



Ministry of Infrastructure
and Water Management

Report to the European Commission on the implementation of Council Directive 2009/71/Euratom, amended by the Council Directive 2014/87/Euratom of 8 July 2014

Second National Report of the Kingdom of the Netherlands
as required under Article 9.1

Abstract

Article 9.1 of the Council Directive 2009/71/EURATOM establishing a community framework for the nuclear safety of nuclear installations as amended by the Council Directive 2014/87/Euratom of 8 July 2014 (hereafter called the Directive), requires Member States to report on how they have fulfilled their obligations as formulated by the articles of the Directive.

This second National Report of the Netherlands, demonstrates that the Netherlands meets all obligations of the Directive.

The structure of the report reflects the articles of the Directive and closely follows the ENSREG guidelines HLG_M(2019-38)_429 regarding Member States Reports to the Council Directive.

This report has been prepared by the Authority for Nuclear Safety and Radiation Protection, the ANVS.

Contents

Abstract	2
Contents	3
List of symbols and abbreviations	6
Introduction	8
Article 4 Legislative, regulatory and organisational framework	11
4.1 National legislative, regulatory and organisational framework	11
Overview of national framework	11
Description of the elements of the framework and its implementation	12
Differences in implementation for different types of nuclear installations	14
Ratification of relevant international conventions and legal instruments related to the scope of the Directive	14
4.1(a) Allocation of responsibilities and coordination between relevant state bodies	15
4.1(b) National nuclear safety requirements, covering all stages of the lifecycle of nuclear installations	15
4.1(c) System of licensing and prohibition of operation of nuclear installations without a licence	15
4.1(d) System of regulatory control of nuclear safety performed by the competent regulatory authority	18
4.1(e) Effective and proportionate enforcement actions, including, where appropriate, corrective action or suspension of operation and modification or revocation of a licence	20
4.2 Maintenance and improvement of the national framework	21
Article 5 Competent regulatory authority	23
5.1 Establishment and maintenance of a competent regulatory authority	23
5.2 Independence of the competent regulatory authority	25
5.2(a) Functional separation from bodies or organisations concerned with promotion or utilization of nuclear energy	25
5.2(b) Regulatory decisions founded on robust and transparent nuclear safety-related requirements	26
5.2(c) Dedicated and appropriate budget allocation for delivery of regulatory tasks	26
5.2(d) Appropriate number of staff with qualifications, experience and expertise necessary to fulfil its obligations	27
5.2(e) Procedures for prevention and resolution of any conflicts of interest	28
5.2(f) Provision of nuclear safety-related information without clearance from any other body of organisation	29
5.3 Legal powers of the competent regulatory authority to fulfil its obligations	29
5.3(a) Definition of national nuclear safety requirements	29
5.3(b) Power to require licence holders to comply and demonstrate compliance with national nuclear safety requirements and terms of the relevant licence	29
5.3(c) Verify compliance by licence holders through regulatory assessments and inspections	29
5.3(d) Propose or carry out effective and proportionate enforcement actions	29

Article 6 Licence holders	30
6.1(a) Ensuring prime responsibility for nuclear safety rests with licence holders	30
6.1(b) Requirement to submit a demonstration of safety when applying for a licence	31
6.1(c) Licence holders to regularly assess, verify, and continuously improve, ALARP, nuclear safety of their installations in a systematic and verifiable manner	33
6.1(d) Licence holders are to establish and implement management systems which give due priority to nuclear safety	34
6.1(e) Licence holders to provide for appropriate on-site emergency procedures and arrangements, including SAMGs or equivalent	35
6.1(f) Licence holders to provide for adequate financial and human resources	37
Article 7 Expertise and skills in nuclear safety	39
7.1 Licence Holder	39
7.2 Competent regulatory authority	39
7.3 Further developments regarding development of knowledge	39
Article 8 Transparency	40
8.1 Provision of necessary information to workers and the general public by licence holders and authorities on nuclear safety of nuclear installations and its regulation	40
8.1(a) Provision of information on normal operating conditions of nuclear installations, to workers and the general public	40
8.1(b) Provision of prompt information in case of accidents to workers and the general public and competent regulatory authorities of other Member States	42
8.2 Provision of information to the public in accordance with relevant legislation and international instruments	43
8.3 Cooperation activities of the competent regulatory authority on nuclear safety with authorities of other Member States in the vicinity of a nuclear installation	44
8.4 Provision of appropriate opportunities to the general public to participate effectively in the decision-making process relating to licensing of nuclear installations	44
Article 8a Nuclear safety objective for nuclear installations	46
8a.1 National nuclear safety framework requiring to prevent accidents happening to (new) nuclear installations as much as possible and mitigate consequences if accidents occur	46
8a.2 Correct scope of application of Article 8a.1	47
Article 8b Implementation of the nuclear safety objective for nuclear installations	49
8b.1 Ensuring objectives of Defence-in-Depth are achieved	49
8b.2 National framework requiring competent authority and licence holder take measures to promote and enhance nuclear safety culture	50
Article 8c Initial assessment and periodic safety reviews	53
Article 8d On-site emergency preparedness and response	55
8d.1 National framework requiring organisational structure for on-site emergency preparedness and response	55
8d.2 Ensuring there is consistency and continuity between the various emergency preparedness and response arrangements satisfying Directive 2013/59/EURATOM	55

Article 8e Peer reviews	56
8e.1 Periodic self-assessments and peer review of national framework and competent regulatory authority	56
8e.2 National assessments to be conducted on a specific topic and to be peer reviewed	57
8e.3 Member States to ensure periodic topical peer reviews take place	57
8e.4 Invitation of peer review after accidents that require off-site emergency or protective measures	57
List of tables	
Table 1 Nuclear installations in the Netherlands	8
Table 2 Dose limit values for DBAs pursuant to Bkse	32
Table 3 Key examples of recently conducted EIAs (2014 – 2020)	45
Table 4 Overview of recent PSRs	54
List of figures	
Figure 1 Locations of nuclear power plants, research reactors and other facilities of the nuclear programme of the Netherlands	9
Figure 2 Simplified representation of the hierarchy of the legal framework	12
Figure 3 Overview licensing process under Nuclear Energy Act, variant with EIA	16
Figure 4 Intervention matrix used in decision making about interventions. With: LOB administrative coercion order, LOD financial penalty order, BSBm environmental penalty order, and PV police report	20
Figure 5 Organisation chart of the ANVS	24

List of symbols and abbreviations

Abbreviation	Full term	Translation or explanation (in brackets)
ALARA	As Low As Reasonably Achievable	
ASME	American Society of Mechanical Engineers	
Bkse	Besluit kerninstallaties, splijtstoffen en ertsen	Nuclear installations, fissionable materials, and ores Decree
Bbs	Besluit basisveiligheidsnormen stralingsbescherming	Decree on Basic Safety Standards for Radiation Protection
Bvser	Besluit vervoer splijtstoffen, ertsen en radioactieve stoffen	Transport of fissionable materials, ores, and radioactive substances Decree
BWR	Boiling-Water Reactor	
BZK	(Ministerie van) Binnenlandse Zaken en Koninkrijksrelaties	(Ministry of) the Interior and Kingdom relations
CETsn	Crisis Expert Team –straling en nucleair	Crisis Expert Team – radiological and nuclear
Cmer	Commissie voor de m.e.r.	Commission for Environmental Impact Assessments
COVRA	Centrale Organisatie voor Radioactief Afval	Central Organisation For Radioactive Waste
CNS	Convention on Nuclear Safety	
CSNI	Committee on the Safety of Nuclear Installations	(OECD/NEA)
EIA	Environmental Impact Assessment	
ENSREG	European Nuclear Safety Regulators Group	
EOP	Emergency Operating Procedure	
EPZ	NV Elektriciteits- Productiemaatschappij Zuid- Nederland	(Operator of Borssele NPP)
ET-NL	Enrichment Technology Nederland B.V.	Subsidiary of ETC Ltd
EU	European Union	
EZK	(Ministerie van) Economische Zaken en Klimaat	(Ministry of) Economic Affairs and Climate Policy
FTE	full-time equivalent	
GRS	Gesellschaft für Anlagen- und Reaktorsicherheit	(Nuclear safety experts organisation, Germany)
HABOG	Hoog Actief Afval Gebouw	Interim storage facility of COVRA for High Level Waste and Spent Fuel
HFR	High Flux Reactor	Research Reactor (Petten, tank in pool type, 45 MWth, operated by NRG)
HOR	Hoger Onderwijs Reactor	Higher Education Reactor (Delft, open pool, 2 MWth, operated by RID)
I&C	Instrumentation and Control	
IAEA	International Atomic Energy Agency	
IenW	(Ministerie van) Infrastructuur en Waterstaat	(Ministry of) Infrastructure and Water Management
IPSART	International PSA Review Team	(IAEA)
IRRS	International Regulatory Review Service	(IAEA)
JC	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	
JRC	Joint Research Centre of the European Community	
Kew	Kernenergiewet	Nuclear Energy Act
KWU	Kraftwerk Union	(former Siemens nuclear power group)
LH	Licence Holder, licensee	
LTO	Long Term Operation	
MER	Milieu-effect rapport	Environmental Impact Assessment (EIA) report
MR NV	Ministeriële Regeling Nucleaire Veiligheid kerninstallaties	Ministerial Nuclear Safety Regulation for Nuclear Installations
mSv	milliSievert	(Milli = 10 ⁻³); see Sievert

Abbreviation	Full term	Translation or explanation (in brackets)
μSv	microSievert	(Micro = 10 ⁻⁶); see Sievert
MWe	Megawatt electrical	
MWth	Megawatt thermal	
NEA	Nuclear Energy Agency	(OECD)
NEA	Nuclear Energy Agency	(An OECD agency)
NPP	Nuclear Power Plant	
NRG	Nuclear Research and consultancy Group	Nuclear consultancy company, TSO and operator of the HFR
NUSS	Nuclear Safety Standards	(of the IAEA, old series)
NUSSC	Nuclear Safety Standards Committee	(IAEA)
NVR	Nucleaire Veiligheids-Richtlijn	Dutch transposition of IAEA Safety Standards
OECD	Organisation for Economic Cooperation and Development	
OSART	Operational Safety Review Team	(IAEA)
PSA	Probabilistic Safety Assessment	
PSR	Periodic Safety Review	
PWR	Pressurised-Water Reactor	
RASSC	Radiation Safety Standards Committee	(IAEA)
RB	Regulatory Body	In the nuclear safety Directive called 'Competent regulatory authority'
RID	Reactor Institute Delft	Operator of the HOR research reactor in Delft and part of the Delft Technical University
RIVM	Rijksinstituut voor Volksgezond- heid en Milieu	National Institute for Public Health and the Environment (the Netherlands)
RR	Research Reactor	
SALTO	Safety aspects of Long Term Operation	
SAMG	Severe Accident Management Guidelines	
SAR	Safety Analysis Report	
SF	Spent Fuel	
SR	Safety Report	A summary of the most relevant information of the SAR and a public document
Sv	Sievert	unit of ionizing radiation dose
SZW	Ministerie van Sociale Zaken en Werkgelegenheid	Ministry of Social Affairs and Employment
TRANSSC	Transport Safety Standards Committee	(IAEA)
TSO	Technical Support Organisation	
URENCO	URanium ENrichment COporation Ltd	
WANO	World Association of Nuclear Operators	
VWS	Ministerie van Volksgezondheid, Welzijn en Sport	Ministry of Health, Welfare, and Sport
WENRA	Western European Nuclear Regulators Association	

Introduction

This introduction sets out the purpose and structure of the present National Report, and it presents an overview of the Dutch civil nuclear programme.

Purpose and structure of the report

In the Member States of the European Union the regulation of nuclear safety is a national responsibility that has to be carried out within the community framework for the safety of nuclear installations laid down by the Council Directive 2009/71/EURATOM as amended by the Council Directive 2014/87/Euratom of 8 July 2014 (hereafter called the Directive). One of the requirements (art. 9.1) of the Directive is the publication of a National Report on the implementation of its obligations as formulated by the articles of the Directive.

In 2014 the Netherlands produced its first National Report. This is the second and final one, describing how the Netherlands meets the obligations of the Directive.

The present report closely follows the ENSREG guidelines HLG_M(2019-38)_429 regarding Member States Reports to the Council Directive. This Introduction ends with a description of the civil nuclear programme of the Netherlands. The numbering of the successive chapters reflects the numbering of the Directive, that according Article 9.1 of the Directive needs to be reported on.

It should be noted, that the most recent Netherlands' national report for the Convention on Nuclear Safety (CNS) provides a lot of background information that has not been included in the present report.

Civil nuclear programme

Table 1 lists all installations according to the definition of Article 3(1) of the Directive, present in the Netherlands. Spent fuel and radioactive waste in the Netherlands is stored at the national waste management facility operated by COVRA in the South-West of the country. Nuclear installations are obliged by law to store all their radioactive waste at COVRA, and therefore shall not have their own (long-term) waste storage facilities. To meet this requirement, currently a large multi-annual programme is being carried out to repackage and transfer all legacy waste, stored at the research location Petten, to COVRA. Spent fuel from the Borssele Nuclear Power Plant (NPP) is reprocessed abroad, resulting waste is stored at COVRA. Spent fuel from Research Reactors (RRs) and depleted uranium from Urenco in Almelo is also stored at COVRA.

Table 1 Nuclear installations in the Netherlands

Nuclear installation	Short description	Status
Enrichment plants ¹	Urenco enrichment plant, Almelo	In operation
Nuclear fuel fabrication plants	None	n.a.
NPPs	Borssele NPP, PWR, 485 MW _e Dodewaard NPP, BWR	In operation Permanent shut down, in safe enclosure
Reprocessing plants	None	n.a.
Research Reactor (RR) facility(ies)	High Flux Reactor (HFR), Petten, 45 MW _{th} Technical University Delft research reactor (HOR), 2 MW _{th}	In operation In operation
Spent fuel storage facility(ies) (only from RRs)	HABOG facility, operated by National waste management organisation COVRA	In operation

It should be noted that there are plans for establishing a new research reactor 'PALLAS'. Currently the PALLAS reactor project is in the pre-licensing phase.

Some more details about the installations are provided below.

¹ The company ET-NL in Almelo supplies all centrifuges for the enrichment plants of its parent companies Urenco and Areva – world-wide.

Enrichment plant of Urenco in Almelo

Urenco produces low-enriched uranium. Its plant in Almelo, the Netherlands, has a licensed capacity of 5200 tSW/a.

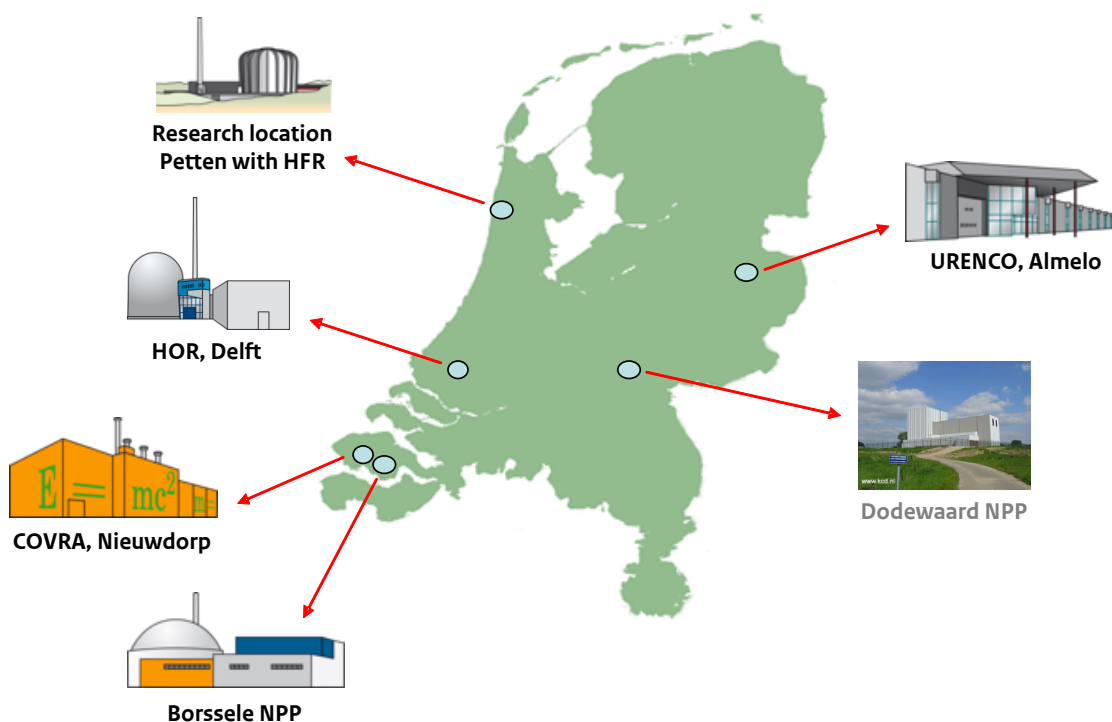
Nuclear Power Plant: Borssele NPP

The Borssele NPP is a two-loop Siemens PWR that has been in commercial operation since 1973. Its net electrical output is about 485 MW_e. It has a licence unlimited in time. In 2006 a Covenant was signed by operator and owners of the plant and the government, stating that the plant shall cease operation no later than 31 December 2033. Notwithstanding this Covenant the requirements of the Nuclear Energy Act and the licence shall be complied with at all times. The final date of electricity production, was also included in the Nuclear Energy Act.

In 2012 the Safety Report was updated and time limited ageing analyses were performed to cover 60 years of operation (instead of the 40 years documented previously). The updated Safety Report showed that safe operation of the Borssele power plant is technically feasible until at least 2033. The licence (which is not time- limited) was modified to include the new Safety Report. No modification of the plant design or major backfitting was necessary.

The operator and Licence Holder (LH) of Borssele NPP is the company EPZ. PZEM and Essent/RWE are shareholders of EPZ, and own 70% respectively 30% of the shares.

Figure 1 Locations of nuclear power plants, research reactors and other facilities of the nuclear programme of the Netherlands



Nuclear Power Plant: Dodewaard NPP, in safe enclosure

The Dodewaard NPP was a BWR-type 60 MW_e reactor that operated from 1968 until early 1997. In 2002 the LH obtained a licence for 40 years of safe enclosure. In April 2003, the last spent fuel was removed from the site. April 2005, the construction of the 'safe enclosure' was finished. June 1st, 2005, the 40-years waiting period started under the licence that requires the LH to commence dismantling activities in 2045 at the latest. In 2009, all vitrified waste from reprocessing of Dodewaard's spent fuel was shipped from Sellafield to the COVRA.

Research Reactors: High Flux Reactor (HFR)

The HFR is a tank-in-pool type reactor commissioned in 1961 and is located in Petten in the province of North Holland. In the 1980s its reactor vessel was replaced. The owner is the Joint Research Centre (JRC) of the European Commission but since January 2005, the LH and operating organisation is the Nuclear Research and consultancy Group (NRG). The HFR is used not only as a neutron source for applied and scientific research, but also for the production of isotopes for medical and industrial applications.

Research Reactors: HOR in Delft

The HOR is an open pool-type research reactor with a thermal power of 2 MW_{th}. It is located in Delft. The owner and LH is the Technical University of Delft. It services education and research purposes. Medical applications are getting more and more attention at the HOR and its associated facilities. Currently the HOR is being upgraded. The associated project is called OYSTER. The installation of a liquid hydrogen cold neutron source is an essential element in the project.

Spent fuel and radioactive waste storage facility of COVRA

COVRA is the national waste management organisation in the Netherlands. On its (single) site of 25 hectares, it operates several waste processing and storage facilities for radioactive waste and spent fuel. All high level waste is stored in the dedicated HABOG building, which is a modular vault with a passive cooling system. It stores spent fuel (SF) of research reactors, spent uranium targets from molybdenum production, vitrified waste and compacted end caps and hulls, from the reprocessing of power reactor Spent Fuel (SF).

More about waste management and COVRA can be found in the national report of the Kingdom of the Netherlands of the Joint Convention (JC) on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

Article 4

Legislative, regulatory and organisational framework

1. Member States shall establish and maintain a national legislative, regulatory and organisational framework ('national framework') for the nuclear safety of nuclear installations. The national framework shall provide in particular for:
 - (a) the allocation of responsibilities and coordination between relevant state bodies;
 - (b) national nuclear safety requirements, covering all stages of the lifecycle of nuclear installations;
 - (c) a system of licensing and prohibition of operation of nuclear installations without a licence;
 - (d) a system of regulatory control of nuclear safety performed by the competent regulatory authority;
 - (e) effective and proportionate enforcement actions, including, where appropriate, corrective action or suspension of operation and modification or revocation of a licence.

The determination on how national nuclear safety requirements referred to in point (b) are adopted and through which instrument they are applied remains within the competences of the Member States.

2. Member States shall ensure that the national framework is maintained and improved when appropriate, taking into account operating experience, insights gained from safety analyses for operating nuclear installations, development of technology and results of safety research, when available and relevant.

4.1 National legislative, regulatory and organisational framework

Overview of national framework

Relevant state bodies under the Nuclear Safety Directive

In the present report, the competent regulatory authority or 'regulatory body' (RB) is the entity 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.

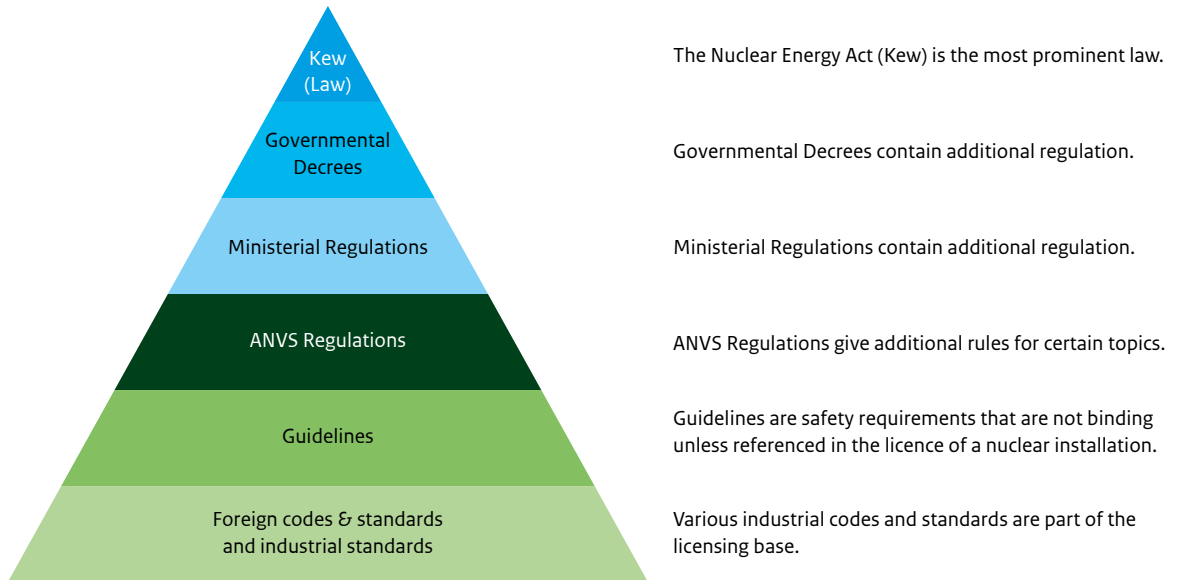
The ANVS is independent in its regulatory decision making on radiation protection, nuclear safety and security in the Netherlands. The Minister of Infrastructure and Water Management (IenW) is politically responsible for its functioning and has final responsibility for the effective operation of the ANVS.

Refer to the text on Article 4.1.(a) and Article 5.1 for more information on the RB and its organisation and position in the regulatory framework.

Legal framework - structure

The legal framework in the Netherlands with respect to nuclear installations can be presented as a hierarchical structure. Refer to the diagram in Figure 2.

Figure 2 Simplified representation of the hierarchy of the legal framework



In addition there are international conventions and other legal instruments related to nuclear safety that also apply. Refer to a section below on ‘Ratification of relevant international conventions and legal instruments related to the scope of the Directive’.

Description of the elements of the framework and its implementation

The elements of the legal framework are summarized in the sections ‘Nuclear Energy Act’ and ‘Associated legislation’ below.

Nuclear Energy Act

The basic legislation governing nuclear activities is contained in the Nuclear Energy Act (‘Kernenergiewet’ or 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. The Nuclear Energy Act has a comprehensive character: all uses of ionizing radiation and all of the requirements to protect against it are regulated exclusively by this Act and by legislation based on it. The more detailed legislation is provided by associated Governmental Decrees and Ministerial Regulations. These continue to be updated in the light of ongoing developments

With regard to the safe use of nuclear energy, the purpose of the Nuclear Energy Act, according to its Article 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 at least 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.

Associated legislation

An extensive body of legislation is based on the Nuclear Energy Act. This includes Governmental decrees, ministerial regulations, the regulations issued by the ANVS, and a number of general operating decisions. These include:

- *Nuclear Facilities, Fissionable Materials and Ores Decree (Bkse²)*: the licensing system for practices with fissionable materials and ores has been elaborated in the Nuclear Facilities, Fissionable Materials and Ores Decree.
- *Fissionable Materials, Ores and Radioactive Materials Transport Decree (Bvser³)*: The licensing system for the shipment of these materials has been elaborated in the Fissionable Materials, Ores and Radioactive Substances (Transport) Decree.
- *Decree on Basic Safety Standards for Radiation Protection (Bbs⁴)*: the Decree on Basic Safety Standards for Radiation Protection has been in force since 6 February 2018. The goal of this Decree is to protect the public, the environment, employees and patients against the adverse effects of ionizing radiation. This complies with the 2013/59/Euratom directive. The requirements set out in the Decree have been further elaborated, in the form of the associated regulations, published January 2018.
 - Regulation on Radiation Protection for Occupational Exposure: Responsibility for the protection of employees from occupational exposure to radiation rests with the Ministry of Social Affairs and Employment. Specific topics have been further elaborated.
 - Regulation on Radiation Protection for Medical Exposure: The Bbs chapter 8 deals with medical exposures. This decree elaborates on a number of specific subjects.
 - Regulations on Basic Safety Standards for Radiation Protection: The Regulation on Basic Safety Standards for Radiation Protection contains provisions for the elaboration of the Decree on Basic Safety Standards for Radiation Protection. These Regulations contain rules and appendices with technical and other requirements for implementation.
- *Ministerial Regulation on Nuclear Safety for Nuclear Installations (MR NV⁵)*: The regulations extend to implementation of the Euratom Directive for the nuclear safety of nuclear facilities (Directive 2009/71/Euratom, as amended by Directive 2014/87/Euratom). The regulations provide the necessary Community framework for maintaining the nuclear safety of nuclear facilities and for promoting continuous improvement. The transposition of the Directive was prepared in 2016 and resulted in the publication of the MR-NV on 14 June 2017.
- *Nuclear Facilities and Fissionable Materials (Security) Regulation⁶*: This regulation includes the Dutch implementation of the amended Convention on the Physical Protection of Nuclear Material (CPPNM/a).
- *Nuclear pressure equipment Regulation⁷*: This regulation specifies the requirements for designated inspection authorities for nuclear pressure equipment.

ANVS-regulations

The ANVS is authorized to issue 'ANVS – Regulations'. These are issued if:

- Rules are needed on technical or organisational issues.
- Rules are needed, relevant to nuclear safety, radiation protection and security.
- Governmental Decrees or Ministerial Decrees refer to guidance to be provided in ANVS Regulation.

At this moment there is no ANVS-regulation in the area of nuclear safety.

Guidelines

Examples of guidelines as applied in the Netherlands are:

Nuclear Safety Rules (NVRs)

The NVRs are IAEA Safety Requirements and Safety Guides that have been adapted to the Dutch situation. The Nuclear Safety Rules (Dutch: 'Nucleaire VeiligheidsRegels', NVRs) are legally binding for an installation or nuclear facility, as far as they are referenced in their licences through a licence condition. This mechanism allows the ANVS to enforce the NVRs. The practice of including requirements in the licence is suitable for a country like the Netherlands with a very small number of different nuclear facilities and only one operating NPP. Currently NVRs are only applied to the NPP. Recently the ANVS has studied ways to further implement IAEA Safety Requirements and Safety Guides in the regulatory framework. Recently, it was decided that in future, IAEA Safety Requirements will be implemented in the licences of

² Dutch: Besluit kerninstallaties, splijtstoffen en ertsen, Bkse

³ Dutch: Besluit vervoer splijtstoffen, ertsen en radioactieve stoffen, Bvser

⁴ Dutch: Besluit basisveiligheidsnormen stralingsbescherming, Bbs

⁵ Dutch: Ministeriële Regeling Nucleaire Veiligheid kerninstallaties, MR NV

⁶ Dutch: Ministeriële Regeling beveiliging nucleaire inrichtingen en splijtstoffen

⁷ Dutch: Regeling nucleaire drukapparatuur

all nuclear installations through licence conditions. 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 will be determined by the licensing procedures.

VOBK

VOBK⁸ are the Guidelines on the Safe Design and Operation of Nuclear Reactors - Safety Guidelines for short. These Guidelines provide new reactor licence applicants with detailed insight into what the ANVS considers to be the best available technology. It is applicable to existing nuclear power reactors as far as reasonably achievable (e.g. as a reference during a Periodic Safety Review, PSR) and in line with the objective of continuous improvement. An annex to the VOBK is dedicated to Research Reactors. The application of this annex to new and existing research reactors will also have a graded approach.

Adopted foreign nuclear and industrial codes and standards

The experience with the IAEA-Standards has been generally positive and they give guidance on many specific items. 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 and do not cover industrial codes and standards. Therefore in addition nuclear and industrial codes and standards of specific countries often are 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. Industrial codes and standards in common use in major nuclear countries are generally acceptable (e.g. ASME, IEEE and KTA). The RB has the power to formulate additional requirements if necessary.

Differences in implementation for different types of nuclear installations

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

The Netherlands has a small but quite diverse nuclear programme. Because of the diversity present, and in order to allow maximum flexibility, specific requirements are listed in the licence, tailored to the characteristics of the installations, rather than in general regulations. In the licences, the Nuclear Safety Rules (NVRs) can be referred to as well as other nuclear codes and standards.

Ratification of relevant international conventions and legal instruments related to the scope of the Directive

The Netherlands is Party to many Treaties and Conventions relating to the use of nuclear technology and radioactive materials. For this Directive the most relevant are:

- *Liability*: The Netherlands is Party to a series of UN Treaties on liability, including the Paris Convention⁹ and supplementing convention to the Convention of Paris, established in Brussels, and the joint protocol concerning the application of the Vienna Convention and the Paris Convention.
- *Nuclear safety*: The Netherlands is Party to the UN Convention on Nuclear Safety, the CNS.
- *Emergency preparedness*: The Netherlands is Party to the Convention on Early Notification of a Nuclear Accident.
- *Radioactive Waste management*: The Netherlands is Party to the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive waste management¹⁰.
- *Physical protection*: The Netherlands is Party to the Convention on Physical Protection of Nuclear Material and Nuclear Facilities¹¹.
- *Environmental impact*: The Netherlands is Party to the Espoo Convention on Environmental Impact Assessment(EIA) in a Transboundary Context.
- *Public Participation*: The Netherlands is Party to the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters.

⁸ Dutch: Veilig Ontwerp en het veilig Bedrijven van Kernreactoren, VOBK, published October 2015

⁹ 'Paris Convention on Third Party Liability in the Field of Nuclear Energy'

¹⁰ Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, (JC)

¹¹ 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.

- 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).

4.1(a) *Allocation of responsibilities and coordination between relevant state bodies*

The complete set of responsibilities related to the Directive is covered by the Ministry of IenW and the ANVS.

Since May 15th 2020, the Ministry of IenW is responsible for policy preparation on nuclear safety and radiation protection. This has been decided after the recent external evaluation of the ANVS (refer to the text on Article 5.1). The responsibility includes the framework of laws, decrees and Ministerial regulations on these issues. As stated under 4.1, ANVS may publish binding ANVS-regulations.

By law the ANVS has the following tasks:

- Granting licences; all nuclear facilities in the Netherlands, including the NPP of Borssele, 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. This includes supervision of the radiological safety of workers at the nuclear installations;
- Evaluating, preparing of and advising 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.

The above mentioned transfer of responsibility for policy preparation to IenW will not alter these legal tasks of the ANVS.

IenW and ANVS signed a protocol describing their different responsibilities and roles for policy preparation. Cooperation mechanisms have been put in place at the various levels in the organisations.

In the licensing phase, the ANVS coordinates with other authorities (see 4.1c). Additional information on the ANVS can be found in chapter 5 of the present report.

4.1(b) *National nuclear safety requirements, covering all stages of the lifecycle of nuclear installations*

The national nuclear safety requirements have been described above under 4.1. They cover all stages of the lifecycle of nuclear installations.

4.1(c) *System of licensing and prohibition of operation of nuclear installations without a licence*

Procedures

The Nuclear Energy Act stipulates (in its Article 15, sub b) that a licence must be obtained to construct, commission, operate, modify or decommission a nuclear power plant or another 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 also required in a number of cases (identified in the Decree Bbs) for the preparation, transport, possession, import or disposal of radioactive material.

The procedures to obtain a licence under the Nuclear Energy Act (and other acts), follow the procedures specified in the General Administrative Act (Awb). The licensing and the requirements that are to be met by licence applications for nuclear installations, are governed by the Decrees Bkse and Bbs. The licensing 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 RB can be challenged in the administrative court. Refer to Figure 3 for an overview of the process.

With a licence application regarding nuclear installations, there are many cases for which it is compulsory to conduct an Environmental Impact Assessment or EIA (Dutch: milieu-effectrapportage, m.e.r.). Examples are: construction of a nuclear installation, increase of its power (reactors), increase of storage capacity (SF and waste storage facilities), increase of processing capacity (enrichment), or decommissioning of the installation. This does not apply to nuclear research reactors with a thermal power lower than 1 kW.

The Netherlands has a permanent commission, the Commission for the Environmental Assessment ('Commissie voor de m.e.r.', Cmer) that advises the competent regulatory authority on the requirements of all EIAs conducted in the Netherlands, including those related to nuclear installations.

Figure 3 Overview licensing process under Nuclear Energy Act, variant with EIA

Overview of the licensing process under Nuclear Energy Act, observing procedures mentioned in the Abw, variant with Environmental Impact Assessment

- Informal discussions applicant and ANVS about application and EIA.
- The EIA procedure as well as the procedure for licence application start simultaneously with applicant submitting 'Mededeling m.e.r.', a document stating the intention to submit an application for which an EIA is required;
- The ANVS notifies the general public of the 'Mededeling m.e.r.' by publication in the Dutch Government Gazette, one or more national and local newspapers, and on the website of the ANVS. The notification also mentions that (1) all members of the public are free to lodge opinions on the 'Mededeling m.e.r.' and (2) advice will be requested from the Cmer. Members of the public submit their opinions and Cmer gives advice on required scope and content of EIA.
- Twelve weeks after receiving the 'Mededeling m.e.r.', ANVS gives advice to applicant on required scope and content of EIA report, taking notice of opinions and Cmer advice received.
- Applicant drafts its EIA and other documentation that will accompany the licence application. There is no regulatory limit to the time it takes to prepare the required documents. Applicant submits EIA report and other required documentation to the ANVS.
- ANVS determines if application satisfies procedural requirements and expected completeness. ANVS notifies the applicant whether the application is admissible, or needs more work.
- Once the application is considered to be complete, ANVS notifies the general public, just like described above. In addition, during six weeks, the ANVS offers the public the opportunity to read printed versions of the documents at ANVS offices and at the town hall of the municipality in which the nuclear installation is (to be) located. In this phase it is not possible to submit opinions to the ANVS.
- ANVS starts evaluating the application and its documentation, to arrive at a draft decision. It will also judge if it is possible to do this in six months. With more complicated applications, ANVS may extend this period, although opinion of the applicant about this extension will be taken notice of.
- After concluding the evaluation, ANVS will send its draft decision to applicant, other authorities involved, as well as to the Cmer to ask its advice on the decision. Furthermore the decision is made public, like described above, and during six weeks, anyone may submit opinions. Cmer gives advice on draft decision and on opinions submitted to the ANVS.
- ANVS formulates final decision, taking notice of advice of Cmer and opinions submitted and describing how this input has been used. ANVS sends the decision to applicant, Cmer and anyone who has sent an opinion on the final decision.
- The final decision is made public like described before. During six weeks, stakeholders that have objected to the draft decision are free to lodge an appeal with the Administrative Jurisdiction Division of the Council of State (the highest administrative court in the Netherlands) against the decision by which the licence is eventually granted, amended or withdrawn. The Council of State will issue a decision within one year.

The licences for nuclear installations are granted for an indefinite period. Modifications of licences are needed if the installation or the activity as described in the Safety Report (SR) is changed. For example modifications have taken place in the past related to the implementation of safety improvements after the PSR (several nuclear installations), and for NPP Borssele modification of the fuel enrichment, fuel composition (MOX) and operation beyond 40 years.

Article 18a of the Nuclear Energy Act empowers the ANVS to compel the LH 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.

In line with its policy on transparency, the ANVS has published a document on its website¹² that describes its licensing policy. It also has published a document on its supervision and enforcement policy. There are more guidance documents, that aid LHs and applicants in submitting licence applications. This all helps to improve the interaction between the ANVS and the LHs, and make it more efficient.

Some of ANVS' guiding principles regarding licensing, as well as supervision and enforcement, documented in above-mentioned documents, 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 are an essential element of safety.
- Responsibility of the LH and justifiable trust. The LH is responsible for (nuclear) safety. The ANVS supervises the LHs and assesses if the trust vested in the LHs is justifiable.
- Emphasis on continuous improvement. The safety must remain 'state-of-the-art' as far as reasonably achievable. A changing environment, technological advances, lessons learnt from incidents and accidents and so on all may give rise to implementation improvements, also taking account that the LHs need 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 guidelines, or the applicant needs to demonstrate how the objectives of the requirements will be met in an equivalent way.

Principal responsible authority

The authority most relevant with respect to the regulatory process under the Nuclear Energy Act is the ANVS. 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.

The civil engineering part of the construction of a nuclear installation and local spatial planning aspects will be licenced under the Environmental Permitting Act or the Spatial Planning Act by local authorities on the level of towns or rural municipalities. Fire safety is relevant to nuclear safety and therefore relevant for assessment by ANVS, but it is also one of the topics relevant when assessing an application for a building permit and thus in principle it is also within the scope of the local authorities. For the use of water from aquifers and the discharge of water into surface waters, a permit under the Water Act is needed. Provincial and other local authorities may then be involved.

Coordination regulation

For projects related to large scale energy infrastructure, special government coordination regulation applies, that is subordinate to the Spatial Planning Act. Large scale projects that may be subject to government coordination regulation

¹² This is the document 'Vergunningenbeleid ANVS' (Dutch), refer to https://www.autoriteitnvs.nl/binaries/anvs/documenten/publicatie/2017/08/01/vergunningenbeleid-anvs/WEB_118940_Vergunningenbeleid.pdf.

are for instance the construction of power plants with an electrical power greater than 500 MW_e, investment in the power grid, et cetera. The coordination regulation supposes involvement of the Ministry of Economic Affairs and Climate Policy (EZK). With such large projects, the Ministry of EZK is assumed to be the coordinator, organising the interaction between the many authorities, each of which will perform its own legal duties.

4.1(d) *System of regulatory control of nuclear safety performed by the competent regulatory authority*

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.

The Bkse states that it is not allowed to use in a nuclear installation nuclear pressure equipment that is not approved by a designated body. To become a designated body a company has to comply as a basis to the same requirements as a designated body under the conventional European Pressure Equipment Directive would have to comply with, as well as a few additional nuclear-specific requirements as described in the Ministerial Regulation on Nuclear Pressure Equipment. The ANVS is tasked with designating companies under this regulation. Licence Holders are free in deciding which designated body to use for the necessary approval in design, fabrication and inspection of their nuclear pressure equipment. ANVS determines the requirements and conditions for the work done by a designated body.

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 Report (SR) 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), et cetera.

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 do not require a licence modification.

During the licensing phase the ANVS assesses among others, whether the applicable NVRs (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 transients¹³ and accidents in the various plant categories. The ANVS lays down the guidelines for the required calculations regarding radiological consequences (data for food consumption, dispersion, et cetera).

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 may choose to use support from a foreign or national TSO in these activities.

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 enforcement. This includes an assessment of the draft licence to establish if compliance with the proposed licence conditions can be enforced and duly verified, and if the set of conditions is susceptible to fraud.

Review and assessment during operation

The licences of nuclear installations contain conditions requiring the LH to perform PSRs, and stating their periodicity. Identified safety improvements are to be implemented as far as reasonable. Refer to section 6.1(c) for more information on PSRs and continuous improvement.

¹³ Anticipated Operational Occurrences

Regulatory inspections

The function of regulatory inspections mainly is:

- to check that the LH 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 investigate/assess any (reported) violation of these regulations and conditions and if necessary to initiate enforcement action;
- to check that the LH is conducting its activities in accordance with its Safety Management system;
- to check that the LH is conducting its activities in accordance with the best technical means and/or accepted industry standards;
- To check that the LH is committed to continuously improve nuclear safety.

All inspections with regard to nuclear safety, radiological protection of personnel and of the environment around nuclear sites, security and safeguards, including transportation of fresh and spent nuclear fuel and related radioactive waste to and from nuclear installations are carried out by the ANVS.

The LH must act in compliance with the Nuclear Energy Act, the licence and the associated Safety Analysis Report (SAR). The compliance is verified with a system of inspections, audits, assessment of operational monthly and/or quarterly (depending on the licensee), reports, and evaluation of operational occurrences and incidents.

Inspection activities are supplemented by international missions. For instance about every 10 years the NPP will host an OSART-mission (the next one around 2024), while the two RRs will host INSARR missions (in 2020 and 2022). Recently also the specific mission on safety culture ISCA was applied to the NPP and HFR. A CSO (SALTO for RR) mission will take place at the HFR in 2020. An important piece of information for inspection are the two-yearly (or five-yearly, depending on the licensee) safety evaluation reports, in which the LH presents its own self-assessment of performance with respect to the licence base on technical, organisational, personnel and administrative provisions. These self-evaluations, which are mandatory, and the missions contribute to the continuous improvement of safety at the nuclear installations.

The management of inspections is supported by a yearly planning, the reporting of the inspections and the follow-up actions. A number of times per year, all ANVS inspectors and experts together review the situation of the licensees in each area of supervision¹⁴, which yields future inspection priorities. A number of times per year there are meetings of the management of the LH and the ANVS. The discussions are mainly about general issues relating to supervision activities. More often technical or project meetings between LH staff and ANVS staff are held, discussing issues or progress in relation with inspection findings or assessment activities. There are also regular inspections of the LH's incident analysis group activities.

Inspections are generally characterised by an emphasis on technical judgement and expertise. They are compliance-based, meaning that the ANVS investigates whether the LH is acting in accordance with the terms of the licence. Other compliance-based inspections focus on organisational aspects. However part of the inspections on the organization are more goal-oriented and are focussed on the behavioural aspects of the organization and the individuals within. There is a need to scrutinise the way the LH has fulfilled its responsibility for safety and to ascertain whether the LH's attitude shows a sufficient awareness of safety aspects (i.e. safety culture). Supervision on these aspects of human and organizational factors often needs a different approach than supervision on technical issues. For example ANVS has practiced annual meetings at the management level about these subjects with a number of LHs, where it was felt to be beneficial and proportional.

ANVS teams carry out smaller team inspections or team audits from time to time.

¹⁴ The teams doing these reviews are referred to as 'helicopter teams'.

Major supervision programmes on nuclear safety issues in the years since the last report were:

- NPP: implementation of measures originating from the stress test, PSR and Ageing Management (AM), replacement of reactor control and limitation system;
- HFR: safety culture, organisation, AM, stress test measures;
- NRG: management of legacy waste;
- HOR: AM, PSR-measures, Oyster project (i.e. modification of reactor);
- COVRA: new storage building for depleted U and extension of existing storage building for HAW.

4.1(e) *Effective and proportionate enforcement actions, including, where appropriate, corrective action or suspension of operation and modification or revocation of a licence*

Enforcement

In line with its policy on transparency, the ANVS published a public document on its supervision and enforcement policy¹⁵ in 2017. It shows that enforcement actions are proportionate.

Figure 4 Intervention matrix used in decision making about interventions. With: LOB administrative coercion order, LOD financial penalty order, BSBm environmental penalty order, and PV police report.

4 - Considerable	Criminal law BSBm / PV Administrative law LOB, LOD, Enhanced regulation	Criminal law BSBm / PV Administrative law LOB, LOD, Enhanced regulation	Criminal law BSBm / PV Administrative law LOB, LOD	Criminal law PV Administrative law LOB, LOD
3 - Of importance	Criminal law BSBm / PV Administrative law Administrative meeting, Warning	Criminal law BSBm / PV Administrative law LOB, LOD, Enhanced regulation	Criminal law BSBm / PV Administrative law LOB, LOD, Verscherpt toezicht	Criminal law PV Administrative law LOB, LOD
2 - Limited	Administrative law Aanspreken / informereren	Criminal law BSBm / PV Administrative law Administrative meeting, Warning	Criminal law BSBm / PV Administrative law LOB, LOD, Enhanced regulation	Criminal law PV Administrative law LOB, LOD
1 - Almost nothing	Administrative law Challenging / informing	Administrative law Challenging / informing	Criminal law BSBm / PV Administrative law Administrative meeting, Warning	Criminal law PV Administrative law Administrative meeting, Warning
Category of violation	A - Good intentions and proactive	B - Neutral	C - Opportunistic and calculating	D - Consciously and structural
Type of offender				

As an aid in decision making, ANVS uses an ‘intervention matrix’. When considering observed deviations from regulatory requirements and licence conditions, the matrix can be used in deciding what follow-up will be needed. In the decision making both the potential for more or less serious impact on safety is considered, but also the track-record of the LH in meeting his regulatory obligations and his attitude to meeting such obligations.

In the matrix, classes of LHs range from (A) ‘willing and proactive’, via (B) ‘neutral’ and (C) ‘opportunistic and calculating’ to (D) ‘consciously & structural (wrong- doing)’. The potential consequences of deviations from regulatory requirements

¹⁵ The policy document can be found on the website of the ANVS, at: https://www.autoriteitnvs.nl/binaries/anvs/documenten/publicatie/2017/08/01/toezicht--en-interventiestrategie-anvs/104335_Toezicht_en_Interventiestrategie.pdf

range from (1) 'almost nothing', via (2) 'limited' and (3) 'of importance' to (4) 'considerable'. The matrix shows what kind of enforcement actions can be applied by ANVS, once the classification of observed deviation(s) and the LH are complete.

In the inspection report sent to the LH, ANVS will make clear what deviations are found and depending on the severity what kind of intervention ANVS will make and which actions (including their timing) are required from the LH. These are formulated SMART¹⁶.

Measures can be taken enforcing the conditions of the licence conditions. Article 83c of the Nuclear Energy Act grants the power to the authority to impose an administrative enforcement order subject to a penalty. Currently the ANVS cannot impose penalties directly, but this issue is under review.

Article 83a of the Nuclear Energy Act with reference to the Wabo empowers the authority to revoke a licence (Wabo 15:32).

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.

Should there be any 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 such measures as deemed necessary, including (temporary) shutting down the nuclear installation. Enforcement procedures have been published describing the action to be taken if this article of the Act needs to be applied. Staff of the ANVS can prepare an official report for the public prosecutor, should the need occur.

The overall effectiveness of the enforcement actions under the new policy will be evaluated once there is a sufficient number of cases. In general the number of cases is low.

Examples of individual enforcement actions in the past years are:

- An example of enforcement of compliance is the HFR-case in 2012, where a leakage of the primary circuit to the pool made clear that there was room for improvement of the ageing inspection programme. The ANVS requested the LH to restore the safety boundary in a proper way before it would be allowed to restart the reactor and investigate if there are other places where the inspection effort might need to be enhanced. After the requests of the ANVS had been met, the reactor was allowed to restart.
- In 2014 an official intervention letter was sent to a LH in order to enforce implementation, within a prescribed period of time, of a (delayed) safety improvement based on the outcome of the Periodic Safety Review. For each month past the deadline for completion, the LH must pay.

4.2 Maintenance and improvement of the national framework

Refer to section 4.1 for a description of the national regulatory framework.

ANVS has a general procedure that deals with development, maintenance and improvement of regulatory requirements. As far as nuclear safety for existing installations is concerned, the main sources are the Euratom Directive on nuclear safety (transposed into MR-NV), the WENRA reference levels and the IAEA safety standards.

ANVS also has a procedure for Operating Experience Feedback (OEF) and Regulatory Experience Feedback (REF), which are aimed at improving all types of ANVS regulatory control (primary functions like licensing, inspection) and its internal supporting processes. In principle it is not necessary to modify the regulatory requirements to request the licensees to take urgent or important safety improvement actions if needed. The ANVS is entitled by the Nuclear Energy Act to request a safety evaluation at any time (Fukushima was an example), add a licence condition or require action based on the existing licence conditions.

¹⁶ SMART: Specific: make clear what needs to be done. Measurable: it should be possible to demonstrate the action has been completed, when it has been completed. Acceptable: it should be reasonable to require the action(s). Realistic: it should be achievable. Time bound: there is a deadline for completion of the action(s).

PSRs also are a source of improvements, where the latest insights from international regulation, developments in safety analysis and design, R&D, operation experience are evaluated.

ANVS participates in several R&D activities in the OECD/NEA that may also contribute to improvements of the national framework.

Legislation and recent changes

Since the publication of the Netherlands' 1st national report for the Directive, some changes were included in the Nuclear Energy Act. The Authority for Nuclear Safety and Radiation Protection, ANVS, attained its formal status of an independent administrative body (*zbo*) on August 1st 2017 with the necessary amendment of the Nuclear Energy Act and subordinate regulation. For more information, refer to the section on Article 5 of the Directive.

The transposition of several European Directives has been addressed above. In section 4.1(a) the publication of the VOBK, the Guidelines on the Safe Design and Operation of Nuclear Reactors, and the development of NVRs have been mentioned.

Article 5

Competent regulatory authority

1. Member States shall establish and maintain a competent regulatory authority in the field of nuclear safety of nuclear installations.
2. Member States shall ensure the effective independence from undue influence of the competent regulatory authority in its regulatory decision-making. For this purpose, Member States shall ensure that the national framework requires that the competent regulatory authority:
 - (a) is functionally separate from any other body or organisation concerned with the promotion or utilisation of nuclear energy, and does not seek or take instructions from any such body or organisation when carrying out its regulatory tasks;
 - (b) takes regulatory decisions founded on robust and transparent nuclear safety-related requirements;
 - (c) is given dedicated and appropriate budget allocations to allow for the delivery of its regulatory tasks as defined in the national framework and is responsible for the implementation of the allocated budget;
 - (d) employs an appropriate number of staff with qualifications, experience and expertise necessary to fulfil its obligations. It may use external scientific and technical resources and expertise in support of its regulatory functions;
 - (e) establishes procedures for the prevention and resolution of any conflicts of interest;
 - (f) provides nuclear safety-related information without clearance from any other body or organisation, provided that this does not jeopardise other overriding interests, such as security, recognised in relevant legislation or international instruments.
3. Member States shall ensure that the competent regulatory authority is given the legal powers necessary to fulfil its obligations in connection with the national framework described in Article 4(1). For this purpose, Member States shall ensure that the national framework entrusts the competent regulatory authorities with the following main regulatory tasks, to:
 - (a) propose, define or participate in the definition of national nuclear safety requirements;
 - (b) require that the licence holder complies and demonstrates compliance with national nuclear safety requirements and the terms of the relevant licence;
 - (c) verify such compliance through regulatory assessments and inspections;
 - (d) propose or carry out effective and proportionate enforcement actions.

5.1 Establishment and maintenance of a competent regulatory authority

History and legal establishment of the ANVS

Since the publication of the Netherlands' first national report for the Nuclear Safety Directive in 2014¹⁷, several notable changes took place. In 2015 entities that formerly constituted the RB for nuclear safety and radiation protection, merged into one entity, the Authority for Nuclear Safety and Radiation Protection, Dutch acronym ANVS. May 1st 2015 saw the transfer of political responsibility from the then Minister of Economic Affairs¹⁸ to the Minister of Infrastructure and Water Management (Dutch acronym: IenW).

From May 1st 2015 until August 1st 2017, the ANVS operated under mandate of the Minister of Infrastructure and Water Management (Dutch acronym: IenW¹⁹).

¹⁷ 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.

¹⁸ Nowadays the Ministry of Economic Affairs and Climate Policy

¹⁹ 'Infrastructuur en Waterstaat', IenW

ANVS attained its formal status of an independent administrative body (Dutch acronym zbo) on August 1st 2017 with the necessary amendment of the Nuclear Energy Act and subordinate regulation.

The tasks and mandates of the ANVS are described in the Nuclear Energy Act, in its chapter II. Also refer to the text on Article 4.1(a).

The Authority is the competent authority in matters of nuclear safety, nuclear security, radiation protection of the public and the environment, transport safety, and waste management and emergency preparedness and response. It is the entity designated by the government as having legal authority for conducting the regulatory processes, including issuing authorizations, supervision and enforcement. This type of independent administration explicitly meets the international requirements (EU-safety directive, CNS and IAEA standards). It is legally laid down in law that ANVS staff shall carry out its duties independently.

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.

Maintenance of the competent authority: recent evaluations

The former competent regulatory entities in the Netherlands and the current ANVS have been reviewed and evaluated several times since the 1st National Report for the Directive. In November 2014 the Netherlands hosted its first IRRS-mission. In November 2018 the follow-up mission took place.

In 2016 the sufficiency of staffing was evaluated (refer to the text on Article 5.2.d.1).

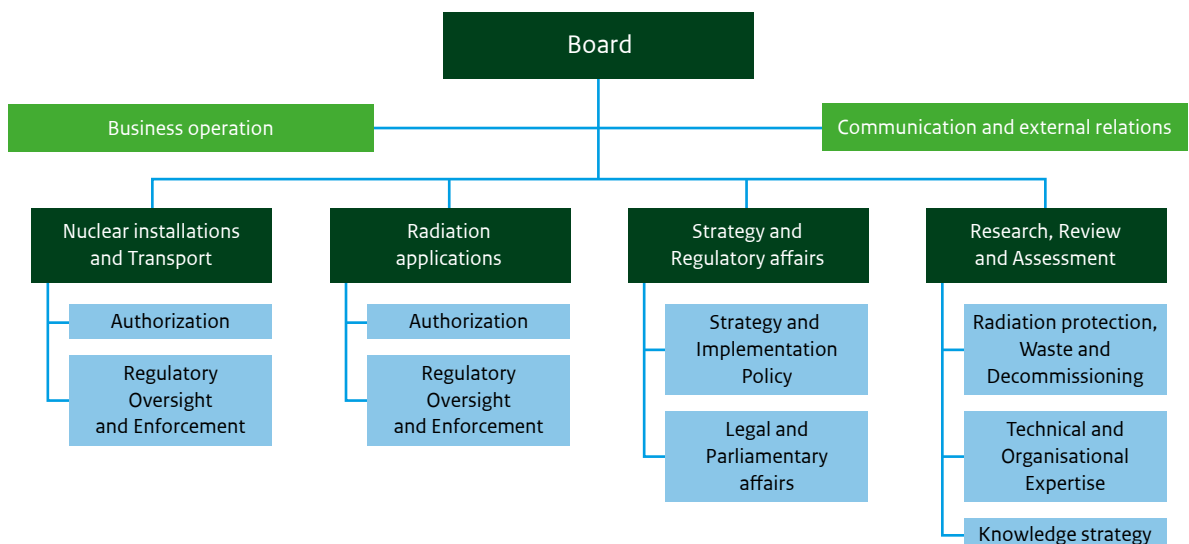
In 2018 and 2019 two evaluations of the ANVS, one internal and one external, were conducted. Periodic external evaluations of independent administrative bodies like the ANVS is a legal obligation. This evaluation was conducted under the auspices of the Ministry of IenW.

The two evaluations eventually resulted in two major decisions:

- Reorganization of ANVS. This reorganization was completed by January 1st, 2020.
- Transferring the responsibility for the task ‘Policy preparation’ to the Ministry of IenW. The change came into effect on May 15th 2020.

Below, the organisation chart of the ANVS is presented.

Figure 5 Organisation chart of the ANVS



The recent internal reorganisation, mentioned above, has resulted in this structure. It aims to achieve the following goals:

- Improving the connection to the surroundings of ANVS;
- Improve cooperation by organisational entities within the ANVS by strengthening interdependencies between these entities and building on trust;
- Strengthen visibility 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;
- Strengthen the visibility of separation of certain functions (licensing versus supervision, policy preparation versus policy execution);
- Pursue unity within ANVS: broad thinking and working with flexible deployment of staff within the ANVS-organisation;

The Minister of IenW 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 policy preparation, IenW 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 entity 'Nuclear Safety and Radiation Protection' resides within the existing Environmental Safety and Risks Directorate²⁰. A number of ANVS staff has moved to this entity. This further supports the aim of the ANVS and the new entity at IenW to strengthen the professional relation and cooperation. This will be evaluated after one year.

5.2 Independence of the competent regulatory authority

5.2(a) *Functional separation from bodies or organisations concerned with promotion or utilization of nuclear energy*

5.2.a.1 **Position of the competent regulatory authority within the Governmental structure**

Refer to the text on Article 4.1 and 5.1 for more regulatory and organisational background information.

The ANVS has a Board of two members being the Chairperson and Deputy Chairperson, who are appointed by the Minister of IenW. In fact they form the zbo ANVS and are not civil servants. The staff working for ANVS are civil servants.

The ANVS is a zbo and as such an administrative independent body, but the Minister 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 Board regulations of the ANVS;
- Annul decisions of the ANVS only if they are in violation with the law;
- Taking the necessary measures if the ANVS is seriously neglecting its tasks.

5.2.a.2 **Separation of protection and promotion**

The ANVS is not in any way involved in energy policies and has no legal tasks regarding these policies. Its involvement with nuclear power is restricted to nuclear safety and radiation protection and associated issues. The development of energy policy is the responsibility of the Minister of Economic Affairs and Climate Policy.

²⁰ The Environmental Safety and Risks Directorate is part of the larger entity, the Directorate- General for Environment and International Affairs of the Ministry of IenW.

5.2.a.3 Openness and transparency of regulatory activities

The reporting arrangements of the competent regulatory authority demonstrate its independence. Refer to the text on Article 8 in the present report.

5.2(b) *Regulatory decisions founded on robust and transparent nuclear safety-related requirements*

The requirements that are the basis of the decision making can be found in the regulatory framework, which has been described in the text on Article 4 of the Directive.

All legislation can be found on governmental websites. All licences under the Nuclear Energy Act can be found on the website of the ANVS, including the licence of the NPP in which the list of NVRs is named. Guidance such as the VOBK has been published too.

5.2(c) *Dedicated and appropriate budget allocation for delivery of regulatory tasks*

Budget allocation process

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 IenW will allocate sufficient financial resources for the ANVS to carry out its duties.

The ANVS makes a draft budget for its financial needs for the following year. It sends this draft budget to the Minister of IenW by 1 April each year (article 25 IAAFA²¹). The ANVS thereby participates in the ministerial budgetary process which is derived from the State budgetary process. The budgetary process is described in “Begrotingscyclus en concernstuuringscyclus bij IenM”. Note: IenM is the Dutch abbreviation of Infrastructure and Environment, the former name of the current Ministry of IenW.

The Minister (now the State Secretary) of IenW decides upon the draft budget of the ANVS. He is hereby legally obliged to make sufficient funding available to the Authority for the exercise of its duties (article 9(1) Nuclear Energy Act). The Minister includes the ANVS as a separate budget item in his budget and provide notes on this item in the Explanatory Memorandum (article 9(2) of the Act).

The budget of the Ministry of IenW has the form of a Bill. The approval of it follows the regular procedure for the approval of a Bill: approval by the Council of Ministers, advice of the State Council, approval by both Chambers of the Parliament, signing by the King and the Minister, and publication in the Official Journal.

Current budget

Already in 2015, even before having the formal independent status of a zbo, ANVS had a dedicated budget that it could spend on its own behalf. The starting point of its budget then (€ 27 million) was the sum of the budgets of the merged entities. Due to budgetary claims, the total annual budget in 2018 rose till € 29 million and in 2019 till € 31.9 million. The budget of the ANVS for contracted support in 2019 was about €10.3 M, mostly spent on contracted support provided by organisations like RIVM and GRS and in smaller contracts with organisations like NRG²² and RTD.

Concluding, it can be stated that nowadays the ANVS has a total allocated yearly budget of currently around € 30 million in the State Budget.

The resources at the ANVS currently are adequate, in terms of financing.

²¹ Independent Administrative Authority Framework Act, IAAFA; Dutch: ‘Kaderwet zelfstandige bestuursorganen’

²² RIVM is the Dutch ‘National Institute for Public Health and the Environment’, GRS is the German ‘Gesellschaft für Anlagen und Reaktorsicherheit’ and NRG is the Dutch ‘Nuclear Research and consultancy Group’.

5.2(d) *Appropriate number of staff with qualifications, experience and expertise necessary to fulfil its obligations*

5.2.d.1 **Situation at the competent regulatory authority**

Current manpower situation of the ANVS

The ANVS operates a regular planning and control cycle. In this cycle, the tasks to be undertaken are planned, taking account of the staffing levels available, while priorities are set when and wherever necessary.

During the IRRS mission of November 2014, IAEA recommended to assess the sufficiency of the staffing levels of the regulatory body. During the parliamentary debate on the legal establishment of the ANVS in 2016, the Minister of (then) Infrastructure and the Environment agreed to have the manpower situation studied and report the results to Parliament. In 2016 the tasks and costs of the ANVS were evaluated, including its required staffing level. The conclusion was that the formation of ANVS was allowed to be increased from 122 (the number at the start in 2015) to 141 FTE. This includes the two Board Members and the 139 FTE civil servants provided by the Ministry of IenW. In May 2020, due to the earlier mentioned transfer of some tasks to the new entity of the Ministry of IenW, this number has been reduced by 5 FTE. The staffing of the ANVS is considered to be sufficient for the current tasks.

Qualification, experience and expertise

ANVS has developed and is further developing a multi-annual HR-plan that also is the basis for recruitment and the management of qualified staff. The regular updates of the plan serve as input for the draft budgets the ANVS makes and submits to the Minister (see above).

The expertise of the ANVS spans disciplines in areas like radiation protection and nuclear safety – with all kinds of expertise like mechanical engineering, electrical engineering, PSA, deterministic safety analysis, fire safety, human and organisational factors, waste safety, transport safety, conventional safety, risk assessment, security and safeguards, emergency preparedness and response, legal and licensing aspects and relevant financial topics. Other disciplines that needed further development were knowledge management and public communication.

Therefore ANVS has contracted staff with the necessary expertise in these areas. When needed, knowledgeable advisors are contracted for support.

The ANVS provides tailor-made training for its staff and has a formalized training policy, with individual ANVS training requirements being formulated for each function group in accordance with the IAEA knowledge quadrants. The ANVS has a goal to have a fully developed training policy and training system in place by the end of 2020. In addition to developing management information and systematic evaluation procedures, this system will also allow inspectors to be certified systematically and periodically. The system is expected to become operational in 2021.

Part of the training policy is that 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 there is information exchange through the international networks of OECD/NEA, IAEA, EU et cetera. 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, such as e.g. IRRS, ARTEMIS, IPPAS, EPREV, or INSARR.

All ANVS staff maintain training plans that are discussed at least bi-annually with their team leader. In addition to formal education courses, the ANVS utilizes informal, voluntary learning opportunities, including presentations, workshops and online training courses.

Staff requiring specific expertise, such as inspectors, receive the specific training required and participate in a mentoring program 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.

ANVS is also entrusted with tasks regarding Research and Development (R&D). Therefore ANVS currently is developing a strategy on R&D in the area of nuclear safety. Earlier, in 2017 and 2018, ANVS started to participate in a number of research activities under the auspices of OECD-NEA: FIRE²³, CODAP, ICDE, and HEAF. In addition in 2019, ANVS decided to support the IAEA IGALL²⁴ with a financial contribution. All these activities are in line with major areas of importance identified for R&D like fire safety, ageing and severe accidents.

Experience Feedback (OEF and REF)

The activities to learn from Regulatory and Operating Experience and Knowledge Management are being restructured and reinforced by ANVS and the newly established structure of the organisation should aid this effort. ANVS participates in the common international projects on databases as ISR, IRSRR²⁵, FINAS²⁶ and others.

The ANVS has studied the lessons learnt from the 7th Review Meeting of the CNS. All identified 'Good Practices' and 'Areas of Good Performance' were collected and sorted, and subsequently will be evaluated for their potential use in the Netherlands. This is an example of REF. The participation in inspection teams of neighbouring countries, the participation in international IAEA missions in various countries and the participation in the ENSREG-led 'Topical Peer Review of Ageing Management' in 2017-2018 (TPR AM) also is an example of OEF- and REF-related activities of the ANVS.

In recent years, cooperation agreements with several foreign RBs were signed. Examples are agreements with the Belgian counterpart FANC (2017), the Australian counterpart ARPANSA (2018) and the US NRC. The latter concerns an extension of a MoU signed in 2013.

5.2.d.2 Contracted support

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. Major examples where ANVS uses TSO-support are the PSR of the NPP, and the new research reactor project PALLAS (pre-licensing).

5.2(e) Procedures for prevention and resolution of any conflicts of interest

Avoiding conflicts of interest in the case of rotation of staff between the nuclear industry and the regulators

Article 8 of the Nuclear Energy Act states that the ANVS will establish procedures to prevent conflicts of interest with the execution of its tasks, and to resolve such conflicts if and when they occur. The ANVS procedural regulation of conflicts of interest was established 15 October 2018.

The ANVS procedural regulation concerns specific supplementary rules for staff who transfer from an employer within the industry that the ANVS supervises, to the ANVS, and specific provisions about non-civil service staff of the ANVS and external service bodies and agencies, such as technical support organisations.

Specific regulations regarding the Board

Several specific regulations are in place regarding the Board. The Board Members are not civil servants. This enhances their independence from any Minister that has a policy responsibility regarding the users of nuclear energy or radiation application (for example for medical, educational or research purposes). Specific requirements can be found in the Independent Administrative Authority Framework Act, the Nuclear Energy Act, the Decision on appointment of Board Members and the Board regulations for the Authority.

The Board Members are not allowed to have any financial or other interests that could jeopardise their impartiality. Board Members hold no additional offices that are undesirable for a good fulfilment of the function. The intention to accept

²³ FIRE: Fire Incidents Records Exchange, CODAP: Component Operational Experience, Degradation and Ageing Programme, ICDE: International Common-cause Failure Data Exchange, HEAF: High Energy Arcing Fault Events

²⁴ IAEA Extrabudgetary Programme on International Generic Ageing Lessons Learned (IGALL) for Nuclear Power Plants

²⁵ IRS: Incident Reporting Systems for Nuclear Installations, IRSRR: Incident Reporting System for Research Reactors.

²⁶ FINAS: Fuel cycle Incident Notification and Analysis System

an additional office must be reported to the Minister. Additional offices of Board Members are made public. Suspension and dismissal of Board Members are only possible in the case of unsuitability or incompetence to fulfil the function, or another severe reason in relation to the person in question.

Avoiding conflicts of interest in the case of organisations that provide the competent regulatory authority with advice or services

ANVS primarily has long-term commitments with two large TSOs, being the National Institute for Public Health and the Environment (RIVM) and the Gesellschaft für Anlagen- und Reaktorsicherheit GmbH (GRS). In addition, the ANVS hires other consultancy organizations in smaller contracts. The RIVM is a governmental agency that solely works for governmental organisations. They are not allowed to obtain assignments from non-public organisations. The staff of the RIVM are civil servants and therefore subject to the regulations about integrity and conflicts of interest. In the agreements with the other TSOs according to ANVS procedural regulation, provisions are made to prevent or resolve conflicts of interest. These provisions are also made for other external service bodies or agencies such as NRG, RTD and SCK. The compliance with these provisions was audited on behalf of the ANVS from February to April 2020.

Furthermore, notwithstanding the expertise of the TSOs, the ANVS must remain a knowledgeable client, able to judge the advices presented to it.

If staff of a TSO (or other external non-civil service staff) is hired by the ANVS, the ANVS procedural regulation on conflicts of interest states in its article 2 that in the agreements with this staff provisions are included that lead to the applicability of provisions about integrity in the General Civil Service Regulations and the Code of Conduct for Integrity in the Central Public Administration 2016. These persons will also have to sign the Model Integrity Statement as part of the aforementioned Code of Conduct.

5.2(f) *Provision of nuclear safety-related information without clearance from any other body of organisation*

Refer to the section on Article 8 of the Directive in the present report, in which openness and transparency of regulatory activities is addressed. The ANVS is 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.

5.3 *Legal powers of the competent regulatory authority to fulfil its obligations*

5.3(a) *Definition of national nuclear safety requirements*

The regulatory framework has been described in section 4.1 of the present report. The allocation of responsibilities (including definition of nuclear safety requirements) has been described in section 4.1(a).

As set out in section 4.1(a) ANVS can define ANVS Regulations and NVRs, and set licensing conditions.

Involvement of the ANVS in establishing arrangements such as laws and decrees

Based on its expertise, the competent regulatory authority, supports the preparation of these, as far as this legal framework concerns nuclear safety, radiation protection or related subjects, under the lead of the Ministry of IenW. Within ANVS both staff with legal and technical expertise work together in such activities.

5.3(b) *Power to require licence holders to comply and demonstrate compliance with national nuclear safety requirements and terms of the relevant licence*

The Nuclear Energy Act in its article 15d requires the LH to satisfy the requirements stated in the licence, that serve to protect the interests stated in article 15b of the same Act. The Nuclear Safety Regulation for Nuclear Installations (MR NV) requires in its article 5, LHs to provide the necessary information about the nuclear safety of the nuclear installation to the authorities, but also to stakeholders and the general population.

5.3(c) *Verify compliance by licence holders through regulatory assessments and inspections*

Refer to section 4.1(d) for verification of compliance through regulatory assessment and inspections.

5.3(d) *Propose or carry out effective and proportionate enforcement actions*

Refer to section 4.1(e) for enforcement actions and their legal basis.

Article 6

Licence holders

Member States shall ensure that the national framework requires that:

- (a) the prime responsibility for the nuclear safety of a nuclear installation rests with the licence holder. That 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;
- (b) when applying for a licence, the applicant is required to submit a demonstration of nuclear safety. Its scope and level of detail shall be commensurate with the potential magnitude and nature of the hazard relevant for the nuclear installation and its site;
- (c) licence holders are to regularly assess, verify, and continuously improve, as far as reasonably practicable, the nuclear safety of their nuclear installations in a systematic and verifiable manner. That shall include verification that measures are in place for the prevention of accidents and mitigation of the consequences of accidents, including the verification of the application of defence-in-depth provisions;
- (d) licence holders establish and implement management systems which give due priority to nuclear safety;
- (e) licence holders provide for appropriate on-site emergency procedures and arrangements, including severe accident management guidelines or equivalent arrangements, for responding effectively to accidents in order to prevent or mitigate their consequences. Those shall in particular:
 - (i) be consistent with other operational procedures and periodically exercised to verify their practicability;
 - (ii) address accidents and severe accidents that could occur in all operational modes and those that simultaneously involve or affect several units;
 - (iii) provide arrangements to receive external assistance;
 - (iv) be periodically reviewed and regularly updated, taking account of experience from exercises and lessons learned from accidents;
- (f) licence holders provide for and maintain financial and human resources with appropriate qualifications and competences, necessary to fulfil their obligations with respect to the nuclear safety of a nuclear installation. Licence holders shall also ensure that contractors and subcontractors under their responsibility and whose activities might affect the nuclear safety of a nuclear installation have the necessary human resources with appropriate qualifications and competences to fulfil their obligations.

6.1(a) *Ensuring prime responsibility for nuclear safety rests with licence holders*

The responsibility of the Licence Holder (LH) emerges from the principles of the Dutch legal system, including the Nuclear Energy Act and underlying regulations, and the obligations referred to therein for the Licence Holder (LH). The principle that the ultimate responsibility for safety lies with the LH is established in the legislation at several levels. This is explained further below.

Transposition of European Directives

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 lies with the LH.

In the Ministerial Regulation (MR NV) from 2017 transposing Directive 2014/87/Euratom the LH's 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.

Nuclear Energy Act

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.

The responsibilities accompanying a licence can only be transferred to another person with permission from the ANVS. Conditions may be imposed on the transfer of the licence to a third party. This enables the ANVS to assess whether the potential new LH meets the same standards as the previous LH.

Governmental Decrees

A further elaboration can also be found in the Governmental Decree on Basic Safety Standards for Radiation Protection (Bbs), as the LH is required to keep exposure of the population and workers as a result of its activities as low as reasonably achievable. There are many regulations in the Bss that specify “The operator ensures that...”. The Bbs also includes requirements with respect to the competence of the operator or LH.

Licence conditions and WENRA reference levels

Also licence conditions contain conditions that imply all kinds of responsibilities.

The latest version of WENRA Reference Levels (RLs) have been implemented in the licence conditions, including RLs that deal with the LH’s responsibilities for the contractors activities.

6.1(b) Requirement to submit a demonstration of safety when applying for a licence

The licensing process has been described in section 4.1(c) of the present report. The applicable regulatory framework has been described in section 4.1.

In the Netherlands, a licence is needed for the construction, operation, modification or decommissioning of a nuclear installation, so for various stages in the lifecycle of an installation. The ANVS grants all licences for nuclear facilities based on the Nuclear Energy Act and subordinate regulation, like the Decree on Basic Safety Standards for Radiation Protection.

Demonstration of safety

The applicant shall demonstrate that he satisfies all regulatory requirements under the Nuclear Energy Act. If a certain requirement cannot be met, the applicant shall demonstrate to the satisfaction of the ANVS that he will achieve the safety objectives of the Act in another way.

The Decree on Nuclear Facilities, Fissionable Materials and Ores (Bkse) lays down more detailed specifications of the information that shall be included in applications for a licence.

Bkse requires that the licence application for the construction of a nuclear installation must contain information about the site where the installation is to be located, stating all relevant conditions of a geographical, geological, climatological, demographical, hydrological, ecological and other nature. A safety report forms part of the application. This report contains a description of the measures that will be taken by or due to the applicant to prevent damage or to limit the chance of damage. It must detail the measures taken to prevent off-site damage during normal operation and those taken to prevent damage ensuing from the postulated initiating events to be included in that description, as well as a risk analysis of the off-site damage resulting from those events. Furthermore, the application must include a risk analysis of off-site damage as a result of beyond-design-basis accidents (severe conditions).

Article 18, paragraph 3, of Bkse Decree stipulates that a licence for a nuclear facility may be refused if the results from the risk analysis of beyond design basis accidents does not meet the prescribed individual risk (a) and group risk (b) limit values:

- a) a probability of 10⁻⁶ per year that a person residing permanently and unprotected outside the relevant facility will die as a result of a beyond design basis accident;
- b) a probability of 10⁻⁵ per year that a group of at least ten persons present outside the relevant facility will be direct fatalities of a beyond design basis accident, or a n2 times smaller probability for n2 times more direct fatalities.

A risk analysis of beyond design basis accidents in which the results shall be tested against the limit values prescribed above is performed on the basis of the level 3 PSA. A national guideline on level 3 PSA exists.

The Bkse Decree also stipulates that a licence shall be refused when the dose criteria for design basis accidents (DBAs) are not met. Refer to the table below for those criteria.

Table 2 Dose limit values for DBAs pursuant to Bkse

Event frequency F per year	Maximum effective dose allowed		Maximum thyroid dose allowed
	persons 16 years and over	persons under the age of 16	
$F \geq 10^{-1}$	0.1 mSv	0.04 mSv	500 mSv
$10^{-1} > F \geq 10^{-2}$	1 mSv	0.4 mSv	500 mSv
$10^{-2} > F \geq 10^{-4}$	10 mSv	4 mSv	500 mSv
$F < 10^{-4}$	100 mSv	40 mSv	500 mSv

Required documentation

To support his licence application, and demonstrate the compliance with the requirements, the LH shall draft (among others) a Safety Report (SR) and a Safety Analysis report (SAR), which it shall submit to the ANVS together with the application. The SR is the report that is attached to the licence, and as such it is a public document. It describes the organisation, the design, the outcomes of the safety analyses, et cetera into some detail. The SAR gives a more detailed description of the proposed facility and presents an in-depth analysis of the way in which it complies with the applicable regulations. Its claims are supported by detailed descriptions of the safety analyses, simplified system diagrams, and other supporting documents.

Article 15c of the Nuclear Energy Act stipulates that the safety-relevant components of the SR constituting part of the licence application form part of the licence itself (to the extent specified in the licence) so that the measures in the SR are in fact prescribed.

Further, more detailed requirements to documentation are for example the NVR-GS- G-4.1 (Format and Content of the SAR of an NPP), a licence condition of the NPP. For other types of installations, appropriate IAEA Safety Standards and Guides may be referenced that give guidance on format and content of the documentation.

In 2016 ANVS finished a final version of the document: "Guidance on the Technical Review of the Safety Analysis Report as Part of Nuclear Reactor Licensing in The Netherlands". This document is available upon request to licence applicants in the context of preliminary consultation on a licence application.

For all nuclear installations, the same type of safety analyses and the same kind of information shall be provided with the licence application. However, the size and detail of the supporting documentation may vary from case to case; it should be adjusted to the size and complexity of the installation, and the potential impact of incidents. This practice is in line with the principle of graded approach.

With the Borssele NPP, the SR is a one-volume document, whereas the associated SAR is a twenty-volume document. Both documents are updated with each modification of the installation, if there is a licence application or licence renewal needed.

For the other nuclear installations in the Netherlands, the documentation is less voluminous. Nevertheless, the licence documentation of the research reactors (HFR and HOR) and NRG's extensive non-reactor facilities in Petten are still considerable.

6.1(c) Licence holders to regularly assess, verify, and continuously improve, ALARP, nuclear safety of their installations in a systematic and verifiable manner

6.1.c.1 Comprehensive and systematic safety assessment and continuous improvement

The Netherlands has implemented the 'Vienna Declaration'. Its second clause reads:

"2. Comprehensive and systematic safety assessments are to be carried out periodically and regularly for existing installations throughout their lifetime in order to identify safety improvements that are oriented to meet the above objective. Reasonably practicable or achievable safety improvements are to be implemented in a timely manner;"

This requirement has been implemented in a general way for all nuclear installations with the transposition of the Euratom Nuclear Safety Directive (already in 2011).

Article 11 of the MR NV contains the requirement for the LH to continuously improve the nuclear safety of the nuclear installation under his management. The LH should comply by this by regularly testing the nuclear safety of his nuclear installation in relation to the state of the art and science and other relevant developments in and insights into the nuclear safety of similar installations in the Netherlands and abroad. As soon as knowledge becomes available, the licensee must research what this means for nuclear safety and how nuclear safety may be improved with this knowledge in mind. Such research is therefore part of the requirement for continuous improvement. The ANVS has developed and published a Guidance on the continuous improvement of safety. It was also sent to the LHs by letter²⁷.

MR NV requires that once every ten years the nuclear installation must be comprehensively reviewed and when reasonable to improve nuclear safety in a timely manner. If ANVS deems it necessary to conduct an interim evaluation, it may issue orders to do so.

Long before the existence of MR NV and the Directive, licence conditions already required periodic safety reviews (PSRs, every 10 years and every 2 years) at the Borssele NPP. One of the licence conditions also requires implementation of the identified safety improvements within five years after completion of the evaluation phase (unless this timeframe is not reasonable). This led to considerable improvements at the Borssele plant.

The licences of all nuclear installations contain conditions requiring the LH to perform PSRs, and stating the periodicity. In general the IAEA Standard SSG-25 is used as a basis for the process and scope of the PSRs.

6.1.c.2 Regulatory requirements establishing basis for verification of measures for prevention of accidents and mitigation of consequences

The Netherlands has implemented the 'Vienna Declaration'. Its first clause reads:

"1. New nuclear power plants are to be designed, sited, and constructed, consistent with the objective of preventing accidents in the commissioning and operation and, should an accident occur, mitigating possible releases of radionuclides causing long-term off-site contamination and avoiding early radioactive releases or radioactive releases large enough to require long-term protective measures and actions"

It also has implemented the second clause of the 'Vienna Declaration' about existing installations, refer to section 6.1.c.1 above.

The 2009 EU Nuclear Safety Directive (NSD) of 2011 has been updated in 2014 and envelops these safety objectives of the Vienna Declaration – and applies to all nuclear installations. As required of EU Member States, transposition of the update into the Dutch regulatory framework was completed in August 2017 (art. 8a and 8b).

At the Borssele NPP, through the subsequent PSRs a lot of backfitting measures have been and are being taken that reduce the core damage frequency to a level of modern reactors. The additional measures based on the stress test increased robustness of the plant to external and internal hazards even further. An important further safety improvement, which strengthens the defense-in-depth, implemented in 2017, is the in-vessel molten core retention by creating a cooling opportunity of the outside of the reactor vessel.

²⁷ See the following link:

<https://www.autoriteitnvs.nl/documenten/publicatie/2015/7/6/handreiking-continu-verbeteren-van-de-nucleaire-veiligheid>

6.1.c.3 Methods and approaches undertaken by regulatory authority to verify status of the implementation of the requirements by the LH

The ANVS closely follows the implementation of PSRs, starting with the agreement on the scope and review framework for each individual PSR, before the start. In this step it is also agreed which documents ANVS will review during the evaluation phase. As far as the decision making is concerned related to reasonably achievable measures to improve safety, the LH will produce a report on potential safety improvements and a conceptual improvement plan that has been derived from that. The LH must describe how it derives the measures to be implemented as part of a modification project, taking into account a number of factors. The ANVS will review and assess the approach presented by the LH in an implementation plan and will then approve the modification project. This process aids to continuous improvement.

ANVS has agreed with the LHs a weighting process using a risk matrix for the NPP and the HFR. For other installations a simpler method is used. During the modification project the regular proceedings for each item of implementation applies, including the involvement of the ANVS. ANVS has contributed to an IAEA TECDOC²⁸ on experiences in implementing safety improvements at existing NPPs. In it the application of the risk matrix is explained.

Throughout the years, the focus has moved from hardware-oriented modifications to more organisational modifications.

As an example, follow-up of PSRs at the NPP are described below.

- The first PSR was followed by a major 200 million euro modification program, with increase of functional and structural separation, protection against external events and so on.
- The second PSR resulted in a fine-tuning of the safety concept of the plant rather than major changes.
- In compliance with the licence the LH issued a third 10-yearly safety review at the end of 2013 (10EVA13). There was some interface with LTO-issues, but it was agreed by the ANVS and EPZ not to combine the two subjects of LTO and PSR but to execute two complementary projects, each having its own time frame. There was also some interface with the European stress test, and its implementation at Borssele NPP, the Complementary Safety Assessment (CSA).
- All identified safety-enhancing measures from 10EVA13 have been completed. There were 19 technical measures and four more organisational, personnel and administrative measures. This PSR also had some interfaces with the CSA.

The 8th national report of the Netherlands for the Convention on Nuclear Safety (CNS) in its Appendix 5 provides details of all PSRs of the NPP and the resulting measures. Examples of safety improvement at the HFR stemming from PSRs can be found in Appendix 6 of that same CNS report.

The research reactor HFR has a full scope PSA, covering all operating states, internal events, internal and external hazards and the reactor, the spent fuel pool, and experiments. The research reactor HOR in Delft also has a full scope PSA, covering all operating states, but its scope is mainly limited to the reactor core.

6.1(d) Licence holders are to establish and implement management systems which give due priority to nuclear safety

The transposition of the amended European Nuclear Safety Directive resulted in a new Ministerial Regulation on the safety of nuclear installations dated 14 June 2017 (MR-NV). In its Article 9, it lists requirements to the management system of the LH. Furthermore there are rules and guidelines on quality assurance for LHs of NPPs in the Netherlands in a Ministerial Regulation which refers to the requirements and safety guides in the IAEA Safety Series (50-C/SG-Q), amended, where necessary, for specific use in the Netherlands. Separate from this, since 2011 relevant and updated NVRs are attached to the licence of the NPP, like NVR-GS-R-3, NVR-GS-G-3.1 and 3.5. In addition the WENRA Reference Levels apply.

In the NPP licence, a requirement is to comply with the Safety Requirements for nuclear power plant operation, NVR NS-R-2 (Safety of NPPs: Operation). This document requires that the operating organisation must be aware of the special emphasis that needs to be placed on safety when operating nuclear power plants.

This special emphasis and commitment to safety must be reflected in the organisational structure.

²⁸ IAEA-TECDOC-1894, published in 2020

NVR-NS-R-2 also states that plant management has a direct responsibility for the safe operation of the plant. All safety-relevant management functions, such as decisions on financial, material and manpower resources and operating functions, must be performed and supported at the most senior level of management.

NVR GS-R-3 'The Management System for Facilities and Activities' requires any LH to establish a management system where priority to safety is paramount, including assuring a sound safety culture. The requirements in this NVR apply to all nuclear facilities.

The ANVS verifies the management systems of the LHs during the regular inspections. More on inspections can be found in section 4.1(d) of the present report.

6.1(e) *Licence holders to provide for appropriate on-site emergency procedures and arrangements, including SAMGs or equivalent*

Regulatory requirements

The Dutch Nuclear Energy Act (Kew) sets the framework for nuclear safety management. It allocates the competent regulatory authority's responsibilities for preparedness and response for a nuclear and radiological emergency. Furthermore, the Ministerial Regulation on the safety of nuclear installations (MR-NV) in its Article 14, lists requirements to provisions in the event of accidents. This regulation also makes reference to the Decree on Basic Safety Standards Radiation Protection (Bbs). The Dutch Safety Region Act details the responsibilities for emergency situations in general.

The Bbs requires that LHs make arrangements in preparing for interventions in case of a radiological emergency on-site. The LH has to prepare an emergency plan for each location, which has to be tested frequently. This general requirement is applicable for nuclear installations and sources. Due to the small scale but diverse nature of the nuclear industry in the Netherlands, the details of such obligations of the LHs are not regulated by law, but in the individual licences.

Examples of regulatory documents attached to the licence of the Borssele NPP, highly relevant for on-site emergency preparedness, are:

- NVR NS-G-2.15 'Severe Accident Management Programmes for NPPs'
- NVR GS-G-2.1 'Arrangement for Preparedness and Response for a Nuclear or Radiological Emergency'
- NVR GS-R2 'Preparedness and Response for a Nuclear or Radiological Emergency' Future changes to these NVRs will reflect developments at the IAEA.

The licence of the Borssele NPP contains licence conditions that require the LH to establish and maintain an emergency plan and an emergency organisation, and also to ensure that exercises are conducted regularly, and if needed leading to improvements. The on-site emergency plan and emergency organisation must be consistent with the off-site emergency planning. Furthermore the (public) Safety Report (SR) of the NPP describes the Severe Accident Management Guidelines (SAMGs), Emergency Operating Procedures (EOPs), function recovery procedures (FHPs), and emergency response organisation and how these are interrelated. The SR is an integral part of the licence. Details and substantiation of this information can be found in the underlying documentation, that is not public, but that is subject to evaluation by the ANVS.

Other nuclear installations also have licence conditions requiring to have emergency procedures and arrangements, details of which can be found in their SRs and underlying documentation.

Verification of implementation by the ANVS

The initial site-emergency plans and its modifications are reviewed by the ANVS.

The practical implementation of the plan by the LH are subject to periodic review and supervision by the competent regulatory authority. Furthermore the LH will have to participate in emergency preparedness and response (EP&R) exercises organised by the authorities. These exercises are evaluated by LH and ANVS.

Examples of implementation

Borssele NPP

The Borssele NPP has developed a comprehensive set of procedures to enable it to respond to anticipated operational occurrences (AOCs) and accidents. Simpler malfunctions are the subject of event-based instructions and procedures.

Emergency situations are dealt with by symptom-based Emergency Operating Procedures (EOPs). Severe Accident Management Guidelines (SAMG) have been introduced. These are intended to provide guidance on accidents involving core damage and potential radioactive discharges into the environment.

The Borssele NPP LH follows the approach adopted by the Westinghouse Owners Group (WOG), both for EOPs and SAMGs. The severe accident management guidance defines priorities for operator actions during the various stages of a core melt process, sets priorities for equipment repairs and establishes adequate lines of command and control. Care has been taken to tailor the WOG approach to the particular characteristics of this Siemens/KWU station. The LH has extended the existing EOPs and SAMGs with non-power procedures not available in the generic WOG package. A new set of generic procedures was introduced by WOG to guide the use of mobile equipment. These procedures called FSGs (FLEX Support Guidelines) can be used in addition to the EOPs and SAMGs. The Borssele NPP also made the FSGs plant-specific. The FSPs are referenced in all applicable steps in the EOPs and SAMGs of the Borssele NPP.

Both operators and other staff are given frequent training in the use of emergency operating procedures. This takes the form of courses on the full-scope simulator located in Essen, Germany, and emergency exercises at the plant. A data link for the process computer has been created between the plant and the simulator to enable calculating real time accident progression data in the phases before core melt to be monitored during an exercise by the staff at the plant. This simulator process data can also be transferred in real time to the ANVS in The Hague and to the severe accident support centres of AREVA. It is also possible to transfer the process data of the plant itself through these data links to the ANVS and to AREVA.

In the event of a severe accident, support is also available from the plant vendor, AREVA (formerly Framatome ANP and Siemens/KWU), which operates a round-the-clock service to assist affected plants and is available on call.

Off-site emergency support is provided by the Safety Region, who is also able for instance to ask assistance from the Ministry of Defence. Several exercises have been undertaken to practice the assistance provided by the Ministry of Defence.

An annual training of larger parts of the national response organisation takes place. Around every five years a National Exercise is organized, where the decision making chain is tested in its entirety, including the Government.

HFR RR and other nuclear installations in Petten

The HFR has procedures to enable it to respond to anticipated operational occurrences (AOCs) and accidents. There are symptom based function recovery procedures ('Functie herstel procedures', FHPs) that act on measured parameters. There are also operating procedures that are event based ('Bedrijfsvoorschriften', BVs). There is a local dedicated emergency plan for the HFR. Not all FHPs and BVs fall within the scope of that emergency plan.

On a higher level, NRG has an emergency preparedness organisation, the BNO ('Bedrijfs-noodorganisatie'). It has established and developed a comprehensive set of procedures to enable it to respond to incidents and accidents, the 'Bedrijfsnoodplan' (BNP). The BNP describes its links with detailed plans for separate facilities on NRG's sites (Petten and Arnhem) and links to the plans of local authorities and national authorities. Furthermore it describes the role of various entities within NRG in emergency preparedness and response, as well as tasks and responsibilities.

The BNP is subject to a continuous improvement cycle. There is a policy on education, training, regular exercises and evaluation of those exercises.

The BNP identifies the following main types of threats: (1) fire, (2) accidents with injuries to staff, (3) nuclear incidents, (4) accident with hazardous substances, (5) failure of supporting facilities, (6) incidents with transports, (7) extreme weather and other natural external hazards, (8) other external threats, and security incidents.

Because of the variety of facilities, mostly on the Petten site, the policy and guidance of the BNP, has been detailed in dedicated emergency plans for these facilities, these are called the 'Locatie noodplannen', or LNPs. The most important IAEA Guidance for these LNPs is found in NS-R-4 'Safety of research reactors' and GSR Part 7 'Draft Safety Requirements – Preparedness and response for a nuclear or radiological emergency'.

Furthermore sets of scenarios have been defined for each and every facility. For each scenario, emissions from scenarios have been calculated. These provide the basis for the plans of the 'Veiligheidsregio' and aid the communication during emergencies by NRG with local authorities and national authorities.

6.1(f) *Licence holders to provide for adequate financial and human resources*

Financial resources

Based on the EU-Directive on Nuclear Safety a requirement of adequate human and financial resources is included in the Dutch regulations (MR-NV, article 4). The regulation requires the LH to have sufficient human and financial resources.

Also the licence of Borssele NPP refers to among others NVR NS-R-2, NVR NS-R-3, NVR NS-G-3.1 and NVR NS-G-3.2. The licence's text does not contain direct requirements to have adequate financial resources but, in order to ensure the safe operation of the NPP, the referenced NVRs require the LH to cope with the costs for safe operation. The requirements stated in the NVRs make it clear that the organisational structure of the LH needs to provide adequate resources, services and facilities to discharge of the responsibility with respect to achieving safe operation of the NPP.

ANVS has developed a risk-based approach to examine the sufficiency of liquidity and solvency to run safely the installation. This approach will be used to perform inspections in cases where the financial situation seems to be an area of attention. These inspections will focus on the financial situation, the governance and the systems for decision making (planning and control).

Decommissioning funding, is assessed by the Ministry of IenW in cooperation with the Ministry of Finance.

Human resources, competences and qualifications

The Nuclear Energy Act stipulates that an application for a licence must 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. In the last years the transposition of the EU-Directive on nuclear safety has reinforced the requirements on adequacy of human resources in MR-NV article 4.

The Decree on Basic Safety Standards Radiation Protection (Bbs) also imposes requirements on the competence of the staff. More information on regulatory requirements on the level of Acts and MR NV can be found in the text on Article 7 in the present report.

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 human resources needed to comply with the obligations in respect of nuclear safety of the nuclear installation under the authority of the LH.

The surveillance program of the ANVS includes human resources. The LH's number of staff, their education, their training and their experience are being assessed periodically. Safety relevant changes in organization and staff must be approved by ANVS. ANVS is also involved in the examination of control room operators at the NPP.

Contractors / Sub-Contractors

The requirements regarding competence of staff, extend to those of contractors or sub-contractors.

At the Borssele NPP, qualifications of the contractors depends on their job or area they have to work in. Independent to their job or area, all the contractors are qualified for industrial safety by the VCA qualification. This is a general Dutch qualification for working in the industry, like the international equivalent SCC²⁹. In addition to that, EPZ has two courses

²⁹ Safety Health and the Environment (SHE) Checklist Contractors

that are compulsory for all workers, whether they work in 'conventional' or 'nuclear' areas and that aid working safely at EPZ's plant. Besides that EPZ has a special qualification for work party leaders called Ziza. All the work party leaders and workers who work without supervision in the plant are specially qualified for this work. Qualifications of special craftsmen are part of the purchasing conditions and are controlled by the purchasing department.

At NRG, LH of the HFR in Petten, there are procedures in the Management System for evaluation of the qualifications of potential contractors. All contractors working on NRG's sites need to satisfy VCA qualifications. On top of this, many other requirements may apply, depending on their tasks and the areas they are to work in. In addition, their track record in the field of industrial accidents will be requested. The potential contractor needs to demonstrate it has management systems to manage the risks associated with the services to be provided to NRG.

The ANVS in overseeing the compliance of the LHs, regularly pays attention to the management systems of the LHs, and how these are applied to hiring contractors.

Article 7

Expertise and skills in nuclear safety

Member States shall ensure that the national framework requires all parties to make arrangements for the education and training for their staff having responsibilities related to the nuclear safety of nuclear installations so as to obtain, maintain and to further develop expertise and skills in nuclear safety and on-site emergency preparedness. The MR-NV transposed this article in Dutch regulation. Details are provided below.

7.1 Licence Holder

MR NV in article 4 states the LH shall have adequate financial and human resources to comply with the requirements related to nuclear safety. Furthermore the LH shall see to it that his staff has the required expertise and skills. This requirement extends to staff of contractors, acting under the responsibility of the LH. Article 8(2) of MR NV details these requirements somewhat further and also addresses safety culture. Article 10 states the LH needs to have documentation on its education and training policy, as well as an associated plan for the education and training of his staff. On-site emergency preparedness is explicitly mentioned as a training subject in Article 10. The documentation shall be regularly evaluated and updated to reflect internal and external developments related to nuclear safety.

In the text in the present report on Article 6 of the Directive (section 6.1(f)) additional information can be found as well as the surveillance program of the ANVS which includes Human Resources at the LH.

7.2 Competent regulatory authority

The Nuclear Energy Act (article 10) states that the Minister of IenW shall provide for sufficient numbers of adequately educated staff to the ANVS. In addition MR NV (article 18) states that ANVS will provide education and training to those members of staff that have duties related to nuclear safety. The education and training will enhance their qualifications with respect to nuclear safety and emergency preparedness. Within the recently implemented ANVS reorganisation mentioned before (text on Article 5.1), the knowledge development and management has been reinforced by introducing a dedicated position (Team leader Knowledge Strategy) within the new Department of Research, Review and Assessment.

The situation regarding education and training of ANVS staff has been described in section 5.2.d.1 of the present report.

7.3 Further developments regarding development of knowledge

In the first half of 2019, the ANVS Advisory Board issued its first report titled: "Safety in a shrinking sector". It signalled the need to retain knowledge and expertise, especially in the field of decommissioning, and recommended the establishment of a 'national nuclear knowledge management program' 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, and 3) promote and maintain in particular the expertise on decommissioning.

Subsequently the ANVS has installed an independent Commission with the task to explore the support in the industry, the knowledge institutions and ministries for structurally strengthening and securing the knowledgebase for the nuclear and radiation sector. In the second quarter of 2020 ANVS, the Commission concluded its report, which was sent to the Dutch Parliament in June 2020. The Commission provided four recommendations that are directed not only at the ANVS, but also at the Ministry of IenW and other Ministries in the sector. The report and possible follow-up steps, will be discussed with these organizations.

Article 8

Transparency

1. Member States shall ensure that necessary information in relation to the nuclear safety of nuclear installations and its regulation is made available to workers and the general public, with specific consideration to local authorities, population and stakeholders in the vicinity of a nuclear installation. That obligation includes ensuring that the competent regulatory authority and the licence holders, within their fields of responsibility, provide in the framework of their communication policy:
 - (a) information on normal operating conditions of nuclear installations to workers and the general public; and
 - (b) prompt information in case of incidents and accidents to workers and the general public and to the competent regulatory authorities of other Member States in the vicinity of a nuclear installation.
2. Information shall be made available to the public in accordance with relevant legislation and international instruments, provided that this does not jeopardise other overriding interests, such as security, which are recognised in relevant legislation or international instruments.
3. Member States shall, without prejudice to Article 5(2), ensure that the competent regulatory authority engages, as appropriate, in cooperation activities on the nuclear safety of nuclear installations with competent regulatory authorities of other Member States in the vicinity of a nuclear installation, inter alia, via the exchange and/or sharing of information.
4. Member States shall ensure that the general public is given the appropriate opportunities to participate effectively in the decision-making process relating to the licensing of nuclear installations, in accordance with relevant legislation and international instruments.

8.1 Provision of necessary information to workers and the general public by licence holders and authorities on nuclear safety of nuclear installations and its regulation

8.1(a) *Provision of information on normal operating conditions of nuclear installations, to workers and the general public*

8.1.a.1 Competent regulatory authority

The ANVS has several tasks regarding nuclear safety and radiation protection and associated emergency preparedness and response, and security and safeguards. Some of the associated communication-related tasks are:

- Informing interested parties and the general public;
- Maintaining relationships with comparable foreign authorities and relevant national and international organisations;
- Supporting national organisations with the provision of expertise, knowledge and communication tools.

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 six members of staff employed in a corporate staff department. This aids the ANVS in meeting its objectives for openness and transparency. The ANVS communication department works in close relation with the other departments within the competent authority. Because of that, communication of information on nuclear safety, security and radiation protection is substantive and understandable. The communication department has set up a communication strategy that describes open communication, sharing knowledge and opinions and transparency as central concepts for the ANVS in order to cooperate well with her stakeholders and to inform the general public.

Legal requirements on transparency by the ANVS comes from several international sources like the EU-Directives on Nuclear Safety, on Radiation Protection, and on Management of Radioactive Waste and Spent Fuel. Such requirements have been transposed in the national regulations like MR NV and Bbs. But also other international Conventions define

such requirements. A working paper³⁰ published by ENSREG in 2009 and updated in 2016 provides an overview of such obligations and has been taken notice of by the ANVS. In addition ANVS contributed to the recent ENSREG publication HLG-p(2019-39)_165, which is a guide on openness and transparency for European nuclear safety regulators, with guidance extending beyond the legal obligations set out in Article 8 of the Nuclear Safety Directive, Article 10 of the Waste Directive and the relevant articles of the Basic Safety Standards Directive. ANVS has fully implemented this ENSREG guide.

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 also involves meetings of regulatory body, LH and the public. The ANVS is 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 Nuclear Energy Act states requirements regarding providing information to the public in case of accidents and to staff mitigating the consequences of such accidents. Refer to section 8.1(b) of this report for more information.

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. The communication tools are continuously improved. Relations with national, regional and local stakeholders and press are gradually built. In 2017 and 2019 the ANVS organised relationship events for its stakeholders, that were attended by a very broad group of stakeholders. The ANVS uses two social media platforms, namely: Twitter @AutoriteitANVS and LinkedIn to communicate with stakeholders, media and general public. It also publishes a newsletter at least three times a year, that is available to everyone interested. In 2017, the ANVS conducted a large-scale public survey. This kind of survey will be regularly repeated.

Special arrangements are in place for the communication and reporting of incidents in neighbouring countries.

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 CNS, National Reports of Action plans related to the stress test et cetera. At least twice a year, the Minister sends a letter to the Parliament with a general update on all important issues.

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

- ANVS licenses;
- 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;
- National reports, published in relation to international conventions and legal instruments related to nuclear safety, are made public by publishing them on governmental websites;
- Results of international peer reviews of aspects of the operation of nuclear installations, like IAEA mission reports.

³⁰ "Current Community and International Law with Relevance to Transparency", ENSREG working document HLG_r(2015-31)_319, 2016

- A notable document is the “National Policy on Nuclear Safety and Radiation Protection (Guide for Readers)”, containing an overview of actual Government policies on nuclear safety and radiation protection, which has been prepared by the ANVS in cooperation with relevant Ministries. Parliament was informed about the document and it was published on the Internet³¹.

One of the recommendations of the external zbo-evaluation was the development of an annual report on the State of Nuclear Safety and Radiation Protection. This will be developed stepwise with a first publication in 2020.

Amongst others, the ANVS keeps track on developments in public communication practices by other nuclear regulators through active participation in the international public communication and transparency groups, e.g. ENSREG WGTA and OECD/NEA/WGPC.

There are legal limitations to providing information. Refer to section 8.2.

8.1.a.2 Licence Holders

The regulation MR NV transposing Directive 2014/87/Euratom of 8 July 2014 includes requirements about transparent communication to the public by the LHs.

All LHs have a communication policy towards public communication specially developed for the general public. Prime means of communication are the websites of the LHs. Special developments, incidents and other news related to their activities is published on these websites. Some LHs will use press conferences, meetings and interviews as well. The LHs of nuclear installations also fund an association that on a central website³² provides information to the public about topics related to the application of nuclear technology, nuclear safety, radiation protection et cetera.

The Borssele NPP promotes visits to its information centre and plant tours, albeit the latter is still legally limited to adults with work-related objectives. The national waste management organization COVRA also has a dedicated visitor centre, and promotes visits to its site.

8.1(b) *Provision of prompt information in case of accidents to workers and the general public and competent regulatory authorities of other Member States*

Regulatory requirements

Chapter VI of the Nuclear Energy Act addresses (in Article 43) the provision of information to those members of the population who might be affected by a nuclear accident. Subordinate regulation also addresses this topic. Among others, there is the MR-NV which in its Article 17 states a number of requirements on provision of information. Consistent with its responsibility for managing the response to a (potential) nuclear accident, national government is responsible for informing the public. This will be done in close cooperation with the local authorities in the threatened or affected area.

Based on the formal National Handbook on Crisis Management (‘Nationaal Handboek Crisisbesluitvoering’) the Netherlands has developed a ‘Nationaal Crisisplan Stralingsincidenten’ (NCS), a National Emergency Plan for radiation incidents. It is accompanied by the ‘NCS Response Plan’, which among many things addresses communication. The Response Plan refers to a document detailing the required communication: ‘Crisiscommunicatieplan Stralingsincidenten’, the crisis communication plan for radiation incidents. It describes all communication between all stakeholders (also abroad) during a radiation incident.

Through their licences LHs are required to report to the ANVS certain events below the emergency threshold. The ANVS provides information on its website about reported events.

Communication of the LH with the RB in emergency situations

If an emergency occurs, the management of the installation must inform the relevant authorities immediately, advise them on the classification of the accident, and provide all available information that is required in order to assist the

³¹ Link: <https://english.autoriteitnvs.nl/documents/publication/2018/11/1/guide-for-readers>

³² <https://nucleairnederland.nl>

ANVS to assess the nature and potential consequences of the accident, to determine the potential for mitigating its effects and to make a prognosis of potential radioactive discharges.

Regarding the NPP, real-time data and process information is available to the ANVS. This is part of the plant information supplied to the ANVS during an emergency. In an emergency response situation, the ANVS sends a liaison-on-site to the plant to optimize the information sharing process while minimizing the impact on the NPP's emergency response staff. The ANVS has a strict 24/7 schedule to secure its availability during any actual or potential accident or serious incident.

Information to workers and general public

In case of a threat or emergency that needs national coordination, and needs the involvement of various ministries, a national crisis communication centre as part of the National Crisis Centre (NCC), is set up to inform the public. Especially in cases of accidents of national relevance (Category-A accident) also the Crisis Expert Team – radiological and nuclear (CETsn³³) will be activated. The ANVS is responsible for CETsn. In case of an accident the CETsn will provide the decision makers with accurate information on the situation and advice on countermeasures. Experts in communication will support the local and regional public information units based on the communication strategy for nuclear and radiological emergencies. Public information about the potential risks of nuclear power plants and the existing emergency plans is provided by the safety regions. The material needed for the information can be provided by central government, as has been the case for the local and regional governments for the Borssele and Doel NPPs, the latter being in Belgium but close to the Dutch border.

The ANVS is responsible for the communication to the public about the potential risks of nuclear power plants and radiation protection in general. The ANVS website provides information on those risks and contains various crisis and contingency plans. It also has a section dedicated to emergency preparedness and response. As mentioned above, the Ministry of IenW has a crisis communication plan for radiation incidents. The plan among others describes the arrangements for providing information to the general public in case of a nuclear or radiological emergency.

In addition, the governmental websites of various ministries have a link to the topic of 'crises', where information can be found on numerous aspects of nuclear and radiological emergencies.

Communication with competent regulatory authorities of other MSs

Information exchange at the international level is regulated by the Early Notification Convention of the IAEA and the European Commission's Decision on urgent information exchange. On bilateral bases, information about (potential) nuclear or radiological emergencies will be exchanged between the respective national emergency coordination centres.

The cooperation and provision of information to the authorities in neighbouring countries is the subject of Memoranda of Understanding (MoU) that have been signed with bordering countries. The exchange of technical data (such as monitoring results and modelling-assessments), reports and measures takes place on a regular basis and in a response-phase between the Netherlands and neighbouring states Germany and Belgium.

At a national level the ANVS is, as competent regulatory authority, improving the arrangements for better and efficient information-exchange and compatibility of countermeasures with the neighbouring states Belgium and Germany. Refer to 8.3 for more information on cooperation with neighbouring countries.

8.2 Provision of information to the public in accordance with relevant legislation and international instruments

Several international instruments, including this directive, require active publication of information, but always within the limitations of the national Act on public information. ANVS policy of external communication goes beyond the legal minimum (see also 8.1).

Under the Dutch Government Information (Public Access) Act (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 10³⁴. The

³³ Dutch: 'Crisis Expert Team – straling & nucleair', CETsn

³⁴ Examples of such exceptions are concerns regarding national security, privacy, and confidentiality of company information submitted to authorities

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. In practice information to be published proactively or reactively is scrutinized against the exception criteria listed in the Wob. The access to information according to the Aarhus Treaty is also covered by the Wob, also referring to the Environment Protection Act. The Environment Protection Act and connected lower level legislation covers the provision of information to the public in case of significant transboundary effects.

8.3 Cooperation activities of the competent regulatory authority on nuclear safety with authorities of other Member States in the vicinity of a nuclear installation

There are annual high level and regular working level meetings with Belgium (FANC) and Germany (BMU), where a broad spectrum of issues, including nuclear safety and emergency preparedness are discussed.

Staff of the competent regulatory authority participates in international workshops, but also conferences and visits to other regulatory bodies. In addition there is information exchange through the international networks of OECD/NEA, IAEA, EU et cetera. To be mentioned are activities in HERCA, WENRA and ENSREG, NEA/CNRA, NEA/CSNI and several of its Working Groups. The activities in international networks also offer extra opportunities for the Netherlands to engage with neighbouring states Belgium and Germany.

Cooperation on emergency preparedness

The Dutch, Belgian and German counterparts on emergency preparedness and response share expertise and experience in regular meetings. Several activities are being undertaken aiming at increasing cooperation and mutual understanding of approaches to various issues. Recently protocols have been agreed between the counterparts for exchanging information on situations, that do not meet the criteria for initiating emergency response measures, but that may become important because of media attention or unease in the population.

In the Netherlands about every five years large scale exercises for emergency preparedness and response are current practice. In 2018, a large nuclear emergency response drill was performed in which also Belgian officials took part. Lessons learnt from the drill will be incorporated in the national crisis plan for radiation incidents. Furthermore Dutch officials participated in drills in Belgium and Germany.

8.4 Provision of appropriate opportunities to the general public to participate effectively in the decision-making process relating to licensing of nuclear installations

General Administrative Act

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 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. For these procedures the Nuclear Energy act refers to the Awb in its article 17.

Refer to section 4.1(c) of the present report for details of procedures for licensing and the Awb. As mentioned in section 4.1(c), a modification of the Nuclear Energy Act is being prepared (article 17 sub 4) to provide more clarity on consultation procedures for licence modifications related to longer operation of nuclear installations than anticipated in the design.

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 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 members of the public. All members of the public are 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. Members of the public that have expressed views to the draft decision are as stakeholders 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.

Environmental Impact Assessment

According to the Environmental Protection Act and the associated Environmental Impact Assessment Decree (which also implements the Espoo Treaty), the licensing procedure for the construction of a nuclear installation includes a requirement to draft an Environmental Impact Assessment (EIA) report. In certain circumstances, an EIA is also required if an existing installation is modified. Also refer to section 4.1(c) of the present report for the procedure associated with the EIA. In that section it is also shown how the EIA procedure merges with the 'ordinary' licensing process under the Nuclear Energy Act, of which the procedures are governed by the Awb. Figure 3 in that section shows all steps of that procedure, including those involving interaction with stakeholders.

The stakeholders can use the information provided in the EIA procedure as an additional basis for lodging their opinions on activities proposed by LHs and lodging appeals to decisions by which licences have been granted.

Table 3 shows some examples of recently conducted EIAs.

Table 3 Key examples of recently conducted EIAs (2014 – 2020)

Year	LH	EIA topic
2018	Foundation Preparation PALLAS reactor	Construction and operation of PALLAS reactor
2018	Municipality of Schagen	Change of 'bestemmingsplan' (i.e. zoning plan) for the area around the future PALLAS reactor
2017	NRG	Change of molybdenum production process, involving transition from HEU to LEU ³⁵
2014	COVRA	Extension of COVRA's interim storage facilities for radioactive waste
2014	NRG	Decommissioning of the Low Flux Reactor

³⁵ HEU: High Enriched Uranium, LEU: Low Enriched Uranium (<20% U-235)

Article 8a

Nuclear safety objective for nuclear installations

1. Member States shall ensure that the national nuclear safety framework requires that nuclear installations are designed, sited, constructed, commissioned, operated and decommissioned with the objective of preventing accidents and, should an accident occur, mitigating its consequences and avoiding:
 - (a) early radioactive releases that would require off-site emergency measures but with insufficient time to implement them;
 - (b) large radioactive releases that would require protective measures that could not be limited in area or time.
2. Member States shall ensure that the national framework requires that the objective set out in paragraph 1:
 - (a) applies to nuclear installations for which a construction licence is granted for the first time after 14 August 2014;
 - (b) is used as a reference for the timely implementation of reasonably practicable safety improvements to existing nuclear installations, including in the framework of the periodic safety reviews as defined in Article 8c(b).

8a.1 *National nuclear safety framework requiring to prevent accidents happening to (new) nuclear installations as much as possible and mitigate consequences if accidents occur*

The new MR NV, article 6 covers the requirements stated in NSD 8a.1 and 8a.2. However, there are more regulatory requirements that aid to meet the objectives of Article 8a of the NSD. Some of these are mentioned below.

In 2015, the Netherlands published the Guidelines on the Safe Design and Operation of Nuclear Reactors, 'VOBK'³⁶. Refer to sections 4.1 and 4.2 for more information on VOBK. It contains requirements, to be applied to new nuclear reactors during licensing and to be used as a reference for safety evaluation of existing reactors. It should also be applied with a graded approach to research reactors.

Through compliance with the requirements of the CNS, the clauses of the Vienna Declaration on Nuclear Safety (VDNS, 2015) also apply. The first clause of the VDNS more or less covers NSD's Article 8a.1. Also refer to section 6.1.c.2.

Furthermore there is the Nuclear Installations, Fissionable Materials and Ores Decree (Bkse) regulating all practices involving fissionable materials and nuclear facilities (including licensing). The Bkse sets out additional regulations in relation to a number of areas, including the licence application for the construction, commissioning and operation of a nuclear reactor, and associated requirements.

According to article 6 of Bkse, for such an application, applicants are required to submit (among others) the following information as part of the demonstration of nuclear safety:

- 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).

Details of requirements stated in Bkse and associated dose and risk limits can be found in section 6.1(b) of the present report.

³⁶ Dutch: Veilig Ontwerp en het veilig Bedrijven van Kernreactoren, VOBK

On-site emergency response plans of a nuclear facility describe the actions that should be taken after an accident. These plans include the establishment of zones for firefighting purposes and radiological criteria for releasing an off-site alarm. The on-site emergency plan forms the first barrier to prevent or to limit accidental emissions of radionuclides into the environment. Refer to section 6.1(e) for more information about on-site emergency procedures, regulation that governs them and examples of practical implementations.

For each regulated nuclear facility off-site emergency provisions also apply, with their scope depending on the risks these facilities pose to the population and the environment. These provisions aim to mitigate the consequences of the release.

8a.2 *Correct scope of application of Article 8a.1*

(a) Application to nuclear installations for which the construction licence is granted for the first time after 14 August 2014

No such licences have been granted since the reference date.

(b) Article 8a.1 used as reference for timely implementation of reasonable practicable safety improvements to existing nuclear installations

The requirement of 8a.1 has been implemented in a general way for all nuclear installations with the transposition of the abovementioned EU Directive. Before that, licence conditions of installations already required Periodic Safety Reviews (PSRs), observing SSG-25 including the Safety Factors. Basically a gap-analysis is carried out leading to a list of potential improvement actions. These are amongst others evaluated against their potential to reduce risks and clustered into real improvement actions.

Licences of nuclear installations also require timely implementation of the safety improvements identified in PSRs, within a fixed timeframe after completion of the evaluation phase. Measures shall be implemented as soon as reasonably achievable. Through a mechanism of periodic progress reporting followed by supervision activities, the regulator verifies if the LH is acting according to the agreed implementation plan. Delays can be allowed but shall always be demonstrated to be justified.

Much more information on PSRs can be found in among others the texts in the present report on Articles 6.1(c) and Article 8c.

Examples of practical implementation of measures resulting from PSRs

At the NPP, through the subsequent PSRs a lot of backfitting measures have been taken that reduce the core damage frequency to a level of modern reactors.

Important examples of measures already implemented in the 90ies of the last century are: bunkered safety systems, PARs, filtered venting, and SAMGs. The additional fixed and mobile equipment and procedural measures based on the stress test and PSR, increased robustness of the plant even further.

Refer to the text on Article 6 for recent examples.

ANVS involvement in international activities related to this requirement

In the framework of WENRA the ANVS is participating in a benchmark on the application and implementation of a series of Safety Reference Levels in the area of severe accidents (Issue F). The benchmark concerns measures that have been or will be implemented on the basis of safety assessments performed as part of assessments like a PSR or stress test. This benchmark aims to be completed in 2020.

The ANVS has also participated in a European Commission activity, carried out by ETSON, concerning practical implementation of articles of the Nuclear Safety Directive, corresponding to the Vienna Declaration. It is about the approach to analyse, assess and implement safety improvements at existing NPPs.

During 2017, 2018 and the first part of 2019, the ANVS has participated in the IAEA activity to create TECDOC-1894 that describes approaches how to deal with the safety improvement of existing NPPs. In its section I-16 the regulatory approaches and practical implementation of reasonably practical safety improvements at the only NPP in the Netherlands are described. The methodology of the decision making approach for the NPP is given (risk matrix). For the HFR a comparable approach is used.

Article 8b

Implementation of the nuclear safety objective for nuclear installations

1. In order to achieve the nuclear safety objective set out in Article 8a, Member States shall ensure that the national framework requires that where defence-in-depth applies, it shall be applied to ensure that:
 - (a) the impact of extreme external natural and unintended man-made hazards is minimised;
 - (b) abnormal operation and failures are prevented;
 - (c) abnormal operation is controlled and failures are detected;
 - (d) accidents within the design basis are controlled;
 - (e) severe conditions are controlled, including prevention of accidents progression and mitigation of the consequences of severe accidents;
 - (f) organisational structures according to Article 8d(1) are in place.

2. In order to achieve the nuclear safety objective set out in Article 8a, Member States shall ensure that the national framework requires that the competent regulatory authority and the licence holder take measures to promote and enhance an effective nuclear safety culture. Those measures include in particular:
 - (a) management systems which give due priority to nuclear safety and promote, at all levels of staff and management, the ability to question the effective delivery of relevant safety principles and practices, and to report in a timely manner on safety issues, in accordance with Article 6d);
 - (b) arrangements by the licence holder to register, evaluate and document internal and external safety significant operating experience;
 - (c) the obligation of the licence holder to report events with a potential impact on nuclear safety to the competent regulatory authority; and,
 - (d) arrangements for education and training, in accordance with Article 7.

8b.1 Ensuring objectives of Defence-in-Depth are achieved

Regulatory requirements concerning the Defence-in-Depth (DiD) of nuclear installations

The MR NV contains binding requirements (article 7) for DiD, covering all objectives stated in the Directive.

In addition the VOBK also has requirements to DiD for nuclear reactors and the practical elimination of off-site radiological consequences for new reactors, which has also to be applied to existing reactors as far as reasonably achievable. Guidance is provided on what the ANVS considers to be the best available technology.

Bkse defines acceptance criteria for design basis accidents (DBAs) and design extension levels (DECs). For DBAs maximum allowed effective doses have been set that are coupled to the probability of the event. For DECs, individual risk and group risk criteria exist. Refer to section 6.1(b)6.1(b) for more information on these criteria in Bkse. The DECs are analysed using Probabilistic Safety Assessments (PSA). When demonstrating compliance with the criteria in Bkse, it is not allowed to take credit for preventive measures like evacuation and sheltering.

For new reactors, DiD requirements are bit tougher than for existing reactors because there still is the possibility to take them into account in the designs. In VOBK there are requirements related to the maximum acceptable effects of 'postulated core-melt accidents'. According to VOBK, for these accidents, no evacuation should be needed 3 kilometres or further away from the installation, and no sheltering 5 kilometres or more from the reactor.

In the Netherlands the IAEA standards also play an important role in the regulatory framework. A subset of IAEA standards are applied in amended form as NVRs.

Currently the NVRs that are applicable contain the amended IAEA design requirements NVR-NS-R1 and guides NVR-NS-G-1.1 through G-1.13. The NVRs for design have been formally introduced as licence conditions for the Borssele NPP in 2011. The NPP has to comply with these as far as reasonably achievable.

The defence-in-depth concept to be applied is defined in NVR-NS-R-1 'Safety Requirements for Nuclear Power Plant Design', which will be updated in the coming years (see 4.1(a)).

The latest IAEA requirements are always applied during the PSRs.

An example of a measure to improve DiD for an existing reactor can be found at the Borssele NPP. It is a two-loop system that was built in the 1970s. Therefore, in the original design physical separation was limited. In the first 10-yearly Periodic Safety Review (PSR), a significant effort was put into creating a physical separation between redundant systems of the two loops. This separation was further improved in the second and third 10-yearly PSR. The evaluation report of the third PSR was published in 2013. A number of measures resulting from this PSR have been merged with measures that resulted from the European stress test. Some of these are related to physical separation. More technical details regarding DiD at the NPP, can be found in the Netherlands' eighth national report for the Convention on Nuclear Safety.

8b.2 National framework requiring competent authority and licence holder take measures to promote and enhance nuclear safety culture

National framework requiring measures to promote and enhance effective nuclear safety culture

At the regulatory authority

The Netherlands has transposed this issue of the European Nuclear Safety Directive through MR-NV article 8, which is directed at the LHs as well as the competent regulatory authority.

The importance of an effective safety culture within the RB is also secured as a policy statement in the main organisational document of the ANVS, the ANVS Integral Management document (AIM). The OECD/NEA Green Booklet 'the Safety Culture of an Effective Nuclear Regulatory Body' is leading for the ANVS and contains the principles and attributes for the safety culture of an effective nuclear regulatory body.

ANVS's mission states: *"The Authority for Nuclear Safety and Radiation Protection (ANVS) is independent and professional; it continuously monitors and promotes nuclear safety, radiation protection and security for this and future generations"*. In addition, six leading principles for the organization were defined: "safety first; individual responsibility and justified trust; continuous improvement; risk oriented; separation of functions/roles; connecting". With reference to these guiding principles, ANVS has implemented several elements of safety culture, such as the open-door policy, feedback on the results of weekly management team meetings, employee perception surveys. Additionally, ANVS has adopted other measures to promote safety culture, such as the introduction of shared vocabulary, periodic integrity surveys, creation of a confidential counsellor and reinforcing the application of the Whistle Blower Authority Act.

Furthermore ANVS participates as a member in the OECD/NEA Committee on Nuclear Regulatory Activities (CNRA) and its Working Group on Safety Culture (WGSC). The ANVS has an internal safety culture working group addressing safety culture and it also develops interactive sessions to educate staff on safety culture issues. The working group will summarise emerging safety culture related themes and present them to management to promote awareness of important topics.

At the LH

In addition to the article in the MR-NV - applicable to all nuclear installations - at the NP NVR-GS-R-3 is applicable as well, as a condition in the licence of Borssele NPP. NVR GS-R-3 is to be updated with GSR Part 2, for which the plan is to make it applicable to all nuclear installations. In any case the current IAEA standards are used as a reference in the PSRs, as well for those installations that receive IAEA missions.

Examples of implementation are given below, regarding the NPP and the HFR.

NPP

The staff of the Borssele NPP is fully aware of the necessity of having safe working conditions and practices to avoid any harm to humans, installation or environment. The policy is to execute no activity until it is ensured that it can be done safely.

Integrated risk analysis, procedures, instructions, checklists, training programs, etc. have been developed to ensure that important safety considerations are not forgotten or overlooked when planning and carrying out the work. Pre-job briefings and last minute risk assessments are used as last safety barriers and independent safety inspectors are employed for monitoring and oversight.

Safety performance is monitored and evaluated by the LH to discover underlying causes and trends. In addition independent safety assessments, like reviews by safety specialists from peer companies, are used to identify areas for improvement. Also WANO peer reviews and OSART missions contribute to further improve LH's safety culture. The last OSART mission in 2014 was combined with an ISCA module (Integrated Safety Culture Assessment) and a Corporate OSART module (assessment of the role of the top-management of EPZ). Important areas for improvement which were identified during last (peer) reviews include: leadership, performance measurement and operating experience. Action plans have been developed and implemented by LH in areas such as reinforcement of management expectations, strengthening ownership and improving risk awareness, supported by a restructuring of the management system to strengthen the continuous improvement cycle.

Management expectations have been evaluated, simplified and clarified. They now stem from the following top-level expectations:

- We always give priority to nuclear safety.
- We either work safely or we stop.
- We adhere to rules, procedures and what we have agreed.
- We use human performance tools to do our work safely.
- We cooperate, share knowledge and experience, and encourage improvement.

Weekly themes address a specific expectation, often based on planned activities or recent observations.

The human performance programme has been improved and undergoes continuous improvement to better support the management expectations.

The OSART Follow-ups in December 2016³⁷ and 2017³⁸ are recent independent reviews of safety culture. The teams noted significant progress in safety culture related programmes, such as the Culture for Safety, Leadership for Safety and Human Performance programmes. Improvements were evident in safety related indicators and confirmed by the team in areas such as openness and trust, communication, use of operating experience, work practices and in radiation safety.

HFR

It has since more than 10 years a licence provision to regularly invite an external peer review (INSARR or equivalent), that includes safety culture. The last INSARR was in 2016. In addition in 2017 also an ISCA mission took place at all operational entities of NRG, including the HFR. The IAEA team noted several efforts to enhance safety and safety culture within the organization and found the workforce at all levels open, approachable and willing to discuss safety. There were still various areas with elements of them in need of attention. The most important areas concerned were Leadership, Management System, Nuclear Safety and Safety Culture Attention, Training and Competence, Communication,

³⁷ Report of first stage follow-up of OSART mission can be found at the ANVS website: https://www.autoriteitnvs.nl/binaries/anvs/documenten/rapporten/2017/09/14/report-of-the-osart-mission-to-epz-and-first-stage-follow-up-mission/report-of-the-operational-safety-review-team_2016.pdf

³⁸ Report of second stage follow-up of OSART mission can be found at: <https://www.autoriteitnvs.nl/binaries/anvs/documenten/rapporten/2018/05/02/eindrapport-osart-missie/OSART+rapport.PDF>

Interactions, Workload and Resources and Committee roles, independent review and quality assurance. In April 2019, in parallel INSARR³⁹ and ISCA⁴⁰ follow-up missions were conducted and good progress was noted.

(a) Management systems give due priority to nuclear safety

For the situation regarding management systems at the LH, and regulatory requirements governing them (like in MR NV), refer to the text on Article 6.1(d) in the present report.

In the text above on Article 8b, the management system of the ANVS (AIM), giving due priority to safety has already been described, including its leading principles.

All processes of the ANVS 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.

(b) Arrangements by the LH to register, evaluate and document internal and external safety significant operating experience

MR NV in article 8 requires the LH as part of its safety culture to collect, document and evaluate operational experience. In its article 11, MR NV requires the LH to strive for continuous improvement – and take account of internal as external safety- relevant operating experience. On top of this, MR NV article 11 requires the LH to conduct PSRs. In these PSRs, among others, the LH shall analyse its own as well as international operating experience. In the licences of nuclear installations more detailed requirements with respect to such analyses may be specified through the licence conditions, sometimes referring to guidance documents.

(c) Obligation of LH to report events with a potential impact on nuclear safety to the competent regulatory authority

MR-NV article 8 requires the LH to report such events to the competent regulatory authority.

All licences of nuclear installations have conditions on reporting situations and events that may affect nuclear safety and/or radiation protection. In periodic (desk top) inspections – quarterly for the NPP, at least yearly for the other installations – ANVS checks whether or not the nuclear installations fulfilled this obligation and implemented the lessons learnt from the events.

Furthermore, the ANVS has published a guideline for licensees on reporting incidents, detailing who is responsible for reporting these events, how and within how many hours or days they must be reported, and the requirements for written reports.

The licence of the NPP includes a set of NVRs, of which NVR NS-R-2 also contains the requirement to report aforementioned situations and events. The system at the NPP for documenting and reporting of events is based on NVR NS-G-2.11, 'A System for the Feedback of Experience from Events in Nuclear Installations'.

Other nuclear installations also have procedures in place for documenting and reporting to the ANVS of events with a potential impact on nuclear safety.

(d) Arrangements for education and training, in accordance with Article 7

Refer to the text on Article 7 of the Directive in the present report for information on these arrangements.

³⁹ Report can be downloaded at: <https://www.autoriteitnvs.nl/binaries/anvs/documenten/rapporten/2019/07/02/definitief-rapport-iaea-follow-up-insarr-missie-en-isca-missie/NRG+Final+INSARR+FU+April+2019+Report+derestricted.pdf>

⁴⁰ Report can be downloaded at: <https://www.autoriteitnvs.nl/binaries/anvs/documenten/rapporten/2019/07/02/definitief-rapport-iaea-follow-up-insarr-missie-en-isca-missie/NRG+Final+ISCA+FU+April+2019+Report+derestricted.pdf>

Article 8c

Initial assessment and periodic safety reviews

Article 8c

Initial assessment and periodic safety reviews

Member States shall ensure that the national framework requires that:

- (a) any grant of a licence to construct a nuclear installation or operate a nuclear installation, is based upon an appropriate site and installation-specific assessment, comprising a nuclear safety demonstration with respect to the national nuclear safety requirements based on the objective set in Article 8a;
- (b) the licence holder under the regulatory control of the competent regulatory authority, re-assesses systematically and regularly, at least every 10 years, the safety of the nuclear installation as laid down in Article 6(c). That safety reassessment aims at ensuring compliance with the current design basis and identifies further safety improvements by taking into account ageing issues, operational experience, most recent research results and developments in international standards, using as a reference the objective set in Article 8a.

(a) Licences based upon appropriate site and installation-specific safety assessment The Acts applicable to licensing of a nuclear installation have been listed in the text on Article 4. Main examples are the Nuclear Energy Act (Kew), the Environmental Protection Act (Wm) and the General Administrative Act (Awb). Also several Governmental Decrees and Ministerial Regulations apply; they too can be found in the text on Article 4.

Site specific aspects need to be considered in the licence application and these are governed by among others the Spatial planning act. Licenses for nuclear installations also require an EIA, according to the Environmental impact assessment decree. An EIA will also address all kinds of characteristics of the site.

The requirements for the construction licence application are contained in the Bkse articles 6 and 11. Bkse requires the LH to consider the site-specific aspects like geography, geology, climate, demographics, hydrologic data, ecology and other relevant site-specific data. Bkse further requires the LH to conduct a risk analysis and submit to the ANVS a Safety Report with its results. The safety criteria the nuclear installation has to comply with, in addition to the objective in article 8a of the Directive, are contained in Bkse articles 18 and 19. Refer to section 6.1(b) of the present report for these criteria.

For new reactors, the Dutch 'Safety Guidelines' (VOBK) established in 2015, provide, among others, guidance on siting and design issues. WENRA, IAEA and other recommendations have been incorporated, derived from various documents, like NS-R-3 'Site Evaluation for Nuclear Facilities'. Although the Safety Guidelines do not have the status of (ministerial) Regulations and do not therefore define any legal requirements, initial construction and operating licence applications will be assessed on the basis of the safety requirements described in these Safety Guidelines. For more background information on the VOBK, refer to the chapter on Article 4.

The technical requirements part of the VOBK is also called the 'Dutch Safety Requirements' (DSR) and is in the English language. For an extensive description of VOBK/DSR, refer to the 8th national report of the Netherlands for the Convention on Nuclear Safety (Appendix 1). The safety objectives for new power reactors recommended by the Western European Nuclear Regulators Association (WENRA) have been implemented in the technical safety concept. The technical requirements part of the DSR has seven main chapters and six annexes. The most important chapters are chapters 2 and 3. Chapter 2 of the DSR-part of the VOBK addresses five main topics:

- Concept of 'Defence in Depth' (DiD), with levels of defence 1, 2, 3a, 3b, 4 and 5. The levels of defence shall be independent as far as practicable.
- Concept of multi-level confinement of radioactive inventory, with barriers and retention functions and their links to the various levels of defence.
- Concept of fundamental safety functions; reactivity control, core cooling and confinement of radioactive materials. For all levels of defence, the DSR describes the requirements that need to be fulfilled in relation to these safety functions – where applicable.

- Concept of Protection against internal and external events. There shall be no failure of safety systems due to external events. With internal hazards, only the affected systems are allowed to fail. Combinations of hazards shall be taken into account.
- Radiological safety objectives that have to be complied with. The DSR requires that large releases shall be practically eliminated. Only limited (in area and time) protective measures shall be needed at DiD level 4.

Implementation of the technical safety concept results in practical elimination of phenomena that might lead to large and early releases.

Chapter 3 of the DSR addresses the technical requirements that when fulfilled will contribute to implementing technical safety concept of chapter 2 of the DSR. Chapter 3 lists many requirements for among others design of the reactor core and shut down systems, fuel cooling in the core, reactor coolant pressure boundary, buildings, containment system, I&C, control rooms etcetera. Various requirements have been stepped up in comparison to current requirements, like those for redundancy.

Safety Report, Safety Analysis Report and PSA

As mentioned above, to support its licence application, the LH shall draft (among others) a Safety report (SR) and also a more detailed Safety Analysis report (SAR), which it shall submit to the ANVS together with the application. The SR is the report that is attached to the licence, and as such it is a public document. It describes the organisation, the design, the outcomes of the safety analyses, et cetera into some detail. The SAR gives a more detailed description of the proposed facility and presents an in-depth analysis of the way in which it complies with the NVRs and other applicable regulations (such as VOBK). Its claims are supported by detailed descriptions of the safety analyses, simplified system diagrams, and other supporting documents. To illustrate the difference between SR and SAR: the Borssele NPP SR is a one-volume document, whereas the associated SAR is a twenty-volume document.

For nuclear reactors, the SAR is supported by a Probabilistic Safety Analysis (PSA), comprising levels 1, 2 and 3. The PSA – in particular the level-3 part of it – is needed to demonstrate that the facility meets the probabilistic safety criteria as laid down in the regulations (Bkse Decree). For non-reactor facilities in the Netherlands, like COVRA and Urenco, there is no need for a PSA considering the more limited potential radiological impact of accidents at these facilities.

(b) Periodic Safety Reviews

The Netherlands has a decades long history of PSRs. In the texts on Articles 6.1(a) and 6.1(c), the instrument of Periodic Safety Reviews (PSRs) has already been mentioned, as well the regulation (e.g. IAEA SSG-25) and licence conditions requiring LHs to perform them. Section 6.1(c) also details the methods and approaches undertaken by the ANVS to oversee the implementation of measures stemming from these PSRs. These texts also provide examples of associated modifications, resulting from PSRs.

It should be noted that at the NPP, there are measures resulting from the PSRs, but also measures resulting from the LTO programme, and the post-Fukushima evaluation. Sometimes these measures are interrelated. Appendix 5 of the 8th national report of the Netherlands for the CNS, provides details of all PSR conducted at the NPP, as well as the measures that resulted from these. Appendix 6 of the CNS report provides information on the PSRs that have been conducted for the HFR.

Table 4 Overview of recent PSRs

Facility	Most recent 10 yearly PSR (to be) finished	Remark
KCB, Borssele NPP	2013	3rd PSR
HFR, RR in Petten	2014*	2nd PSR
HOR, RR in Delft	2021	1st PSR
Urenco, enrichment	2017	1st PSR
COVRA, storage SF and radwaste	Expected 2020	2nd PSR

*The next PSR of the HFR has started and is to be finished in 2021.

Article 8d

On-site emergency preparedness and response

1. Without prejudice to the provisions of the Directive 2013/59/Euratom, Member States shall ensure that the national framework requires that an organisational structure for on-site emergency preparedness and response is established with a clear allocation of responsibilities and coordination between the licence holder, and competent authorities and organisations, taking into account all phases of an emergency.
2. Member States shall ensure that there is consistency and continuity between the on-site emergency preparedness and response arrangements required by the national framework and other emergency preparedness and response arrangements required under Directive 2013/59/Euratom.

8d.1 *National framework requiring organisational structure for on-site emergency preparedness and response*

The national framework for on-site emergency preparedness has been described in section 6.1(e) of the present report.

Off-site emergency preparedness and response (EP&R) and post-accident management (PAM) mainly is a responsibility of the authorities. Nevertheless LH's responsibility is also important, especially regarding providing technical information on plant conditions and the potential risk for emissions.

8d.2 *Ensuring there is consistency and continuity between the various emergency preparedness and response arrangements satisfying Directive 2013/59/EURATOM*

The Netherlands has transposed 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.

Consequently, on 6 February 2018, the Decree on Basic Safety Standards for Radiation Protection (Bbs) and underlying regulations came into force. The implementation of Directive 2013/59/EURATOM led to the introduction of a situation based approach (planned, emergency and existing situations) in the regulations.

In article 6.7 of the Bbs it is stated that LHs in certain appointed categories, among which LHs of nuclear installations, shall have company emergency response plans in place. One of the requirements of these plans is to describe the coordination between the company response and all other parties involved in the emergency response plan, including those in neighbouring countries, when relevant. Company emergency response plans are reviewed regularly by the ANVS.

Article 8e

Peer reviews

Article 8e

Peer reviews

1. Member States shall, at least once every 10 years, arrange for periodic self-assessments of their national framework and competent regulatory authorities and invite an international peer review of relevant segments of their national framework and competent regulatory authorities with the aim of continuously improving nuclear safety. Outcomes of such peer reviews shall be reported to the Member States and the Commission, when available.
2. Member States shall ensure that, on a coordinated basis:
 - (a) a national assessment is performed, based on a specific topic related to nuclear safety of the relevant nuclear installations on their territory;
 - (b) all other Member States, and the Commission as observer, are invited to peer review the national assessment referred to in point (a);
 - (c) appropriate follow-up measures are taken of relevant findings resulting from the peer review process;
 - (d) relevant reports are published on the above mentioned process and its main outcome when results are available.
3. Member States shall ensure that arrangements are in place to allow for the first topical peer review to start in 2017, and for subsequent topical peer reviews to take place at least every six years thereafter.
4. In case of an accident leading to situations that would require off- site emergency measures or protective measures for the general public, the Member State concerned shall ensure that an international peer review is invited without undue delay.

8e.1 *Periodic self-assessments and peer review of national framework and competent regulatory authority*

In November 2014, the Netherlands hosted its first IRRS mission. In preparation, the competent regulatory authority had performed a self-assessment.

In November 2018 a follow-up mission took place. The follow-up mission visited the Dutch competent regulatory authority in a completely new situation, since the ANVS has been established in 2015. There was also a completely new management, and none of the present management team members had experienced the 2014 mission. On the other hand, after the detailed structuring of the organization in 2016, the management has strongly steered the organization to complete the recommendations and suggestions of the first IRRS mission. The result was that finally 26 out of 45 recommendations and suggestions were fully closed, 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 creation of release radiation levels of a greenfield after dismantling of an installation or finalisation of an activity. ANVS management strives for completion of all 19 issues within a few years.

The mission reports have been published and sent to the European Commission and Member States.

The Government has requested the next IRRS mission to the Netherlands during the first half of 2023.

8e.2 National assessments to be conducted on a specific topic and to be peer reviewed

The Netherlands has participated in the ENSREG-led Topical Peer Review on Ageing Management (TPR-AM). In December 2017, in preparation for the Peer Review, it published the 'Netherlands' National Assessment Report for the Topical Peer Review on Ageing Management'.

September 2019, the Netherlands also published its Action Plan on Ageing Management⁴¹.

8e.3 Member States to ensure periodic topical peer reviews take place

Such arrangements are in place and are coordinated by ENSREG.

8e.4 Invitation of peer review after accidents that require off-site emergency or protective measures

Not applicable.

⁴¹ See ENSREG website: http://www.ensreg.eu/sites/default/files/attachments/the_netherlands.pdf

This is a publication of the
Ministry of Infrastructure and Water Management

Report prepared by the
Authority for Nuclear Safety and Radiation Protection (ANVS)

PO Box 16001 | 2500 BA The Hague,
The Netherlands www.anvs.nl
June 2020