Convention on Nuclear Safety
8th and 9th Review Meeting – 2023

International Atomic Energy Agency IAEA, Vienna

Country Review Report for

NETHERLANDS

Drafted by Country Group [N° 2]

(Australia, Belarus, Cuba, Czech Republic, France, Libya, Morocco, Niger, Portugal, Slovenia, Spain, Syrian Arab Republic, The Netherlands)

Rapporteur: [Ms Nangamso Silinga]

Version : Final

DISCLAIMER: Per INFCIRC 571, Revision 7, Para. 16-19 and Annex IV, Contracting Parties were invited to comment on the implementation of the CNS reporting guidance. Contracting Parties were also encouraged to submit proposed Good Practices, Challenges, and Suggestions prior to the Review Meeting. The draft Country Review Report documents the preliminary observations identified by the Contracting Parties. The Country Review Report is the result of the CNS Review Process and was agreed by consensus by the Country Group.

Glossary

The Glossary provides here the definitions of "Challenges", "Suggestion" and "Good Practice" according to Annex IV of INFCIRC/571/Rev. 7. The definition of "Area of Good Performance" was agreed upon by the Officers of the 8th CNS Review Meeting at the CNS Officers' Meeting on TBD.

A **Challenge** is "a difficult issue for the Contracting Party and may be a demanding undertaking (beyond the day-to-day activities); or a weakness that needs to be remediated."

A **Suggestion** is "an area for improvement. It is an action needed to improve the implementation of the obligations of the CNS."

A **Good Practice** is "a new or revised practice, policy or programme that makes a significant contribution to nuclear safety. A Good Practice is one that has been tried and proven by at least one Contracting Party but has not been widely implemented by other Contracting Parties; and is applicable to other Contracting Parties with similar programmes."

An **Area of Good Performance** is "a practice, policy or programme that is worthwhile to commend and has been undertaken and implemented effectively. An Area of Good Performance is a significant accomplishment for the particular CP although it may have been implemented by other CPs."

Executive Summary

The Netherlands has one nuclear power plant in operation: the Borssele NPP (a PWR, Siemens/KWU design). This is the only installation according to the definition in Article 2 of the Convention. There is also one shut-down plant in 'safe enclosure': the Dodewaard NPP (a BWR, GE design, 60 MWe). In addition, there are two research reactors in operation, the largest of which has a thermal power of 45 MW, the High Flux Reactor (HFR) in Petten. The second one is the 'Hoger Onderwijs Reactor' of the Technical University of Delft, which has a thermal power of 2 MW. A third research reactor, the LFR30(30 kWth), was taken out of operation permanently in 2010 and its decommissioning was completed in 2018. PALLAS research reactor final license was granted.

Four (4) out of Four (4) Challenges from the 7th Review Meeting have been closed.

The Country Group highlights the following measures to improve safety in The Netherlands's national nuclear programme:

- 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. This is related to the transposition of the Council Directive 2014/87/Euratom of 8 July 2014 (amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear facilities). The transposition of the Directive was prepared in 2016 and resulted in a new Ministerial Ordinance on Nuclear Safety 14 June 2017 (MR-NV). Noteworthy is also the transposition of Council Directive 2013/59/Euratom, laying down basic safety standards for protection against the dangers arising from exposure to radiation, in its national legislation. On 6 February 2018, the Decree on Basic Safety Standards for Radiation Protection (In Dutch: "Besluit basisveiligheidsnormen stralingsbescherming") and its underlying regulations have come into force.
- Appendix 5 of the National Report provides details about modifications completed since the start of the power plant based on lessons learned and PSRs. The implementation of the measures of the 3rd PSR was finished in 2017. The improvements from the complementary safety review (European Stress test) were largely implemented in the same time frame, only one measure was completed later, in 2019. The improvements made from the 'stress test' and the progress are listed in the summary and some information on a selection of them is presented in the text on Article 14 of the 8th and 9th National Report.
- The additional measures based on the stress test (refer to Part II of the Summary) increased robustness of the plant 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. For the coming years the ANVS is looking closely at the development of ideas internationally to stabilize the molten core after vessel melt-through in an existing reactor, using (part of) the functionalities of a core catcher in an adapted way.

The Country Group highlights the following results of international peer review missions of The Netherlands:

- There has been an IRRS in 2014 and a follow-up in 2018. These have been reported in the Netherlands' previous national report to the CNS. In June 2023 there will be an IRRS mission and in the second half of 2023 an ARTEMIS mission, the so-called back-to-back.
- In 2017 all EU Member States and some neighbouring states carried out a National Assessment of Ageing Management Programmes (AMPs) of nuclear installations (NPPs and RR > 1 MW) under the auspices of ENSREG. The assessments were conducted according to the WENRA.
- Topical Peer Review Specifications. In 2018 these were peer reviewed in an ENSREG-led workshop. A national action plan has been published in September 2019 and it was updated in 2021 (see ENSREG website).
- Borssele intensified its efforts for improvement of safety culture. There has been a two-stage follow-up. During the OSART follow-up meeting in December 2016 the IAEA performed an interim review on safety culture (together with Management, Organization and Administration) and corporate). In the autumn of 2017, there was the actual follow-up meeting on safety culture.
- Missions to the (High Flux Reactor) HFR
    - In 2017 there has been an Integrated Safety Culture Assessment (ISCA mission) to the broader NRG operations branch (including the HFR), in April 2019 the 2016 INSARR and 2017 (ISCA) missions were both followed-up at the same time and finally in June 2022 there was an LTO mission, a Continued Safe Operation (CSO) mission, which is a kind of SALTO mission for RRs. This mission had been postponed due to the Covid-19 pandemic.
- Mission to the 'Hoger Onderwijs Reactor' (HOR)
    - In 2021 it was visited by an INSARR mission and there will be a follow up in 2023 to evaluate the implementation of the recommendations of 2021.
- In 2020 there was a WANO peer review. The LH is implementing improvements suggested in the review. In addition, the LH is participating in WANO's 'Action for excellence' pilot programme. The next WANO Peer Review will be in 2024.

An OSART mission has been held in January 2023.

The Country Group identified the following Challenges for The Netherlands:

Challenge 2023-01: ANVS managing the (need for) fast growing human resources

- Recruitment efforts in a tense labor market in competition with industry
- Dealing with the fast growing number of new workers (training/tutoring)
- Prevention of existing and new workers leaving (worker satisfaction)

- **Challenge 2023-02: Readiness for the developments from the Government plan on nuclear energy and SMRs**
  - Evaluation of nuclear framework (Ministry I&W)
  - Preparing for (pre-licensing of new NPPs, 2 nd LTO, SMRs, ANR (ANVS)
- **Challenge 2023-03: Attacks on automation systems:** The threat of (digital) attacks on automation systems is growing rapidly, both nationally and internationally. The associated risks may increase as more operational technology systems are digitally and remotely controlled. In the nuclear domain, both criminal and state actors are considered as a threat. It is important to be remain alert in order to minimise such risks in the nuclear sectors. ANVS cooperates with LHs and various national security services in this field.

In addition, the country group identified 6 Areas of **Good Performance** and 0 Area of Good Practice. No suggestions were identified.

The Country Group did not identify Good Practices:

The following Areas of Good Performance of The Netherlands were commended by the Country Group:

- **Area of Good Performance 2023-01**: In 2019-2021, the High Flux Reactor (HFR) research reactor underwent a full scope PSA. This is the first research reactor in the world to have undergone a full scope probabilistic safety assessment.
- **Area of Good Performance 2023-02** updating of regulations and the nuclear energy act to create an independent ANVS.
- **Area of Good Performance 2023-03:** The ANVS provides specialized training for its staff and has a dedicated education plan for each function group. Currently, efforts are made to integrate the education plans and the relevant trainings into a single platform: the ANVS Academy. This learning & development platform offers training in technical aspects as well as personal development. This platform was launched in June 2022 and will continue to grow.

- **Area of Good Performance 2023-04:** After 50 years the granting of a construction license for a reactor (PALLAS)
  - First complete reactor reviewed against the state-of-the-art technical guidelines (VOBK).
  - Experiences with this trajectory are used in the preparation and/or (pre-licensing for new projects (NPP/Shine) and in the ANVS processes.
- **Area of Good Performance 2023-05:** Early anticipation on the new developments.
  - Taking a proactive approach in anticipation of nuclear development programme from the lessons learned from licensing of the PALLAS reactor and planning for different growth scenarios for nuclear expansion.
  - This included over a 2 years' time frame, early preparations for 2nd LTO, (a.o. recap 1 st LTO and enter IGALL)
  - Reinforcements of human resources planning and recruitment, training and qualification, documentation management, etc.
  - Updating of the Strategic Course Document
  - Evaluation and decision to adjust the organisation by February 2023 Amongst others: more flexibility to developments.
  - Large campaign to recruit new staff (30% growth to 150+ in 2022)
  - Long term contract new TSO

- **Area of Good Performance 2023-06:** Creation, in recent years, of extensive information for licensees on ANVS' policy on licensing, inspection and enforcement and more.
  - Already being updated based on experience with the implementation.
  - Explanation in detail of the application of the 'intervention matrix' for proportionate enforcement.

Country Group 2 concluded that Country Netherlands:

- Submitted National Reports for the 8th CNS Review Meeting and for the Joint 8th and 9th CNS Review Meeting, and therefore complies with Article 5 and in time, following Rule 39 of INFCIRC/573/Rev.6
- Attended the Joint 8th and 9th CNS Review Meeting, and therefore complies with Article 24.1.
- Held a national presentation and answered questions during the Joint 8th and 9th CNS Review Meeting, and therefore complies with Article 20.3.

1. Basic Information on The Netherlands Nuclear Programme

The Netherlands has a small nuclear programme, with only one nuclear power plant, producing about 4% of the country's electrical power consumption. In 2006 The Dutch government signed an agreement with the owners of the Borssele NPP, which allows for operation until the end of 2033, at the latest. In 2017 Delta N.V., main owner of Borssele NPP, was split into three parts. This was required because of national legislation requiring unbundling of generation and network activities. One of the parts is PZEM B.V.6, a company with activities: energy production, trade and supply to businesses. One of the main assets of PZEM is now the 70% share in company EPZ, licensee of NPP Borssele.

The nuclear programme in the Netherlands features a number of other steps of the nuclear fuel cycle. Some of the Dutch nuclear businesses have a global impact. Urenco supplies a major part of the world-demand for low-enriched uranium. Its plant in Almelo, the Netherlands, represents more than a quarter of its production capacity. The company ET-NL in Almelo supplies all centrifuges for the enrichment plants of Urenco and Areva – world-wide. The High Flux Reactor (HFR) in Petten, on average supplies 70% of the European demand for radio-isotopes – and no less than 30% of the global demand.

A new research reactor (named PALLAS) is under consideration in order to replace the HFR. The national government and the province of North Holland together provided a loan of about 80 Meuro to finalize licensing and design of PALLAS. Recently (June 2022) the project applied for a licence, and review of the licence application by ANVS is under way. During 2022 important decisions on the continuation of the project are expected. The construction license was granted in February 2023. According to the PALLAS organisation, the plan is to have finished construction of the new reactor in around 2028.

The Delft University of Technology is conducting a project Oyster to upgrade the research facilities in its research reactor. Oyster is jointly financed by the university and the national government. The work is due to be completed in 2022.

2. Follow-Up from previous CNS Review Meeting

2.1 Challenges

The Netherlands provided the following updates on Challenges identified during the 7th CNS Review Meeting:

Challenge 1: Maintaining nuclear safety at the NPP during the remaining operating years facing end of operation December 31st, 2033.

The Operator EPZ which regularly received WANO and IAEA missions, organised education and training for its staff, has established a 'Young EPZ Professionals' program as a response to demographic changes,

and is committed to reinforcing nuclear safety as the number one priority. Also a change of management structure has been implemented to further the accountability for nuclear safety. There is also a 'culture for safety programme', to further develop and sustainably improve leadership, continuous improvement and management system activities. ANVS has annual high-level meetings with EPZ about organization and safety culture developments.

Follow Up Status: **Closed**

Challenge 2: Development of expertise and regulatory strategy related to safety relevant financial issues at license holders:

The Netherlands addressed this Challenge through different actions initiated by ANVS. As an example, ANVS has contracted staff with the necessary financial expertise and in addition, when needed, knowledgeable advisors are contracted. Since 2018 License Holders are requested to provide the ANVS with their yearly (financial) reports together with auditors reports over the last five years and to update these every year. This information is used to analyse the financial position of License Holders: particularly to establish whether there is sufficient liquidity and solvency to secure safety. Signal values are established and these are used in a risk-based approach. Together with the results of qualitative analyses of the financial yearly reports, this can lead to an examination of possible safety risks.

Follow Up Status: **Closed**

Challenge 3: Strengthening the 3S's and safety culture with ANVS's activities:

Safeguards, Safety and Security cover all aspects of institutional arrangements for regulating the use of nuclear energy. Establishment of ANVS as an independent regulatory body incorporating the 3S's was a good step forward. Strengthening the 3S's has been achieved by the ANVS carrying out combined safety- and security-inspections at License Holders starting in 2019. In international context, the ANVS supports 3S-initiatives where it can; e.g. the creation of the WENRA Task Force on the Interface between Nuclear Safety and Nuclear Security.

Follow Up Status: **Closed**

Challenge 4: 'Cross border inspections':

In the current legal framework, ANVS-staff cannot perform inspections in a neighbouring country, since it does not have jurisdiction outside the Netherlands. The term 'cross border inspection' therefore refers to a form of Regulatory Experience Feedback (REF) by joining inspection teams of neighbouring countries or receiving such teams in the Netherlands. Such REF activities and others are now happening with increasing frequency. with Belgian counterpart FANC in particular.

Follow Up Status: **Closed**

2.2 Suggestions

There were no identified suggestions during the 7th CNS Review.

3. Measures to improve safety

3.1 Changes to the regulatory framework and the national nuclear programme

Since the last Review Meeting, the Country Group took note that several laws and regulations affecting nuclear safety matters were officially approved and published:

- Since the last national report, the Nuclear Energy Act and subordinate regulation were updated with the legal establishment of the ANVS as an independent administrative authority (Dutch acronym: zbo). The ANVS is independent in its functioning (including decision making) and organising its activities, but a Minister remains politically responsible for its functioning and is accountable to the Parliament. Furthermore the Act no longer addresses energy supply.
- The Council Directive 2014/87/Euratom of 8 July 2014 (amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear facilities) transposition into Dutch law was prepared in 2016 and was completed in 2017 and resulted in a new Ministerial Decree on Nuclear Safety (MR-NV).
- 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.

As per the 9th National Report these are the Changes to legislative and regulatory framework since publication of the 8th national report:

- 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.
- 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 Regulatory Body ANVS, the Authority for Nuclear Safety and Radiation Protection. Also refer

to the text on Article 8, section 8.1(d). The responsibility of IenW includes the framework of laws, decrees and Ministerial regulations on these issues. ANVS may publish specific binding ANVS-regulations that are subordinate to the aforementioned types of regulations. 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.

  - Article 8, section 8.1(d), refers: Transferring the responsibility for the task 'Evaluating and preparing policies, acts and regulations' to the Ministry of IenW. The change came into effect on May 15th, 2020. The task advising on policy and legislation and regulations on the basis of its specific knowledge and expertise remains with the ANVS. The ANVS has also the task of participating in the definition of regulations on nuclear safety as referred to in Article 5(3)(a) of Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for nuclear safety for nuclear installations (PbEU 2009, L 172), as last amended by Directive 2014/87/Euratom of 8 July 2014 (OJ 2014, L 219).

- Nuclear Safety Rules (NVRs) are IAEA Safety Requirements and Safety Guides that have been adapted to the Dutch situation. They are legally binding for an installation or nuclear facility, as far as they are referenced in their licences through a licence condition. 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 for all nuclear installations. On the basis of this, it was decided that in future, IAEA Safety Requirements will be implemented in the licences of all nuclear installations through licence conditions. More details can be found in the text on Article 7 of the CNS.
- As of February 16th, 2022, a modification of the Act, article 17, sub 4 came into force. This is in reaction to findings of the Aarhus Convention Compliance Committee in 2018. The modification aims at broadening the public participation in case of change of the design lifetime of a nuclear installation.
- Decree on Basic Safety Standards for Radiation Protection (Bbs23): 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.

3.2 Safety improvements for existing nuclear power plants

The Country Group took note of the following implemented safety measures for existing nuclear power plant in The Netherlands during the period 2016-2018:

Amongst others, the following modifications to safety improvement have been implemented in Borselle nuclear power plants, mostly as post Fukushima Daiichi measures:

- In vessel retention (IVR) has been studied by the License Holder with the support of Framatome. Internationally this topic has become more important in recent years. The License Holder concluded that it is feasible to implement the IVR in the Borssele NPP. The ANVS requested GRS to review international experience with IVR and to review the modification proposals. GRS undertook a number of verifications, amongst others its own verification calculations and concluded that the IVR should be possible. A modification application for a retro-fit of an external cooling system for the reactor pressure vessel was filed by the License Holder and it was implemented in 2017.
- Appendix 5 of the National Report provides details about modifications completed since the start of the power plant based on lessons learned and PSRs. The implementation of the measures of the 3rd PSR was finished in 2017. The improvements from the complementary safety review (European Stress test) were largely implemented in the same time frame, only one measure was completed later, in 2019. The improvements made from the 'stress test' and the progress are listed in the summary.
- The additional measures based on the stress test (refer to Part II of the Summary) increased robustness of the plant 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. For the coming years the ANVS is looking closely at the international development of ideas to stabilize the molten core after vessel melt-through in an existing reactor, using (part of) the functionalities of a core catcher in an adapted way.

3.3 Response to international peer review missions

The Country Group took note of the following implemented or planned measures in response to the results of international peer review missions:

- There has been an IRRS in 2014 and a follow-up in 2018. These have been reported in the Netherlands' previous national report to the CNS. In June 2023 there will be an IRRS mission and in the second half of 2023 an ARTEMIS mission, the so-called back-to-back.
- In 2017 all EU Member States and some neighbouring states carried out a National Assessment of Ageing Management Programmes (AMPs) of nuclear installations (NPPs and RR > 1 MW) under the auspices of ENSREG. The assessments were conducted according to the WENRA

- Topical Peer Review Specifications. In the Netherlands, Borssele NPP and the two research reactors participated, in fact conducting a self-assessment, independently reviewed by the ANVS, published in 2017. In 2018 there was a peer review, including a workshop, organised by ENSREG. In October 2018 ENSREG published a general report and a report with country specific findings. In 2019 the National Action Plan was published, and it was updated in 2021 (see ENSREG website).
- Borssele intensified its efforts for improvement of safety culture, after recommendations from the OSART/ISCA mission in 2014. There has been a two-stage follow-up. During the OSART follow-up meeting in December 2016 the IAEA performed an interim review on safety culture (together with MOA93 and corporate). In the autumn of 2017, there was the actual follow-up meeting on safety culture.

  The main elements of the new approach to safety culture are:

  - Reinforcing nuclear safety as the number one priority
  - Reinforcing accountability for nuclear safety
  - Engaging all employees in improvements through the improvement programme
  - Culture for safety programme
- Missions to the (High Flux Reactor) HFR
  - In 2017 there has been an Integrated Safety Culture Assessment (ISCA mission) to the broader NRG operations branch (including the HFR)
  - In April 2019 the 2016 INSARR and 2017 ISCA missions were both followed-up at the same time. After the follow-up the IAEA concluded that there was a high level of implementation of the INSARR recommendations. Main issues that still need attention are the revision of the safety analysis report, handling of documents by the safety committee and the development of the dismantling plan. On the ISCA side the IAEA was positive about the NRG Leadership for Safety Programme, the developments of the roles and task perceptions of all staff and training and communication on safety culture. Main issues that need attention are keeping the management system up-to-date, the functioning of the reactor safety committee and the perceptions on the workload. During the mission IAEA already looked at the scope and selection of SSCs for the LTO-programme. The licensee was advised that the safety classification and its scope shall be improved.

- and finally in June 2022 there was an LTO mission, a Continued Safe Operation (CSO) mission, which is a kind of SALTO mission for RRs. This mission had been postponed due to the Covid-19 pandemic. Results of the mission will be presented at the CNS review meeting, but some highlights of the mission were:
  - IAEA noted that the assignment of a dedicated ageing management coordinator is a good performance.
  - IAEA recommends ensuring a systematic implementation of the obsolescence programme.
  - IAEA recommends updating the ageing management review methodology in accordance with the standards for all in-scope civil structures and components.

- The HOR is the RR in Delft. In 2021 it was visited by an INSARR mission. The INSARR team noted priority to safety during the recent renovation and modernisation of the reactor and the completion of all measures that resulted from the self-evaluation (so-called stress test). The effective communication between ANVS and the LH was noted as well. There were also some recommendations, like:
  - Strengthening the organizational structure for operation by clarifying roles and responsibilities for safety to avoid potential conflicts of roles and duties;
  - Enhancing the functioning of the HOR safety committee by revising the safety documents to be submitted for review in accordance with the IAEA safety standards No. SSR-3, and by enhancing working procedures;
  - Improving the programme for restart of the reactor operation after the prolonged shutdown period by retraining reactor operating personnel and updating reactor safety documents and operating procedures to reflect recent modifications;
  - Enhancing ageing management by addressing obsolescence of systems and components and by using feedback from the reactor operation and safety assessment.

    In 2023 there will be a follow-up INSARR mission. It will evaluate the implementation of the recommendations of 2021. Currently the compulsory 10-yearly PSR is being conducted. It has been agreed that the recommendations stemming from the INSARR mission will be integrated in the final report of the PSR.

- In 2020 there was a WANO peer review to EPZ (NPP). The LH is implementing improvements suggested in the review. In addition, the LH is participating in WANO's 'Action for excellence' pilot programme. The next WANO Peer Review will be in 2024.
- An OSART mission was held in January 2023.

4. Implementation of the Vienna Declaration on Nuclear Safety (VDNS)

On 9 February 2015, the Contracting Parties adopted INFCIRC 872,"Vienna Declaration on Nuclear Safety", which is a commitment to certain principles to guide them in the implementation of the CNS' objective to prevent accidents and mitigate their radiological consequences, should they occur. The Contracting Parties agreed to discuss the principles of the Vienna Declaration on Nuclear Safety in their National Reports to the 7th and the subsequent Review Meetings.

The Netherlands reports the following safety improvements to existing nuclear power plants:

- Through the subsequent Periodic Safety Reviews 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 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. For the coming years the ANVS is looking closely at the development of ideas to stabilize the molten core after vessel melt-through in an existing reactor, using (part of) the functionalities of a core catcher in an adapted way.

The Netherlands reports the following enhancements to its regulatory framework for the design, siting and construction of new nuclear power plants:

- The 2009 EU Nuclear Safety Directive (NSD) of 2011 has been updated in 2014 and envelops the safety objectives of the Vienna Declaration. As required of EU Member States, transposition of the update into the Dutch regulatory framework was completed in August 2017.
- During 2017, 2018 and the first part of 2019, the ANVS has participated in the IAEA activity to create a TECDOC that describes approaches how to deal with the safety improvement of existing NPPs.
- In the framework of WENRA the ANVS is participating in a pilot benchmark on the application and implementation of a series of two 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 pilot benchmark aims to be completed in 2020 but has been delayed until 2023, which is mostly due to the Covid-19 pandemic.
- The ANVS is also participating in an European Commission activity, carried out by ETSON, concerning practical implementation of articles of the Nuclear Safety Directive (2014), corresponding to the Vienna Declaration. It is about the approach to analyse, assess and implement safety improvements at existing NPPs.

- Apart from the transposition of the amended Nuclear Safety Directive 2014, the Dutch Safety Requirements (DSR) for new reactors are aiming at the same goal. The document containing the DSR is a guidance document. It has been created using IAEA standards and WENRA Objectives for new reactors. It will for instance be used as a reference for the next PSR at Borssele NPP (evaluation to be finished 2023) and as a guidance in the preparations for the PALLAS research reactor.

5. Results of the Review

5.1 General Quality of the National Report

Contracting Parties and officers were invited to provide general comments on the Netherlands implementation of the obligations of the CNS (e.g., report submitted on time), addressed all articles, addressed the Vienna Declaration on Nuclear Safety, and addressed all Challenges, the general quality of its National Report, transparency issues, and the compliance with the CNS guidance documents and Major Common Issues identified in the previous CNS Review Meeting.

With regards to the general quality of the National Report and transparency issues, the members of the Country Group made the following observations:

- The Report is qualified to be comprehensive and well structured. It covers all aspects of the program.
- Some Articles include a good comprehensive description of the level of compliance of HFR and HOR as well as the Borssele NPP but others only consider the NPP (e.g. Article 11). With regards to the compliance with the requirements of the CNS and its Guidelines,
- The Report for the 8th CNS Review Meeting was submitted on time before the deadline of 15 August 2019.
- The Report for the Joint 8th and 9th CNS Review Meeting was submitted before the deadline 5 August 2022.
- The content and structure of Netherlands National Report for the Joint 8th and 9th CNS Review Meeting does comply with the CNS guidance
- The directions of the Summary Report of 7th CNS Review Meeting were taken into consideration in the Report for the Joint 8th and 9th CNS Review Meeting.

5.2 Participation in the Review Process

With regards to The Netherlands's participation in the Review process, the members of the Country

Group made the following observations. Netherlands

- did post questions to the Contracting Parties.
- delivered answers to the questions of Contracting Parties on time.
- delivered its national presentation during the Joint 8th and 9th Review Meeting

5.3 Challenges

The Country Group identified the following Challenges for The Netherlands.

- **Challenge 2023-01: ANVS managing the (need for) fast growing human resources**
  - Recruitment efforts in a tense labor market in competition with industry
  - Dealing with the fast growing number of new workers (training/tutoring)
  - Prevention of existing and new workers leaving (worker satisfaction)
- **Challenge 2023-02: Readiness for the developments from the Government plan on nuclear energy and SMRs**
  - Evaluation of nuclear framework (Ministry I&W)
  - Preparing for (pre-licensing of new NPPs, 2 nd LTO, SMRs, ANR (ANVS)
- **Challenge 2023-03: Attacks on automation systems:** The threat of (digital) attacks on automation systems is growing rapidly, both nationally and internationally. The associated risks may increase as more operational technology systems are digitally and remotely controlled. In the nuclear domain, both criminal and state actors are considered as a threat. It is important to be remain alert in order to minimise such risks in the nuclear sectors. ANVS cooperates with LHs and various national security services in this field.

5.4 Suggestions

The Country Group identified no Suggestion(s) for The Netherlands.

5.5 Good Practices and Area of Good Performance

During the peer review of The Netherlands's National Report, the Contracting Parties were invited to recommend Good Practices and to highlight Area of Good Performance.

The Country Group did not identify Good Practices:

The following Areas of Good Performance of The Netherlands were commended by the Country Group:

- **Area of Good Performance 2023-01**: In 2019-2021, the High Flux Reactor (HFR) research reactor underwent a full scope PSA. This is the first research reactor in the world to have

undergone a full scope probabilistic safety assessment.

- **Area of Good Performance 2023-02** updating of regulations and the nuclear energy act to create an independent ANVS.
- **Area of Good Performance 2023-03:** The ANVS provides specialized training for its staff and has a dedicated education plan for each function group. Currently, efforts are made to integrate the education plans and the relevant trainings into a single platform: the ANVS Academy. This learning & development platform offers training in technical aspects as well as personal development. This platform was launched in June 2022 and will continue to grow.
- **Area of Good Performance 2023-04:** After 50 years the granting of a construction license for a reactor (PALLAS)
  - First complete reactor reviewed against the state of the art technical guidelines (VOBK).
  - Experiences with this trajectory are used in the preparation and/or (pre-licensing for new projects (NPP/Shine) and in the ANVS processes.
- **Area of Good Performance 2023-05:** Early anticipation on the new developments.
  - Taking a proactive approach in anticipation of nuclear development programme from the lessons learned from licensing of the PALLAS reactor and planning for different growth scenarios for nuclear expansion.
  - This included over a 2 years' time frame. Early preparations for 2nd LTO, (a.o. recap 1 st LTO and enter IGALL)
  - Reinforcements of human resources planning and recruitment, training and qualification, documentation management, etc.
  - Updating of the Strategic Course Document
  - Evaluation and decision to adjust the organisation by February 2023 Amongst others: more flexibility to developments.
  - Large campaign to recruit new staff (30% growth to 150+ in 2022).
  - Long term contract new TSO.
- **Area of Good Performance 2023-06:** Creation, in recent years, of extensive information for licensees on ANVS' policy on licensing, inspection and enforcement and more.
  - Already being updated based on experience with the implementation.
  - Explanation in detail of the application of the 'intervention matrix' for proportionate enforcement.

5.6 Response to COVID-19 Situation

The Country Group took note of the following information related to the COVID-19 pandemic:
The covid-19 pandemic has had a major impact on the organisation of work in government and industry. In early 2020, the pandemic reached the Netherlands. Society was disrupted by the virus and resulting illnesses and deaths. Government interventions tried to contain the outbreak. Various measures were taken to limit infections. This included advice to work from home if possible, closing non-essential shops and other facilities, keeping a distance from others, a curfew and advice not to travel abroad. After achieving a high vaccination coverage, many measures were scaled down. Occasionally, the number of infections increases and the measures are tightened up again.

Work at the RB, the ANVS, generally continued well during the pandemic, although most of the work normally done at the office was done at home. Meetings were mainly held via video connection. Inspections at LHs continued, but with extra precautions to prevent infections if they were carried out onsite. Several inspections were performed remotely. The ANVS allowed the LH of the NPP to postpone part of the obligatory work during the annual maintenance stop of 2020.

At the start of the pandemic, the RB received urgent questions from hospitals. Overwhelmed by the large numbers of patients, they temporarily needed extra diagnostic equipment, especially for taking pictures of the lungs. For example, they placed extra X-ray machines in the emergency room or used mobile scanners in emergency facilities. However, according to the licence, this was not possible. To ensure that hospitals could safely examine people and continue to do their work, the RB, in consultation with the Social Affairs and Employment Inspectorate and the Health and Youth Inspectorate, made a temporary method of working possible.

At the LHs, special procedures had to be put in place to limit the risk of contamination with Covid-19 for the staff. Where possible, many office staff worked from home. For many staff in the facilities, this was obviously not possible. Additional measures on the work floor had to limit the risk of contamination.

6 Fulfilment of CNS Review Requirements

The Country Group concluded that: The Netherlands

- Submitted a National Report, and therefore complies with Article 5 and in time following Rule 39 of INFCIRC/573 Rev. 6
- Attended the 8th and 9th CNS Review Meeting, and therefore complies with Article 24.1
- Held a national presentation and answered questions, and therefore complies with Article 20.3