirements in an equivalent way.

Development and maintenance of Human Resources and competence

Current manpower situation of the ANVS

ANVS started 2021 with 126 employees (2020: 131) representing 121,7 FTE (2020: 124) and externally hired staff of 18 persons (2020: 12), representing 4,7 FTE (2020: 7).

Disciplines and training

The expertise of the ANVS spans disciplines in areas like radiation protection, nuclear safety, waste safety, transport safety, conventional safety, risk assessment, security and safeguards, emergency preparedness and response, legal and licensing aspects. When needed, knowledgeable consultants are contracted for support.

The ANVS provides tailor-made training for its staff. Experts have to keep up to date with developments in their discipline. Apart from the general courses, training dedicated to the technical disciplines in the areas of nuclear safety, radiation protection and emergency preparedness and response is provided. This includes international workshops, but also conferences and visits to other regulatory bodies. In addition, information exchange takes place through the international networks of OECD/NEA, IAEA, and EU, e.g. the Article 31 and Article 37 Group of Experts. To be mentioned are the contributions to HERCA, WENRA, ENSREG, TRANSSC, RASSC, WASSC, NUSSC, EPRSC, NEA/CNRA, NEA/CSNI and several of its Working Groups. Furthermore there is a policy to participate in several IAEA missions annually, like in IRRS, ARTEMIS, IPPAS, EPREV, INSARR. It is considered to be worthwhile to have staff positioned at IAEA, NEA or EU; however this has not yet materialised.

All ANVS staff follow trainings improving their work and maintain training plans that are assessed at least annually with their team leader. In addition to formal education courses, the ANVS utilizes informal, voluntary learning opportunities, including presentations and workshops. The ANVS is also conducting a competence gap analysis, through an employee knowledge survey, to assess the organization's education and development capabilities.

Staff requiring specific expertise, such as inspectors, receive the specific training required and participate in a mentoring programme with more experienced staff before completing work on their own. In addition, they are provided with the training and information required to safely complete their tasks in the various work environments that they may encounter. The inspector qualification process includes instruction for all the procedures necessary to complete inspections and practical experience in the field, combined with the evaluation by a senior inspector. Inspectors also receive training on a comprehensive range of potential workplace hazards that they may encounter, both general (such as chemicals and physical hazards) as well as specific hazards related to the physical locations where they may conduct their inspections. Through this training programme, the ANVS fulfils its duty of care to these workers and ensures their ongoing safety through education.

Contracted support and cooperations

For areas in which its competence is not sufficient or where a specific in-depth analysis is needed the ANVS has a budget at its disposal for contracting external specialists. This is considered one of the basic policies of the ANVS: the core disciplines should be available in-house, while the remaining work is subcontracted to third parties like governmental research organisations and/or commercial Technical Support Organisations (TSOs). Also when more resources are needed to meet peak demands, contracting third parties is an option.

The ANVS cooperates with other national and regional authorities and organisations, like the Human environment and Transport Inspectorate, the inspectorate of health, several safety regions (including the regional fire brigades), provinces and communities, the national coordinator for terrorism and public safety, and the national crisis center. More about contracted support can be found below.

Financial resources

The State Budget allocates funds for implementing the duties, responsibilities and powers associated with nuclear safety and radiation protection. These resources are also
intended to facilitate permanent compliance with quality and expertise requirements in the area of nuclear safety and radiation protection.

Specifically for the ANVS, the Nuclear Energy Act stipulates that the Ministry of Infrastructure and Water Management will allocate sufficient financial resources for the ANVS to carry out its duties.

Under current regulation the costs of the Regulatory Body for oversight and licencing are partially reimbursed. Applicants and licensees pay for indicated licensing activities and the licence holders of nuclear installations pay an annual fee for oversight.

The total annual ANVS budget in 2021 is € 29.95 million (2020:€ 29.8 million). The budget of the ANVS for contracted support in 2021 is about € 10.7 million (2020: € 10.1 million), mostly spent on contracted support provided by organisations like RIVM, GRS and NRG.

Quality management system of the Regulatory Body – ANVS Integrated Management System (AIM)

Since the merger of the former separate entities of the Regulatory Body in 2015, a new management system of the ANVS was developed and is continuously updated. Recommendations from the IRRS mission and follow-up mission are being incorporated in the new system, which is the ANVS Integral Management System, the AIM.

There is a central AIM, describing the working procedures and processes and the main documents of the management system. It also describes how its achievements in terms of Key Performance Indicators (KPIs) need to be monitored. The AIM demonstrates how the ANVS implements the 'Plan, Do, Check, Act' (PDCA) principle.
The AIM has not been designed to achieve some kind of certification. Nevertheless it has been based on the components that should be present according to common management system standards.

The AIM contains ANVS-internal procedures. Various documents have been published to inform the public of the ANVS's policy and procedures regarding licensing, supervision and enforcement. See below for more information.

The AIM also gives a high-level description of the processes by which the ANVS executes its various tasks. There are three main types of processes: (1) Corporate processes that drive the organisation, (2) Primary processes, the end-to-end processes across the operational areas, for execution of the ANVS' statutory tasks, and (3) Supporting processes for activities that create the prerequisites (staff, other resources) for executing the primary processes. These three sets of processes in the AIM terminology constitute the 'ANVS proceshuis' (literally: process building).

These processes and their detailed descriptions are available to ANVS staff via its Intranet, in a system called 'ANVS Central'. Clickable links give access to all available information.

For every process, roles and responsibilities have been defined. In addition it is described how the various roles contribute to continuous improvement of the processes of ANVS. The periodic invitation of IRRS missions is also part of the efforts to have continuous improvement.

Openness and transparency of regulatory activities

Both the creation of the ANVS and its legal task to provide public information led to the recruitment of dedicated ANVS communication staff, which is currently a group of 6 FTE. This is a positive development and aids the ANVS in meeting its objectives for openness and transparency. Legal requirements on transparency by the ANVS come from several international sources (e.g. the EU-Directives on Nuclear Safety, on Management of radioactive waste and spent fuel and on radiation protection).

Also the Nuclear Energy Act and the Nuclear Safety Regulation for nuclear installations states requirements regarding providing information to the public in case of accidents and to staff mitigating the consequences of such accidents. Stakeholder involvement is embedded by public consultation during the licensing process under the General Administrative Act (Awb) and - if applicable - in the process of the Environmental Impact Assessment (EIA) under the Environmental Protection Act. This process may also involve meetings of regulatory body, licence holder and the public. The ANVS aims to be transparent in its communication of regulatory decisions to the public (e.g. on licence applications and adequacy of 'stress tests'); these are published with supporting documentation.

The ANVS has its own website: www.anvs.nl. This is also instrumental in positioning the ANVS as an independent authority and communicating with relevant stakeholders. In
2015 and 2016 the basic communication tools (e.g. website, intranet) have been developed further and are continuously improved. Relations with national, regional and local stakeholders and press have been gradually built. Special arrangements are in place for the communication and reporting of incidents in neighbouring countries, as well as communication about licensing processes with effects that extent the borders.

Parliament is actively informed by the Minister of Infrastructure and Water Management, supported by the ANVS when relevant. Examples are results of IAEA mission reports, National Reports for the Joint Convention, National Reports of Action plans related to the stress test et cetera. Usually twice a year, the Minister sends a letter to the parliament with a general update on all important issues. The ANVS reports about its annual plan and the status of planned actions.

Currently, regulatory information and products are published on a regular basis, mostly on the ANVS website. Examples are:

- ANVS licences;
- Information on national policies and regulatory framework in the Netherlands;
- ANVS regulations;
- General information about ANVS' tasks and activities;
- ANVS Annual Report;
- ANVS' main policy document, the 'Koersdocument' describing the 'course' of the ANVS, its mission, values, guiding principles, vision on developments, and its choices;
- ANVS policy document on its licensing strategy;
- ANVS policy document on its supervision and enforcement strategy;
- Guidance for applicants on how to apply for a licence, including guidance on what kind of information to include;
- Several review and assessment reports (PSR, licence applications);
- Information about cross inspections with FANC (not the reports);
- Event reports and follow-up;
- ANVS quarterly news items and articles;
- IAEA mission reports.

The ANVS also actively participates in the international public communication and transparency groups, e.g. ENSREG WGTA and OECD/NEA/WGPC.

External Technical Support

The ANVS can rely on various national and foreign organisations that regularly provide technical support. In this section the most important are introduced. The ANVS will continue to cooperate with foreign Technical Support Organisations (TSOs) to evaluate safety cases of Dutch licence holders.

Governmental supporting organisation RIVM

Via the ANVS an annual contribution is provided to support the work of the National Institute for Public Health and the Environment (RIVM). RIVM provides scientific support to several ministries including the Ministry of Infrastructure and Water Management but also directly to the ANVS.

RIVM is a specialised Dutch government agency. Its remit is to keep knowledge up to date, by gathering, generating and integrating knowledge and make it available in the public domain. By performing these tasks RIVM contributes to promoting the health of the population and the environment by providing protection against health risks and environmental damage.

The RIVM advises the Ministries on the basis of scientific studies. RIVM works together with other (governmental) expert organisations as the Royal National Meteorological Institute (KNMI) with models for the prediction of the effects of discharges of radioactive material in the air. RIVM also operates the national radiological monitoring network and coordinates the collaborating expert organisations for radiological and public health advise in nuclear crisis situations.

Education and training organisations

The RID/RST organisation at the Technical University in Delft and the Nuclear Research & consultancy Group (NRG) in Petten and Arnhem provide education and training in nuclear technology and radiation protection to clients from nuclear and non-nuclear businesses and various governmental organisations. Dedicated trainings on various topics are also contracted by the ANVS with other national and foreign supporting organisations. For the education and training in radiation protection a national system exists with several levels of education. The government recognizes training institutes for a specific training of radiation protection. For getting a degree in radiation protection, an exam has to be passed. Registration of coordinating and general coordinating radiation protection experts has been implemented. There are formal requirements to obtain registration certificates for the initial education, for continuing education and for work experience.

Technical Support Organisations (TSO)

GRS, Germany: The ANVS collaborates with a Technical Support Organization (TSO) from Germany, GRS. This is a TSO for the German national regulator and one of the large German TSOs. GRS provides technical support like review and assessment of safety cases (e.g. PALLAS). It also has provided other types of consultancy to the ANVS, like support in the development of regulations and provision of education and training. GRS currently has a major framework contract with the ANVS.

NRG, Netherlands: The Nuclear Research & consultancy Group (NRG) in Petten and Arnhem provides consultancy & educational services to government and industry. The company has implemented 'Chinese Wall' procedures to protect the interests of its various clients and avoid conflicts of interest. NRG currently has framework contracts with the ANVS for consultancy in the areas radiation protection and nuclear safety and support in licensing of applications of ionising radiation. NRG is the operator of the HFR research reactor. In the contracts there are strong requirements dealing with conflict of interest, which will be audited.

Other contracted support organisations

RTD, Netherlands: ANVS has a framework contract for support in licensing of applications of ionising radiation with Dutch firm RTD. RTD is a Dutch acronym for 'Röntgen Technische Dienst', a subsidiary of multinational company Applus+, operating in the testing, inspection and certification sector.

SCK·CEN, Belgium: ANVS has a framework contract with Belgium research institute SCK·CEN for consultancy in the area radiation protection. SCK·CEN operates two research reactors at its site in Mol, Belgium.

Advisory Committees

The ANVS has an Advisory Board which has the task of providing the ANVS with solicited and unsolicited advice on matters related to the tasks of the ANVS. Refer to beginning of this section for more information. It has no role in assessing safety, like standing committees in some other countries.

If needed an advisory committee is formed on an ad hoc basis as required, as happened several times in the past. A committee can be formed for any required issue.

Status of the Regulatory Body

Governmental structure

The ANVS originally was tasked with the responsibility for the preparation of policy development in the areas of nuclear safety, security and radiation protection. Since 15 May 2020, these tasks have been transferred to the Ministry of Infrastructure and Water Management. The newly formed Unit Nuclear Safety and Radiation Protection of the Directorate-General Environment and International is now responsible for this. The ANVS can be consulted as an advisor.

The ANVS, by an amendment to the Nuclear Energy Act (ANVS Establishment Act), became an independent administrative authority (Dutch acronym: zbo) in 2017.

The Minister of Infrastructure and Water Management bears ministerial responsibility for the functioning of the ANVS and is empowered to:

- Appoint, suspend or dismiss the members (of the board) of the ANVS;
- Decide on the remuneration policy for the members of the ANVS;
- Decide on the budget of the ANVS;
- Ask for any information needed for executing his tasks;
- Approve the management regulations of the ANVS;
- Abrogate decisions of the ANVS if they are in violation with the law;
- Taking the necessary measures if the ANVS is severely neglecting its tasks.

The entities of the Regulatory Body are mentioned at the beginning of this section. The various entities have regular meetings on those activities for which they share responsibilities. As mentioned before, there is a cooperation agreement describing the interaction, communication and cooperation between the various entities.

There are examples of differing and shared responsibilities. For instance, the Ministry of Social Affairs and Employment is responsible for worker protection and the Ministry of Health, Welfare and Sport for patient protection. An example of shared responsibility is the cooperation of the ANVS with the Dutch Human Environment and Transport Inspectorate (ILT) of the Ministry of Infrastructure and Water Management, in the monitoring of transports of radioactive materials to verify compliance with applicable regulations. The ANVS focuses on the safety, radiation protection and security aspects, while the ILT focuses on the requirements of modal transport regulations.

Independence in decision-making

The ANVS as a Regulatory Body is not in any way involved in energy policies. In the Dutch Cabinet, the Minister of Economic Affairs and Climate Policy is responsible for this subject. The Regulatory Body is also separate from bodies or organisations involved in production and application of radioisotopes, and organisations involved in the management of spent fuel and/or radioactive waste.

The ANVS aims to be transparent in its decision-making processes, which also positively promotes the perception of its independence. The reporting obligations of the authority contribute to that transparency. COVRA is an independent company (state-owned enterprise) responsible for the safe management of spent fuel and radioactive waste and for implementing a part of the policy of the Netherlands on the safe management of radioactive waste and spent fuel. As a licence holder, COVRA is subject to regulatory supervision by the Regulatory Body.

The ANVS has documented decision-making processes. However, the ANVS is a learning organisation and attempts to constantly improve these processes. The reporting arrangements (described below) are instrumental in achieving perception of independence in decision-making.

Reporting obligations

The ANVS reports to the Minister of Infrastructure and Water Management about its functioning. The Minister of Infrastructure and Water Management bears ministerial responsibility for the functioning of the ANVS. If information has to be shared with the Parliament this will be done by the Minister. In addition, the ANVS sends its annual report to Parliament. About two times a year the Minister sends a letter to Parliament covering progress on several on-going issues of interest concerning nuclear safety and radiation protection for politics and the general public. In this letter, reference may be made to the ANVS website for further information or announce future ANVS publications. Everything reported to Parliament is immediately available on the government website www.overheid.nl and is therefore available to any interested party.

Also, licensing procedures provide for timely publication of documents. The General Administrative Act (Awb) is the body of law that governs the activities of administrative agencies of government and the interaction of the public in the procedures (i.e. objections and appeals).

The ANVS has information on many issues published on its website. Information on all major licence holders can be found online too, such as licences. This is part of the policy on transparent governance. Also refer above for information on ‘Openness and transparency of regulatory activities’.

G. Licence holders

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.

7.1 Prime responsibility for safe management of spent fuel and radioactive waste

Several legal provisions ensure that the licence holder is primarily responsible for the safety of the management of radioactive waste and spent fuel.

The Netherlands has transposed Directive 2009/71/Euratom as amended by Directive 2014/87/Euratom establishing a Community framework for the nuclear safety of nuclear installations and Directive 2013/59/Euratom laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation. Articles of these Directives state that the prime responsibility for safety lies with the licence holder.

In the Ministerial Order from 2017 transposing Directive 2014/87/Euratom the licence holders responsibility for nuclear safety and the obligation for continuous improvement of safety is provided. This includes the requirement to develop an institutional safety policy at the corporate level and pursue continuous improvement. It is further stipulated that the responsibility cannot be delegated and includes responsibility for the activities of contractors and sub-contractors whose activities might affect the nuclear safety of a nuclear installation. The regulation also contains requirements about transparent communication to the public, by the regulatory body and licence holders. The Nuclear Energy Act (Articles 15 and 29) forbids practices with radioactive materials (including radioactive waste and spent fuel) without a proper licence. During the licence application procedure the prospective licence holder has to present, among others, a safety case, which shall be assessed by the Regulatory Body. Once the licence is issued, the licence holder is charged with the prime responsibility for compliance with the licence and licence requirements. Besides this, a number of general requirements apply for licence holders.

Regarding the operation or decommissioning of a nuclear facility, a similar reasoning applies, based on Article 15b of the Nuclear Energy Act. The associated licence covers both the safety of the facility as well as the safety of the waste or spent fuel.

Article 70 of the Nuclear Energy Act specifies that a licence issued according to this Act is personal. In case of a licence transfer this regulation requires that the new licence holder needs to have the necessary expertise and reliability in relation to safety. Reliability in relation to safety can also be related to financial solvency.

For more information on the implementation policy on this subject, see annex 1: Overview matrix of liabilities and current policies and practices.

Responsibility of contracting party if there is no licence holder or other responsible party

In Articles 22 and 33 of the Nuclear Energy Act provisions have been made for situations where the owner or person or organisation responsible for fissionable material (including spent fuel) or radioactive material respectively cannot be identified. This applies for example to orphan sources. In such cases the Regulatory Body has been empowered to impound such material and have it transferred to designated institutes, which are equipped and licenced to manage these materials.

For fissionable materials two institutes have been designated by a special decree[36]: NRG in Petten and COVRA in Nieuwdorp. The same institutes as well as the RIVM in Bilthoven have been designated for the management of radioactive materials.

7.2 Safety assessment

In section E of this report the national regulations for the safe management of spent fuel and radioactive waste are already explained. Section 5.1.c explains the related licensing system. Appropriate control and enforcement by government are discussed in section E, 5.1.d and 5.1.e.

A licence for a waste management facility is only granted if the applicant complies with the national requirements and, more in general, with international (IAEA) established safety goals, codes and guides, as well as with the international state of the art for its facility. The applicable parts of the IAEA Safety Standards (Safety Fundamentals,

[36] Decree on the designation of institutes as meant under articles 22 sub 4 and 33 sub 4 of the Nuclear Energy Act, Bulletin of Acts and Decrees 1996, 528.

Safety Requirements and Safety Guides) must be covered or incorporated in the Safety Report (SR), which is submitted to the ANVS. A typical example is compliance with the requirements addressing the site-specific external hazards, such as military aircraft crashes, external flooding, seismic events and gas cloud explosions.

The licence holder drafts and submits to the Regulatory Body the Safety Analysis Report (SAR) and supporting topical reports. In these reports detailed descriptions of the facility are presented as well as an in-depth analysis of the way in which the facility meets the requirements and the international state of the art.

After construction and commissioning of the waste management facility the licence holdersubmits the updated SAR with a description of the as-built facility and the results of the commissioning to the Regulatory Body for approval before start of the routine operation. Since full compliance is expected with the Safety Report, no formal update of the safety assessment or environmental assessment is foreseen and there will be no need for revision of the Safety Report, which is the basis of the licence. However, all the results of the commissioning programme are incorporated in a full update of the detailed SAR.

As IAEA regulations are fairly general and hence lack technical detail, the licensing basis for the HABOG building was based on the French state of the art for SF/HLW storage. As an independent assessment tool for the SAR the USA ANS/ANSI standard 57-9-1992 was incorporated.
Selected items or documents in the SAR are studied in more depth, often using assessment by independent organizations.
COVRA undergoes very extensive safety evaluations on a five-yearly and ten-yearly cycle. The latest ten-year periodic safety review (PSR) is expected to be finished in 2021. The nuclear power plant in Borssele undergoes very extensive safety evaluations every ten years as well, and more limited evaluations every two years, in which the applicable basis for the licence is assessed.

Updated assessments before operation

In the Environmental Impact Assessment Decree[37], which is based on the EU Council Directive 97/11/EC on "Assessment of the effects of certain public and private projects on the environment", spent fuel and radioactive waste management facilities are designated as activities which are subject to the Decree. An Environmental Impact Statement (EIS) is always mandatory in the cases indicated in Table 5 below.

Table 5: Situations in which an EIA is required

Activities	Cases	Decisions
The creation of an establishment: a. for the treatment of irradiated nuclear fuel or high-level radioactive waste, b. for the disposal of irradiated nuclear fuel c. solely for the disposal of radioactive waste, or d. solely for the storage of irradiated nuclear fuels or radioactive waste from another establishment	In relation to the activity described at d, in cases where the activity relates to the storage of waste for a period of 10 years or longer.	The decisions to which part 3.5 of the General Administrative Law Act and part 13.2 of the Act apply.

The facilities at COVRA meet the descriptions under the entries a. and d. and an EIA had to be conducted. The first EIS for COVRA was published in 1985. The most recent EIS was carried out in 2013 as a consequence of the extension of the HABOG facility and the construction of a new storage building for depleted uranium (the VOG-2).

Both the EIS of 1985 and the subsequent EIS of 1995 and 2013 predicted that the envisaged activities of the COVRA facility would not cause any detrimental effect on the population and the environment.

[37] Environmental Impact Assessment Decree, Bulletin of Acts and Decrees 1999, 224.

The actual impact to the environment is even lower than assumed in the EIS, because all emissions of radioactive materials and chemical hazardous materials – both airborne and waterborne – remain far below the limits authorized in the operating licence. The successive annual reports of COVRA on releases and radiation levels at the fence of the facility show that this favourable situation is continuing.

In addition to the update of the EIS in 2013, in 2014 the Safety Report was updated as well.

Safety assessments of future facilities

A geological disposal facility is envisaged in 2130. Safety assessments will be carried out at that time.

7.3 Demonstration of the safety of a facility or activity during the entire lifecycle

Section 5.1.c of this report explains the applicable system of licensing. Appropriate control and enforcement by the government are discussed in 5.1.d and 5.1.e.

The Nuclear Energy Act (Article 15b) specifies that a licence is needed for the construction, operation and dismantling of nuclear installations – in other words, at the start of each phase in the entire lifecycle. Licence applications include extensive safety evaluations and the accompanying documentation. In these safety analyses, attention is focused on organisational and technical arrangements that are aimed at preventing accidents and mitigating the consequences of accidents.

The obligation to carry out periodic safety evaluations as described in section 7.2 helps ensure that during the entire lifecycle, the safety of a facility is regularly demonstrated.
For nuclear power plants and research reactors, additional regulations apply that compulsorily require the establishment of a dismantling plan and financial security (for dismantling).

Annex 2 exemplifies how the HABOG facility at COVRA is safely managed and assessed.

7.4 Integrated Management System and quality assurance

General

The Ministerial Regulation on nuclear safety in implementation of European Directive no. 2009/71, specifies in Article 5 that the licence holder must ensure that the management systems of the nuclear installation are drawn up and implemented in such a way that sufficient priority is given to nuclear safety.

Due to the limited size of the nuclear industry in the Netherlands, it was not cost-effective to develop a specific national programme of QA rules and guidelines. As a result the Netherlands have relied on IAEA guidance on QA. The current guide is the IAEA GSR Part 2 “Leadership and Management for Safety”.

Licence COVRA

By licence requirement, COVRA is obliged to apply and maintain an Integrated Management System (IMS) for safe operation. Due to the fact that GS-R-3 has been superseded by GSR Part 2 in 2016, COVRA continues the implementation of the Integrated Management System (IMS) using GRS part 2.

The Integrated Management System (IMS) of COVRA is part of the operating licence and hence is binding for the licence holder. Those parts of the IMS that apply specifically to design and construction of the installations and to the safe operation of the spent fuel and waste management facilities require prior approval from the Regulatory Body.

The core of the system is the "IMS Blueprint". The blueprint describes the structure and the organizational framework of the COVRA Integrated Management System. The Integrated Management System is process-based and is divided in 4 components:

- Policies (Why);
- Processes (How)
- SSC's (Structures, Systems and Components (With what)
- Organization (Who).

At COVRA, provisions from the industrial standards NEN-ISO 9000 – 9004 have also been implemented.

Acceptance criteria

With regard to the acceptance criteria for vitrified waste it is worth to mention that the specifications were drawn by the reprocessing facilities and approved by the operators of the NPP's and the Regulatory Body. These specifications were used – among other things – as input for design and licensing of COVRA's HLW facility. These specifications include guaranteed parameters for contamination and radiation levels, heat load and chemical composition. Before shipment from the reprocessing site to COVRA, all relevant data and product files are provided and checked, compliance with transport regulation is assured, and the canisters are witnessed by COVRA and the NPP operator. Upon arrival at the COVRA site a second check is performed.

7.5 Adequate financial and human resources at licence holder

Nuclear Safety Rule NVR-GS-R-3 'The Management System for Facilities and Activities' requires of the management of the organisation that it makes available those resources needed for correctly implementing the activities of the organisation. Resources also include the financial resources. The Ministerial Regulation on nuclear safety in implementation of European Directive no. 2009/71 specifies in Article 4 that the licence holder must have sufficient financial and human resources to comply with the obligations in respect of nuclear safety of the nuclear installation under its authority.

Financial resources

One of the principles of the national policy for the management of spent fuel and radioactive waste is that 'the polluter pays'. All costs arising from radioactive waste management must therefore be borne by the waste producer. There are private agreements (contracts) between major producers of radioactive waste and COVRA.

For the transfer of low level and intermediate level radioactive waste to COVRA, lists of charges are published at COVRA's website. Standard waste packaging is used, and for this type of waste, COVRA is paid for each waste package received. The charges already include the costs for disposal in a geological disposal facility at 2130 after aboveground storage.
With respect to the management of spent fuel and high-level radioactive waste, the operators of nuclear power plants and research reactors have jointly decided to build a special storage facility, the HABOG. This building was commissioned on the COVRA site in 2003. Both the construction costs and the operating costs are borne by the waste generators.

The charges employed by COVRA are corrected annually by the price index. Every five years the charge structure is evaluated to determine whether structural adjustments are needed.

The cost estimate for the construction and operation of a national disposal facility has been updated within the OPERA research programme. The funds for disposal are managed by COVRA in a separate fund, on an account held by the Ministry of Finance.

Decommissioning

As a consequence of the general accepted understanding that the "polluter pays principle" applies, the legislation requires the licence holder to make adequate financial resources available for decommissioning at the moment that these are required. The decommissioning funds are managed by the utilities.

Licence holders of the nuclear power plant and research reactors are required to have a financial provision to cover the costs of decommissioning, which will have to be updated and approved by the authorities every five year, when the decommissioning plan is updated. The licence holder is in principle free to choose the form of the financial provision: however, it has to be approved by the Minister of Finance and the Minister of Infrastructure and Water

Management. Upon approval, the authorities will assess whether the financial provision offers sufficient security that the decommissioning costs are covered at the moment of decommissioning.

Certain licence holders of non-nuclear facilities are obliged to submit a decommissioning plan which contains a description of the required financial provisions. An inadequate decommissioning plan is one of the grounds for not granting a licence. The decision which licence holders are obliged to submit a decommissioning plan is based on the nature and size of the radiological risks involved (graded approach). The obligation for financial assurance for decommissioning of major non-nuclear facilities is in a more preliminary phase and currently being investigated.

Human resources

The Nuclear Energy Act requires that an application for a licence for a nuclear facility shall contain an estimate of the total number of employees plus details of their tasks and responsibilities and, where applicable, their qualifications. This includes supervisory staff. The licence holder has to submit its education and training plan for the Regulatory Body's information and approval. These requirements apply also to the COVRA waste and spent fuel management facilities.

COVRA has implemented a Personnel Qualification Plan (as part of a more generic quality management system) in which clear guidelines have been formulated on the subject of attracting and developing (new) employees. In addition to the Personnel Qualification Plan, COVRA has an education plan and education matrix which contains the requisite level of expertise, and in which the requirements for training and education are laid down. A training plan ensures that an adequate number of staff, with relevant expertise and appropriately trained is always available. Any major organisational changes, e.g. at management level, must be reported to the Regulatory Body. Together with the job descriptions, which detail the responsibilities and authority interfaces, the Personnel Qualification Plan and the education plan constitute the building blocks to ensure qualified staff.

H. 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.

Expertise and skills: ANVS

Disciplines and training

See section F, 6.1 Competent Regulatory Authority – ANVS, Development and maintenance of Human Resources and competence.

Contracted support and cooperations

See section F, 6.1 Competent Regulatory Authority – ANVS, Development and maintenance of Human Resources and competence.

Expertise and skills at Ministry of Infrastructure and Water Management

The new policy unit for nuclear safety and radiation protection has been created on 15 May 2020. The Ministry is working on a programme for knowledge development for policy advisors.

Adequate education and scientific knowledge on nuclear technology and radiation applications

From June 2019 to January 2020, an independent committee explored support and conditions for the required knowledge structure in the Netherlands.
Following the discussions with stakeholders, the Commission makes the following four main recommendations:

- Draw up a knowledge and innovation agenda for nuclear technology and radiation from the government.
- Establish a national platform for Nuclear Technology and Radiation and from the platform initiate three impulse programs in the field of awareness, research and education.
- Establish a Human Resources Observatory for Nuclear Technology and Radiation.
- Strengthen horizontal interdepartmental coordination at (high) official level.

These recommendations relate to the Ministry of Infrastructure and Water Management and the ANVS, but also to other ministries and the sector. The report will be discussed with these parties, among others, after which follow-up steps will be identified.

Expertise and skills of the licence holders

See section G, 7.5.

Research and development activities – after OPERA[38]

In 2020 COVRA published a detailed research plan for the period of 2020-2025 as part of a long-term research programme for geological disposal of radioactive waste. This programme uses the roadmap developed in the OPERA safety case, thereby using a structured process to select research activities to be carried out over the coming years.

[38] OPERA: https://zoek.officielebekendmakingen.nl/kst-25422-217.html.

I. Financial resources (Article 9)

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.

9. Adequate financial resources

As explained in sections A and D, one of the basic principles governing radioactive waste management is the 'polluter pays' principle. This principle requires that all costs associated with radioactive waste management are borne by the organisations or institutes responsible for the generation of this waste. This principle is fulfilled by the fact that COVRA includes in its charges all estimated costs for processing, storage, geological disposal and the associated research, on the basis of the state-of-the-art knowledge at this given time.

Moreover, the main producers of nuclear waste generally directly pay for the construction costs of the buildings in which the waste is stored, these construction costs are not included in the waste management tariffs. This applies for example to the HABOG and VOG-2 buildings.

Current arrangements

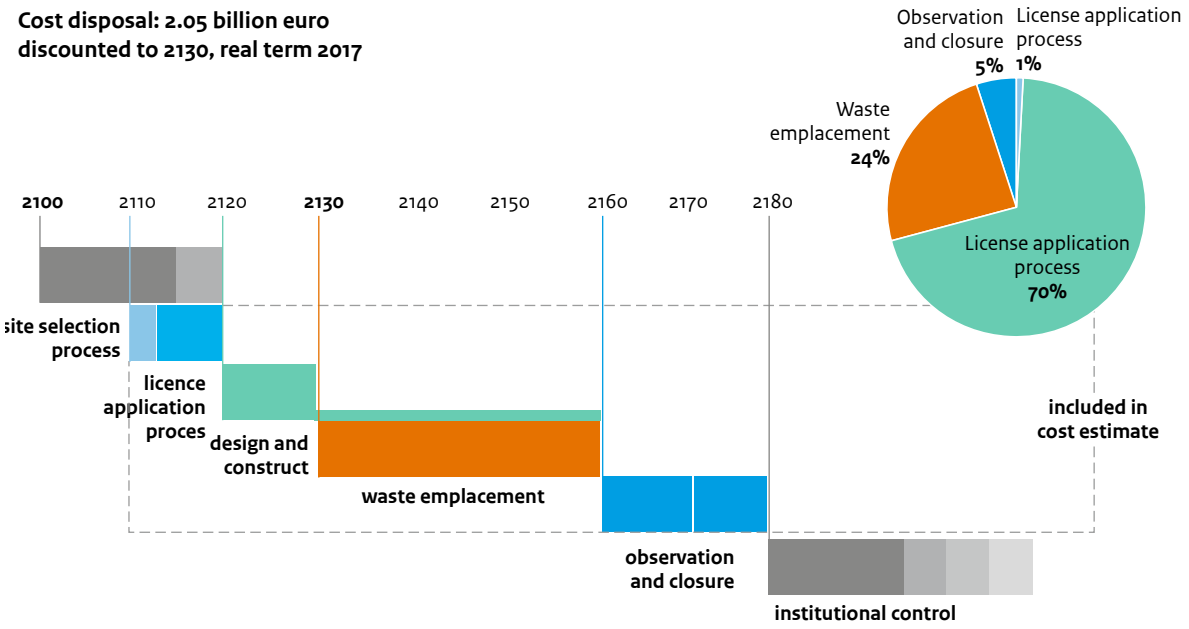
COVRA charges a (contractual) tariff for all phases of the management involved (including the operational costs for storage and disposal). With the implementation of Directive 2011/70/Euratom, the obligation to add a surcharge to the tariffs of COVRA for future research of disposal has been introduced. The final goal is to acquire the financial resources and knowledge needed to have an operational geological disposal facility around 2130.

Due to economies of scale, it is envisioned that all radioactive waste (including high-, intermediate- and low-level radioactive waste) will be placed in a single final geological disposal facility.

The cost of the above-ground management of radioactive waste at COVRA is estimated in 2020 at approx. €13 million per year (excluding transport and processing costs).

COVRA is currently working on the basis of a cost estimate for geological disposal of €2,05 billion (price level 2017, sources: COVRA 2019 annual report and OPERA Safety Case report). The cost estimate is based on a definitive decision on the disposal method being made around 2100. The development of the disposal concept and the site selection process are not included in the cost estimate. The provision for geological disposal currently on the COVRA balance sheet will increase in the period up to 2130 (based on the forecasts for income from waste producers, real growth and inflation) to the target amount.

Figure 8: OPERA Safety Case: estimated costs of geological disposal in Boom Clay



Based on the 'polluter pays' principle, COVRA passes on the estimated costs for interim storage and geological disposal in the tariffs it charges the waste suppliers. After payment of the tariffs, the financial liability for the waste is transferred to COVRA. The accumulated funds are projected to grow during the period of interim storage, to cover the costs of both storage and disposal. Allowance should be made for the fact that the provisions COVRA has included in the balance sheet reflect future liabilities in terms of real cost levels. Underlying assumptions are an average inflation rate of 2% and a real interest rate of 2.3%. These parameters translate into a target return of 4.3% on the financial resources for interim storage and geological disposal. These provisions and underlying parameters are periodically reviewed.

COVRA has several long-term contracts with major radioactive waste suppliers. Construction costs for the main storage buildings (e.g. HABOG and VOG-2) are paid for directly by the main producers. Details of the tariffs charged to small-scale suppliers are available to the public and can be viewed at COVRA's website. The cost prices are periodically recalibrated to reflect current costs and quantities. These tariffs are corrected annually by the price index of 2%, or 17.5% when a margin on a waste stream is negative.

Research

With the implementation of Directive 2011/70/Euratom, the obligation to add a surcharge to the tariffs of COVRA for future research of waste management has been introduced. The final goal is to acquire the financial resources and knowledge needed to have a geological disposal around 2130.

Financial resources for dismantling nuclear installations

The Netherlands has established arrangements that require nuclear power stations and research reactors to have a dismantling plan and financial security (Nuclear Energy Act, Article 15f). The financial security must be approved by the Ministers of Infrastructure and Water Management and Finance. The financial security guarantees that even in the event of unexpected closure of business, sufficient financial resources are available for the responsible dismantling of the installations.

Financial resources for other activities

For operators working with large volumes of scrap or highly active sources, there are statutory obligations for securing the management of these potential waste flows.

A volume of historical radioactive waste that predates the establishment of COVRA in Nieuwdorp is still present at the research location in Petten. A project is ongoing to transfer the historical waste to COVRA (more information on this project can be found at section A).
The costs for this transfer are for the account of the owner of the waste, NRG. These costs include adapting installations to make them suitable for repackaging the waste for transport, transport to third parties and treatment of the waste at third parties, transport to COVRA and the costs charged by COVRA for the storage and disposal of the waste. To cover the increasing cost estimates of the historical waste project over the last 20 years, caused by new insights, new regulations and technical challenges, the government provided several times extra budget as a loan to NRG.

One disposal facility

Due to economies of scale, it is envisioned that all radioactive waste (including high-, intermediate- and low-level radioactive waste) will be placed in a single geological disposal facility. This will make a near surface depository for intermediate and low level waste superfluous. NORM waste is safely managed as very low level waste at one of the two licenced designated landfills.

J. 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.

10.1 Provision of information to the public and employees

General obligations

The general obligations on provision of information to the public and employees is regulated by the General Administrative Act and the Act on Government Information. For more information, see section E.

There is also a Publication Act that lays down requirements for the publication of new regulations. All new regulations are published on the Internet and in the Bulletin of Acts and Decrees and in the Government Gazette, following ratification by Parliament. Ministries can also make their own additional arrangements to improve the accessibility of their regulations.

The Dutch Government Information (Public Access) Act (Wob) specifies that information managed by public bodies is in principle open to the public. Exceptions are listed in Article 10 of the Wob, and relate to such issues as 'State Security' and confidential commercial information. The Wob specifies that authorities must make information public, unsolicited, because this is in the interests of good democratic government. According to Article 3 of the Wob, any individual may request information about an administrative issue. This information may be contained in documents in the possession of public bodies or businesses carrying out work on behalf of those public bodies.

Obligations in the field of nuclear safety and radiation protection

Council directives emphasize for provision of information to the public and employees. The transposition of Council Directive 2011/70/Euratom, establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste and of Council Directive 2013/59/Euratom laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation and of Council Directive 2014/87/Euratom amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations provides for regulations to inform the public as well as employees.

The Minister of Infrastructure and Water Management bears ministerial responsibility for the ANVS and reports to Parliament. Everything reported to Parliament is immediately available on the government website www.rijksoverheid.nl and is therefore available to any interested party.

International reports, such as this report for the Directive, the national programme and the report for the Joint Convention, are made available to any interested party via reporting to Parliament and subsequently publication on the internet.

Communication strategy of the competent regulatory authority

General communication by the competent regulatory authority fulfils the statutory requirements as described above.

One of the legally established tasks of the ANVS is informing and communicating to interested parties and the public. The ANVS is transparent in its communication about its strategy and decisions; decisions and background information relating to its activities are published on the website. For example, the ANVS Vision Document ('koersdocument'), the strategy for inspection and enforcement, and the policy for licensing have been published on the website of the ANVS: www.anvs.nl. This website is available in Dutch and English (on the latter the website only contains topics that are relevant in an international context).

The website is also instrumental in positioning the ANVS as an independent authority and communicating with relevant stakeholders. In 2015 and 2016 the basic communication tools (e.g. website, intranet) have been developed further and are continuously improved. Relations with national, regional and local stakeholders and press are gradually built. Special arrangements are in place for the communication and reporting of incidents in neighboring countries.

The ANVS provides online information on their website[39] about what the government does, and what people can do themselves, in the event of a nuclear crisis or a radiation accident and, among other things, answers questions about the safety and risks of nuclear reactors. A Nationwide al Crisis Plan for Radiation Accidents (LCP-S) can be found on the website of the central government (in Dutch).

[39] Accessible through this website: www.infonucleairrisico.nl (in Dutch)

In 2017, the ANVS and Belgium's regulatory body 'FANC' signed a cooperation protocol. With this they have reaffirmed existing agreements and, where necessary and possible, intensified existing cooperation. Because of the cross-border aspects of the security policy and public communication, both organizations attach great importance to an even better cooperation. In order to formalize, expand and concretise the existing cooperation, agreements have now been laid down in a protocol. These agreements are based on relevant guidelines from the European Atomic Energy Community, Euratom. The cooperation protocol is available on the ANVS-website[40].

Use of language

The ANVS is aware of the different backgrounds of interested groups and the public. Ministries and the ANVS often publish both easy-to-ready press releases, questions and answers, annual reports, manuals, as well as detailed specialists reports. From certain international reports, summarised versions are available (in Dutch). The majority of information addressed to the Dutch public (general public, employees of public bodies, Parliament, etc.) is published in Dutch.

The national programme for waste and spent fuel is published in Dutch and in English. Documents intended to be used in peer reviews, information intended for more informed groups (experts) and colleagues in other countries are often published in English.

Frequency of updating the information

Information about laws, regulations, licences and related decisions is published on the government site as soon as it becomes available. In other words, this information is constantly kept up to date.

The start of licensing procedures and the related information meetings are announced in good time in major newspapers, and online.

An annual report is also submitted to the Parliament containing an overview of registered incidents at nuclear installations.

Information provision in emergencies

The Nuclear Energy Act (Article 43) provides for the issuing of information to members of the public who could be affected by a nuclear accident. In line with the responsibility for the response in emergency situations from the government, the government is also responsible for information provision. In such situations, information provision will be undertaken in close collaboration with local governments in the threatened or affected area.

If there is a threat or an emergency situation that requires national coordination and the intervention of different Ministries, the so-called National Crisis Centre (NCC) will establish a national crisis communication center.

The government websites contain information about the subject 'crisis'. Information can be found on many aspects of nuclear incidents. Another section of the government websites is only available during a crisis and then for example will contain a detailed list of questions and answers.

Handling non-publishable information

Under the Dutch Government Information (Public Access) Act (Dutch: Wet openbaarheid van Bestuur, Wob), as a basic principle, information held by public authorities is public, excluding information covered by the exceptions enumerated in the Act in its Article 10. For more information on this Act, see section E.

[40] https://www.autoriteitnvs.nl/documenten/publicatie/2017/09/14/samenwerkingsprotocol-fanc-%E2%80%93-anvs

10.2 Participation by the public in decision-making

Participation by interested parties via public consultation during the licensing process is laid down in the already mentioned Awb Act. Participation is also compulsory in the procedures with an environmental impact report. The environmental impact report procedure includes meetings where the licence holder, the authority (ANVS) and the public participate. The public can present its views on proposed decisions, and the competent body will respond in its rulings. There are opportunities for individual citizens to appeal, if they disagree with a decision.

In drawing up regulations, public participation is effectively indirectly achieved via Parliament.

With regards to the management of spent fuel and radioactive waste, via the procedures, the public is able to participate in the decision-making processes involving licensing for installations in which spent fuel and/or radioactive waste are managed. See section E, 5.1.c., for more details on how the public is involved in licensing procedures.

Current policy envisages a decision on disposal around the year 2100. Therefore, at present there is no specific licensing procedure for a disposal facility yet.

For more information about decision making on disposal and public involvement in that process, see chapter 6 of the national programme.

K. Implementation of the national programme (Articles 11 and 12)

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) an 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.

Article 11 – National programmes

11.1 Implementation National Programme

The progress of implementation of the national programme is described below in the section on Article 12 sub a, b and d through to k. The basis for dealing with the sub- articles can be found in the national programme of the Netherlands.

11.2 Update National Programme

The Netherlands will update its national programme at least once every ten years. This complies with the regulations of the Directive.

Article 12 - Contents of national programmes

The national program is publically available and can be found in Dutch and English at www.anvs.nl. Background documents on which the national programme is based are not part of the national programme.

12.1.a The overall objectives of the Member States' national policy in respect of radioactive waste and spent fuel management

The overall objectives of the policy on waste management appear among others in the Introduction (section A) to this report and in part B (chapter 4) of the national programme.

12.1.b The most significant milestones and clear timetables for the achievement of those milestones in light of the overarching objectives of the national programmes

The most important milestones and their timetable appear in the national programme in paragraphs 7.1 and 7.2. These include:

- Defining criteria for the start of the first environmental impact report: the potential environmental effects of disposal must be considered in the decision making, and this will take place in the future in the form of an environmental impact report. The definition of criteria is planned for 2030.
- Reporting on the implementation of the national programme; a national report must be submitted in a three-yearly cycle to the Commission; this report is the third to be submitted to the Commission.
- The national programme is updated at least every ten years; the first version of the programme was submitted to the Commission in 2016.
- Drawing up a waste inventory: in the national report a waste inventory must be included.
- Establishing a Disposal Advisory Platform: see section B.
- Closure of the Borssele nuclear power plant: closure of the only nuclear power plant still operational in the Netherlands is planned for 2033.
- Reception of last waste from reprocessing of spent fuel in the Netherlands: is agreed at the latest in 2052.
- End of period of aboveground storage at COVRA: the buildings at COVRA are suitable for safe storage of the radioactive waste for the next 100 years, and due to periodic maintenance the lifecycle of these buildings can certainly be extended to 300 years. Geological disposal is envisaged in 2130. Around 2100, a decision will be taken on the follow-up process.

12.1.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

See section C of this report.

12.1.d The concepts, plans and technical solutions for spent fuel and radioactive waste management, from generation to disposal

The concepts, plans and technical solutions for management of spent fuel and radioactive waste appear in the national programme in section 4.3.

The Netherlands has opted for a single central organisation for the management of all spent fuel and radioactive waste, at a single location. That is COVRA. The aboveground storage buildings at COVRA comply with all applicable regulations on nuclear safety and radiation protection. The policy assumes disposal of all radioactive waste around 2130 in one

geological disposal facility, with decision making envisaged around the year 2100. For that reason, no definitive choice has been made for a design or location of the disposal facility.

12.1.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

The policy is that a decision will be taken around the year 2100. In paragraph 4.3.3. of the national programme, it is said that for several decades, retrievability has been included as a precondition in the policy for the management of radioactive waste in a disposal facility. This means that the possibility for retrieving waste (packages) must be included in the design of a facility, so that the retrievability of the waste (via the existing shaft) must be possible at least during the use of the disposal facility. It will be important to assess the optimum period of retrievability in due time, in order to enjoy the greatest possible profit from the advantages of retrievability and the advantages of a passive, safe (closed) disposal facility.

Until the disposal facility is definitely closed, each generation will be able to reconsider whether the disposal facility should be kept open or closed. Following definitive closure of the disposal facility, the waste will no longer be retrievable via the original shafts. Given the development of drilling techniques, it will of course at all times be possible to retrieve the waste, but the costs of retrieval could be very high.

Experiences in countries in which a waste disposal facility is already operational, can be taken into account.

The importance to preserve knowledge is fully recognized. In the National Programme it is said (in paragraph 4.3.4) that "monitoring and knowledge assurance are relevant at different moments of the process of creating a disposal facility. There are many international developments in these fields, and a great deal of progress is expected, because the first disposal facilities for high level radioactive waste have not yet been commissioned. It is important that the Netherlands remains up to date on these developments. This is achieved in the Netherlands through research, tying in with international studies and consultation groups in which the knowledge and results are shared. Annex E provides more information about monitoring, knowledge assurance and research." See also section H.

12.1.f The research, development and demonstration activities that are needed in order to implement solutions for the management of spent fuel and radioactive waste

The Netherlands has a history of several national research programmes into disposal. Two programmes from the past were OPLA33 (1985 – 1993) and CORA34 (1996 – 2000). The results of Research Programme on disposal of radioactive waste in Boom Clay (OPERA, 2011-2017) have been presented to the public in January 2018. More information on OPERA is available in section H. For the current research programme, see section B.

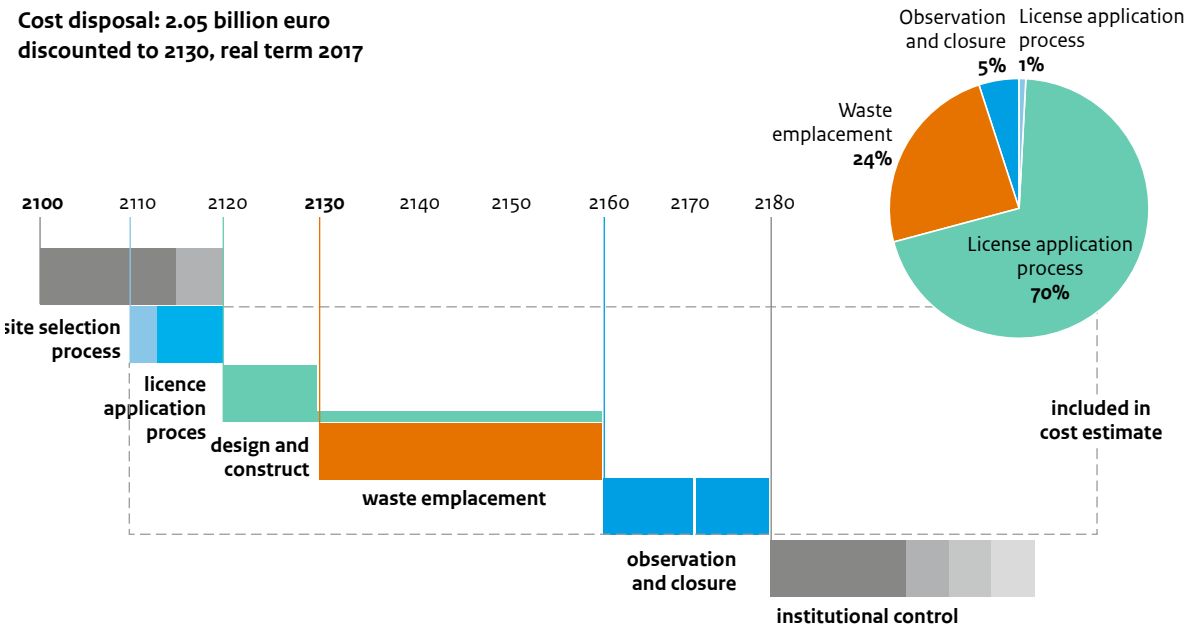
In the past, Dutch researchers participated in experiments in Germany (in salt formations). At present there is collaboration in underground facilities in Belgium (clay).

12.1.g The responsibility for the implementation of the national programme and the key performance indicators to monitor progress towards implementation

The three performance indicators below show the current status of progress of the national programme:

1. Financing – the available sum for disposal must be sufficient for the preparation, construction, operation and closure of the disposal facilities. COVRA charges a (contractual) tariff for all phases of the management of Dutch radioactive wastes, including the operational cost for disposal, with the objective of having sufficient financial resources for the operation of a GDF around 2130 . In the 7- year research programme, OPERA, an updated estimate of the cost of disposal was made. The total cost for disposal in 2130 are estimated to be 2.05 billion in 2017 Euros. At December 31, 2020, the provision for disposal at COVRA amounted €101.462.000 million.

Figure 9: cost estimates of geological disposal as reported in OPERA (2017)



2 Status of action points / milestones as mentioned in nationale programme

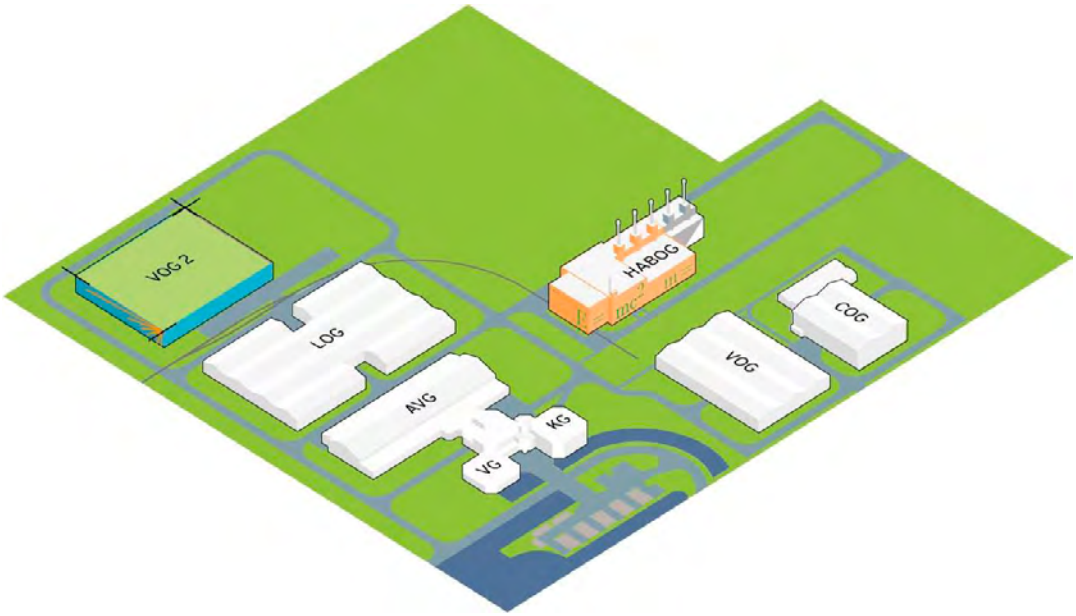
Action points	Status
From chapter 7.1.1 of the national programme	
The transfer of historical radioactive waste from Petten to COVRA.	In progress; see section B.
Release thresholds for materials, buildings and sites.	Accomplished. The completion and publication of a guide for the release of materials, buildings and sites following dismantling of a nuclear installation was finalised by 31 December 2017. In addition, the National Institute for Public Health and the Environment is doing research on how to set specific standards for the clearance of sites and buildings.
Guide and licensing regulations for dismantling of non-nuclear applications.	In progress.
Decay storage.	Accomplished. Current practice: licence holders may store their radioactive material for 2 years at their own site. COVRA used to offer the possibility to store materials at their facilities for 25 years to decay below the clearance levels, without being reprocessed, but has extended this period to 50 years. During decay storage, materials can decay to below the release threshold, and then be safely released for reuse or discharged to a conventional waste processor.
Imposing rules on import and export, storage and disposal of radioactive waste from abroad.	Policy in progress. Research has been done by the National Institute of Public Health and the Environment on secondary waste, and regulation of imports of NORM residues in surrounding countries.
Financial aspects in the decommissioning plan of a facility.	Modification of legislation for nuclear facilities is in progress. See section E. Modification of legislation for non-nuclear facilities is in a more preliminary phase and currently being investigated. See section G, article 7.5.a.
Investigating the consequences of new European basic standards on the volume of radioactive waste.	In progress. The Bbs was implemented in February 2018.

Action points	Status
From chapter 7.1.2 of the national programme	
Environmental impact assessment of disposal	On schedule, planned to be finalised at the end of 2030.
Reporting on implementation of the national programme.	Every three years in this report.
Updating the national programme on radioactive waste.	First update of the NP is planned for 2026, ten years after the first NP.
Drawing up a waste inventory.	Accomplished. See section B and C.
Appointing a consultation group.	In progress. See section B and M.
Analysis of online debate.	Start and frequency to be determined by the Disposal Advisory Platform.

3 Capacity of COVRA – the storage capacity at COVRA must be sufficient for the expected volume of radioactive waste in the Netherlands.

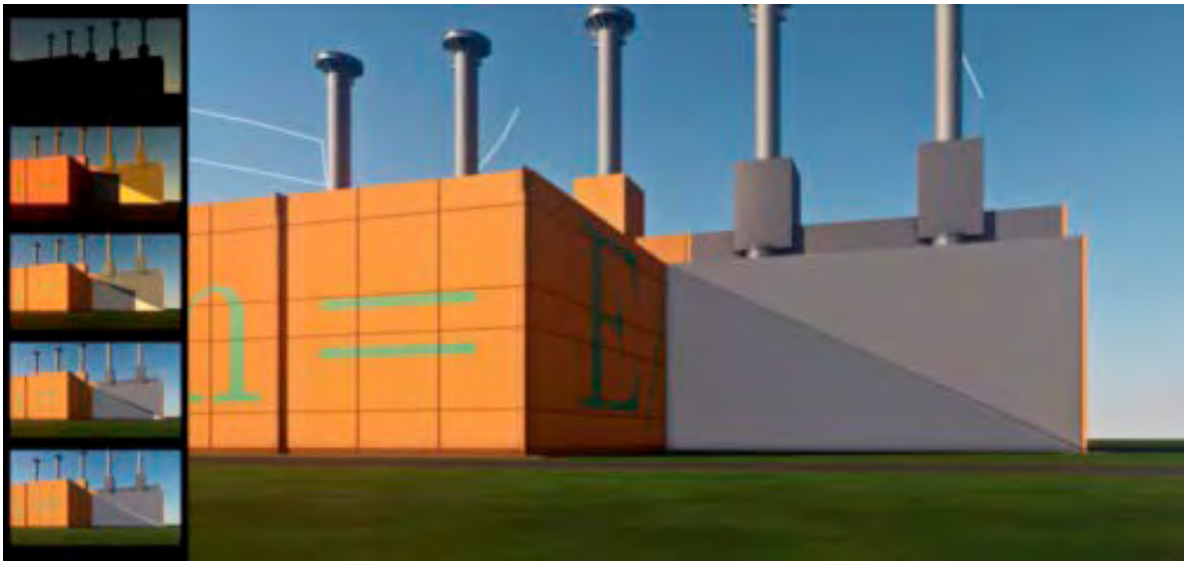
COVRA has a site available of about 25 ha at the harbour and industrial area of Vlissingen-Oost. The current storage capacity at COVRA has been dimensioned to handle the expected Dutch demand for storage capacity for the coming period of at least 100 years. Buildings are constructed in a modular fashion, so new capacity can be added when needed. In 2017, a new building for the storage of depleted uranium (VOG-2) has been constructed and commissioned (Figure 10 below).

Figure 10: Map of waste management facilities at COVRA



Currently, work on the extension of the orange HLW building (HABOG) has started. When the construction is finished (2021), the capacity has increased from three to five storage modules (one spare module) for heat-generating HLW (Figure 11).

Figure 11: Visualization of extension of HABOG at COVRA.



12.1.h An assessment of the national programme costs and the underlying basis and hypotheses for the assessment, which must include a profile over time

The largest future cost item for the national programme is the realisation of a national disposal facility around 2130. The applicable financing arrangements are provided in section I of this report.

12.1.i The financing scheme(s) in force

Information on the adequate financing schemes for the management now and in the future of spent fuel and radioactive waste, the financing of research into disposal, and for the dismantling of nuclear installations is provided in section I of this report.

12.1.j A transparency policy or process as referred to in Article 10

This national report discusses transparency in section J, as well as how transparency is anchored in legislation and regulations in the communication policy of the ANVS. COVRA operates a transparency policy in which communication with the public is very proactive.

12.1.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

In 2012, a treaty was signed by the Republic of France and the Netherlands that regulates the reprocessing by ORANO in France of Dutch spent fuel and the return to the Netherlands of the radioactive residues from reprocessing at the latest in 2052.

L. Peer reviews and self-assessments (Article 14.3)

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.

14.3 Results of self-assessments and Peer Reviews

Competent regulatory authority

In 2013 – 2014, the authority undertook a self-assessment in the framework of an IRRS mission of the IAEA, which was concluded at the end of 2014. In November 2018 a follow-up mission took place. The follow-up mission visited the Dutch regulatory body in a completely new situation, since the ANVS had been established in 2015. There was also a new management, and none of the present management team members had experienced the 2014 mission.

On the other hand, after the structuring of the organization in 2016, the management team has strongly lead the organization to complete the implementation of the recommendations and suggestions of the first IRRS mission. As a result, out of 45 recommendations and suggestions, finally 26 were fully closed, and 18 were closed by the IRRS review team with confidence that they will be implemented within a reasonable time and only one recommendation was kept open. The latter deals with the set up and implementation of clearance levels of a greenfield after dismantling of an installation or termination of an activity. Research has started on an assessment framework on radiological release criteria for release of a site after dismantling of an installation or finalization of an activity. The mission reports have been published and sent to the European Commission and Member States.

The Government has requested the next IRRS mission and the first Artemis mission to the Netherlands in 2023.

Licence holders of nuclear facilities

The Netherlands has a long tradition of Periodic Safety Evaluations, better known as 'Periodic Safety Reviews' (PSRs). These are large scale self-evaluations carried out by licence holders. The PSRs are assessed by the ANVS. The obligation to carry out PSRs has been included for more than 20 years in the licensing conditions, and for a slightly shorter period in guidelines drawn up by the authority. Directive 2009/71/EURATOM of 25 June 2009 on nuclear safety has also been implemented by a Ministerial Regulation, and that arrangement also includes this obligation about PSRs.

Licence holders welcome Peer Review teams with some regularity, such as those organised within the framework of WANO, or under the auspices of the International Atomic Energy Agency of the UN, the IAEA. The results of review activities under the auspices of the IAEA are always evaluated by the authority.

Review Meeting of the Joint Convention

The seventh review meeting of the *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management* has been postponed to 2022 due to the COVID-19 pandemic.

M. Future plans to improve safe and responsible management of spent fuel and radioactive waste

Research

As mentioned in section H, 8.3.

Public participation

For more information on the ongoing project on public participation "Toekomst Radioactief Afval", see section B, recent developments – policy.

Action points/milestones as mentioned in national programme

See section K, 12.1.g.

Annex

Annex 1. Overview matrix of liabilities and current policies and practices

An overview matrix providing the types of liabilities and the general policies and practices for the Netherlands is given below.

Type of liability	Long-term management (LTM) policy	Funding of liabilities	Current practices / facilities	Planned facilities
Spent fuel (SF)	It is up to the licencee to decide if SF is to be reprocessed. RR-SF and HLW resulting from reprocessing of SF of NPP Borssele, are to be stored at COVRA, the national WMO. Licencees pay all-in tariffs that are determined by COVRA and which cover all costs of storage and disposal of SF and radioactive waste (RW). It is foreseen that all radioactive wastes, including HLW from reprocessing and RR-SF, ultimately will be disposed of in one single geological disposal facility.	If applicable, SF producers fund the reprocessing of SF and management of resulting wastes. Via tariffs, licence holders fund storage and disposal of their SF and RW. Upon transferral of the waste to COVRA, all liabilities, including the responsibility for safety, are transferred to COVRA.	SF of NPP Borssele is reprocessed in France; resulting vitrified and metallic HLW are stored in HABOG[41] at COVRA. SF of RRs is stored in HABOG at COVRA. The main producers of nuclear waste generally directly pay for the construction costs of the buildings in which the waste is stored, these construction costs are not included in the waste management tariffs.	A geological disposal facility is foreseen around 2130. As a result of Long-Term Operation of the NPP till end of 2033, an extension of HABOG at COVRA is ongoing.
Nuclear Fuel Cycle waste	All radioactive wastes from NFC facilities have to be stored at COVRA. Licencees pay all-in tariffs that are determined by COVRA and which cover all expected costs of storage and disposal of RW. It is foreseen that all radioactive wastes, including HLW from reprocessing and RR-SF, ultimately will be disposed of in one single geological disposal facility.	Via the tariffs of COVRA, licence holders fund storage and disposal of their radioactive wastes. Upon transferral of the waste to COVRA, all liabilities, including the responsibility for safety, are transferred to COVRA.	All NFC waste is transferred from licence holders to COVRA followed by storage in aboveground facilities at COVRA. The main producers of nuclear waste generally directly pay for the construction costs of the buildings in which the waste is stored, these construction costs are not included in the waste management tariffs.	A geological disposal facility is foreseen around 2130.
Application wastes	All radioactive wastes have to be stored at COVRA. Licencees pay all-in tariffs that are determined by COVRA and which cover all expected costs of storage and disposal of RW. It is foreseen that all radioactive wastes, including HLW from reprocessing and RR-SF, ultimately will be disposed of in one single geological disposal facility.	Via the tariffs of COVRA, licence holders fund storage and disposal of their radioactive wastes. Upon transferral of the waste to COVRA, all liabilities, including the responsibility for safety, are transferred to COVRA.	All radioactive waste is transferred from licence holders to COVRA followed by storage in aboveground facilities.	A geological disposal facility is foreseen around 2130.

[41] HABOG: the high-level waste treatment and storage building.

Type of liability	Long-term management (LTM) policy	Funding of liabilities	Current practices / facilities	Planned facilities
NORM- waste	Disposal of NORM-waste between 1 – 10 times the general clearance levels at designated landfills. When specific clearance is applicable: disposal of NORM-waste below the specific clearance levels at designated landfills. For NORM-waste with an activity concentration > 10 times the general clearance levels and when specific clearance is not applicable: see application wastes.	Via tariffs, waste producers fund disposal of their radioactive wastes at designated landfills.	Disposal of NORM-waste between 1 – 10 times the general clearance levels at designated landfills. When specific clearance is applicable: disposal of NORM-waste below the specific clearance levels at designated landfills.	No planned facilities.
Decommis-sioning Liabilities	Since 2011 it is mandatory for licence holders of nuclear facilities to choose the immediate decommissioning strategy in their decommission-ing plan. In exceptional circumstances, the Minister can allow different strategies. Bkse requires the licence holder of a nuclear facility to have and periodically (every five years) update a decommissioning plan during the lifetime of the facility or sooner when there is a need to update the decom-missioning plan. The ANVS will evaluate the plan and decide on approval. Ultimate responsibility rests with the licence holder.	The licence holders of nuclear reactors are required to have financial assurance for decommissioning, to cover the costs of decommissioning (including a contingency add-on) and resulting waste management costs. The financial assurance will have to be updated and approved by the authorities at least every 5 years or sooner when there is a need to update the decommis-sioning plan or the financial assurance. The Ministers of Finance and of Infrastructure and Water Management are responsible for the evaluation and approval of the financial assurance for decommissioning.	Licence holders of NFC facilities are required to have an up-to-date decommissioning plan throughout their entire lifecycle. Licence holders of nuclear reactors are required to have also an updated FG.	A NPP is in Safe Enclosure (Dode-waard).
Disused sealed sources	All import, manufacturing, storage, use, export and disposal of radioactive sources needs a licence. All radioactive wastes have to be stored at the facilities of COVRA. Licencees pay all-in tariffs that are determined by COVRA and which cover all expected costs of storage and disposal of RW. It is foreseen that all radioac-tive wastes, including HLW from reprocessing and RR-SF, ultimately will be disposed of in one single geological disposal facility.	HASS (High Active Sealed Sources) are regulated according to EU regulations[42], imple-mented in Dutch regulation for licensing, registration & require financial guarantee.	If reuse is not possible, disused sealed sources are preferably returned to the supplier or manufacturer. All radioactive waste is transferred to COVRA, followed by storage in above-ground facilities at COVRA. Most orphan sources are found during routine radiological monitoring of scrap material with portal monitors at scrap yards.	A geological disposal facility is foreseen around 2130.

[42] Council Directive 2003/122/Euratom, of 22 December 2003, on the control of high activity sealed radioactive sources and orphan sources, OJEC, 31/12/03, L346/57.

Annex 2. Safety demonstration HABOG facility at COVRA

Spent fuel from the research reactors and reprocessing residues (vitrified waste packages) are stored in the HABOG facility at COVRA. HABOG was commissioned in 2003. A schematic cross-section of the HABOG facility is presented in Figure 12 (below).

Figure 12: Cross-section of the HABOG facility

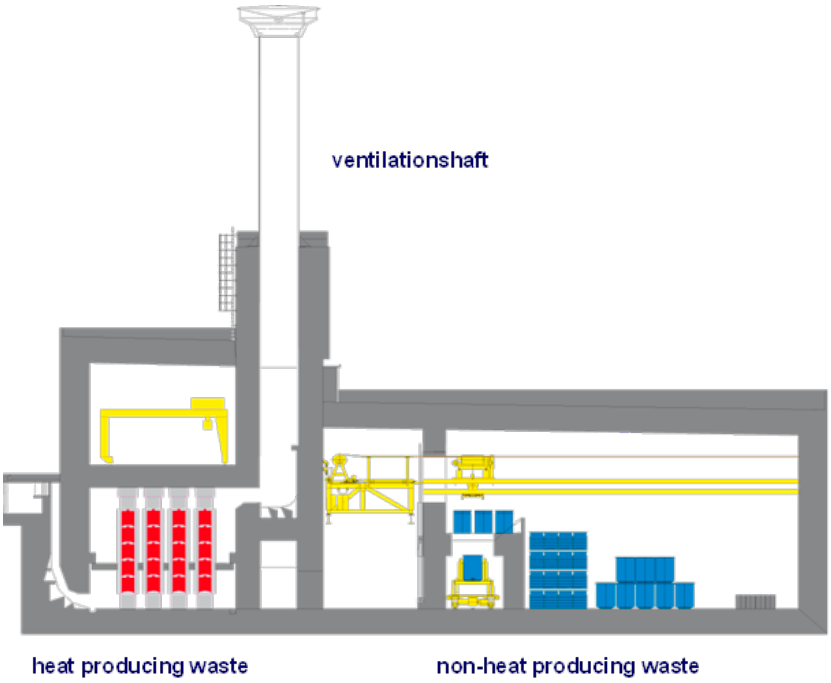
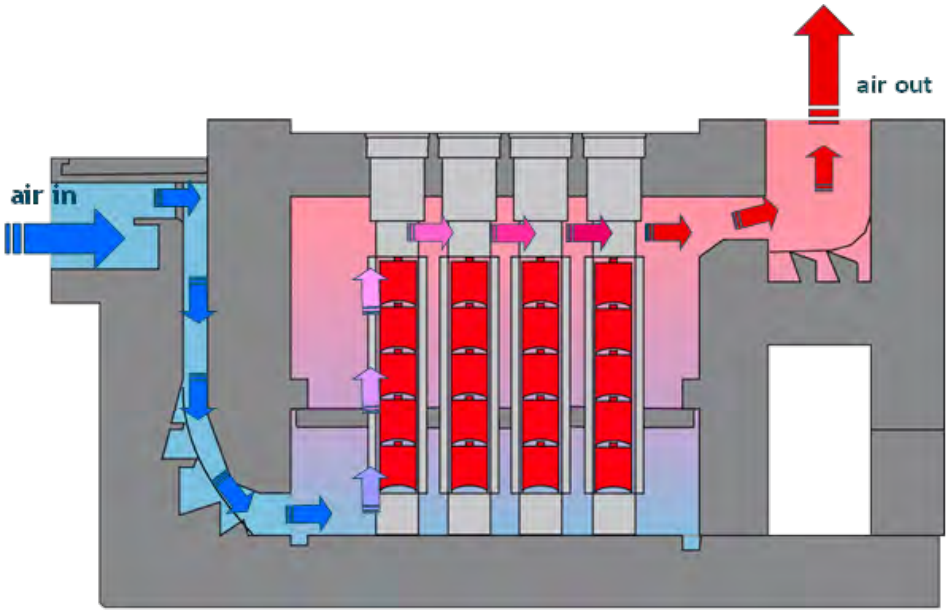


Figure 13: Storage wells for SF and HLW in the HABOG, with passive cooling



The HABOG is a vault-type storage facility divided in two separate compartments. The first compartment is used for the storage of canisters and other packages containing high-level waste that does not need to be cooled (compacted hulls and ends and other high-level radioactive waste). The second one is used for the storage of vitrified HLW from reprocessed spent fuel originating from the NPP's, for spent fuel originating from the research reactors and spent uranium targets from molybdenum production. Spent fuel and spent uranium targets, and vitrified HLW are stacked on 5 levels in vertical air-cooled storage wells. The storage wells are filled with an inert gas to prevent corrosion of the canisters and are equipped with a double jacket to allow passage of cooling air. The double jacket ensures that there is never direct contact between spent fuel, spent targets or waste canisters and the cooling air. The cooling system is based on the natural convection concept.
A schematic diagram of the storage compartment for spent fuel and vitrified HLW is represented in Figure 13 (above).

The leading principles of operational safety in the management of spent fuel (and radioactive waste) are Isolation, Control and Monitoring. For the design of the HABOG the guidelines from ANSI/ANS 57.9-1992 have been applied. Broken down to the abovementioned operational safety principles the following requirements should be fulfilled:

- *Isolation*
  Spent fuel (or radioactive waste in general) should be contained in a way that at least two barriers to the release of radioactive material are present. Adequate shielding of the radiation emitted by the waste should be maintained.

- *Control*
  Assurance of a condition of sub-criticality of the spent fuel and targets by application of neutron absorbers and by a suitable geometry of the spent fuel and targets. Assurance of adequate cooling of heat-generating HLW. Possibility to move spent fuel and targets or HLW from the storage wells with a view to repackaging, relocating to another storage compartment or removal from the facility.

- *Monitoring*
  Monitoring the containment of the storage wells, the temperature of the wells, the shielding capacity and the emissions by inspections and/or measurements.

These requirements have been implemented in the following ways:

- *Isolation*
  The presence of at least two containment barriers between the spent fuel/HLW and the environment is achieved by passive components, constructions and materials such as the immobilization matrix of the material itself, by the packaging, by the storage wells and by the construction of the building.

  Adequate shielding is achieved through the presence of 1.7 m thick concrete walls. The HABOG facility is designed to withstand 15 different design-base accidents in order to prevent consequences for the population or the environment. These design base accidents include for example flooding, fire, explosions in the facility, earthquakes, hurricanes, gas explosions outside the facility, an aircraft crash, and a drop of a package from a crane. The robustness of the construction of the building ensures that none of these accidents, whether arising from an internal cause or initiated by an external event, will result in a significant radiological impact.

- *Control*
  Sub-criticality is maintained by assuring that both under normal operating conditions and under accident conditions the reactivity factor k_{eff} will never exceed a value of 0.95.
  Permanent cooling of the canisters with spent fuel, spent targets and high-level radioactive waste is assured by using a passive air convection system. Calculations have demonstrated that the thermal specifications of the spent fuel/HLW will never be exceeded. The HABOG facility is laid out in such a way that there is always one spare storage compartment for each category of waste available.

- *Monitoring*
  HABOG has a passive cooling system for spent fuel and HLW based on natural air convection. The cooling air never comes in contact with the radioactive material or any contaminated surfaces but is nevertheless monitored. HABOG has also a mechanical ventilation system. This system is designed to keep the building (except for the spent fuel and HLW vaults) under pressure (lower pressure inside the building). The air flow through the building is directed from areas with no contamination towards areas with a potentially higher contamination. Both incoming and outgoing air is monitored and filtered.

Conceptual plans and provisions for decommissioning

The spent fuel and HLW storage facility HABOG is designed for a storage period of at least 100 years. Following the applicable decommissioning legislation, COVRA has a Preliminary Decommissioning Plan (PDP) approved by the authorities. The facility is designed and operated with the objective to prevent contamination, which will ease future decommissioning. The spent fuel and waste packages accepted in the building have to be free of (non-fixed) contamination (IAEA Safety Standard SSR-6[43]). The areas in the HABOG which may be contaminated with radioactive material due to handling of spent fuel/HLW are limited. The finishing of all surfaces in places where radioactive material is being handled, is such that any radioactive contamination can be easily removed. Consequently, it is unlikely that major structures and components of the building become permanently contaminated. Keeping the buildings clean is an integral part of the operations, which prevents or limits the build-up and spreading of any contamination. By regularly conducting contamination measurements, any contamination is timely detected and removed. Finally, the consequences of any contamination are limited by compartmentalisation.

Technologies incorporated in the design and construction

One of the important features in the design of the HABOG facility is the application of natural convection for the control of the temperature of the spent fuel and HLW canisters. The choice was made in favour of a system of natural convection because of its inherent safety characteristics: cooling is ensured under conditions of loss of electric power and it is insensitive to human errors. It is a reliable cooling method, which is common practice these days. Similar systems are also being used in Hungary, Belgium and France.

[43] IAEA Safety Standards Series, Specific Safety Requirements, No. SSR-6, Regulations for the Safe Transport of Radioactive Material - 2012 Edition.

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