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

International Atomic Energy Agency IAEA, Vienna

Country Review Report for

BELGIUM

Drafted by Country Group 5

(Angola, Belgium, Bosnia and Herzegovina, Estonia, Ireland, Mali, Oman, Romania, Russian Federation, Senegal, Switzerland, Tunisia, United Arab Emirates)

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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 during the CNS Officers' Meeting on 24-25 September 2019 and confirmed by the Officers at the CNS Officers' Meeting on 18-19 July 2022.

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

Belgium has 7 nuclear power reactor units (4 at Doel NPP and 3 at Tihange NPP). All 7 are PWRs and all 7 were in operation at the time of writing the Joint 8th and 9th Review Meeting National Report but Doel 3 and Tihange 2 have since been shutdown. The remaining 5 units are currently planned for shutdown by the end of 2025; however in March 2022, the government agreed to permit long-term operation (LTO) for Doel 4 and Tihange 3 (for a further 10 years). Discussion with the licensee is currently ongoing and it is expected that the current 2025 shutdown dates for these units will be modified in the near future. The construction of new NPPs remains forbidden by law in Belgium.

4 out of 4 Challenges from the 7th CNS Review Meeting have been closed (no Suggestions were identified).

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

- A number of safety enhancements to the NPPs at Doel and Tihange have been implemented or planned to be completed as a result of the execution of ongoing action plans as described in Section 2.1. These improvements cover a number of areas: safety culture, stress tests, long-term operation, fire safety and alignment to WENRA 2014 Safety Reference Levels.
- Belgium explained that it had undertaken some additional actions in relation to emergency preparedness and response in light of the current situation in Ukraine in case of a radiological release, to address the concerns of its citizens.
- Work undertaken to assess and develop the safety culture for the regulatory body. The licensee has also undertaken a safety culture assessment. It is noted that WANO judged the continuous examination of safety culture as a strength at Doel NPP.
- Belgium has implemented a capability to be able to inject sodium hydroxide into the containment buildings of 3 NPP units in order to manage long-term corrosion following a severe accident.

The Country Group identified the following Challenges for Belgium:

- Challenge 1: If appropriate, depending on the decision regarding LTO, to complete the seismic PSA.
- Challenge 2: Updating the financing model to ensure adequate resources are provided to FANC into the future, following the decommissioning of NPP units.
- Challenge 3: Continuing to prepare the licensee and regulatory body for both the final shutdown and decommissioning together with the possible political decision regarding lifetime extension.

In addition, the Country Group identified 0 Suggestions, 6 Areas of Good Performance and 0 Good Practices.

The Country Group concluded that Belgium:

- 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 Belgium's Nuclear Programme

Belgium has 7 nuclear power reactor units (4 at Doel NPP and 3 at Tihange NPP). All 7 are PWRs and all 7 were in operation at the time of writing the Joint 8th and 9th Review Meeting National Report but Doel 3 and Tihange 2 have since been shutdown. The remaining 5 units are currently planned for shutdown by the end of 2025; however in March 2022, the government agreed to permit long-term operation (LTO) for Doel 4 and Tihange 3 (for a further 10 years). Discussion with the licensee is currently ongoing and it is expected that the current 2025 shutdown dates for these units will be modified in the near future. The construction of new NPPs remains forbidden by law in Belgium.

2. Follow-Up from Previous CNS Review Meeting

2.1 Challenges

Belgium provided the following updates on Challenges identified during the 7th CNS Review Meeting.

Challenge 1: The regulatory body to complete the new national Nuclear Emergency Plan.

Belgium completed and published the new Nuclear and Radiological Emergency Plan (NEP) in March 2018. The new NEP is based on learning from past exercises and events, the output from dedicated working groups, consideration of international good practice, advice from scientific committees and other stakeholders. The NEP includes at operational Belgian Class I facilities and all foreign facilities within 100 km of the border. It also considers transport accidents and malevolent acts. The NEP adopts the GSR-7 classification systems, describes the management structure and includes planning zones and extension zones in line with the HERCA-WNERA approach. The NEP is continuously evolving and is worked-on continuously. This incorporates learning from exercises and aims at steady progress in the development of standardised working procedures and tools.

Follow Up Status: Closed

Challenge 2: The licensee to execute ongoing action plans (safety culture, stress tests, LTO, fire hazard analysis and PSA, WENRA 2014 safety reference levels) and the regulatory body to conduct appropriate oversight.

The Belgian NPP operator, ENGIE Electrabel, developed a nuclear safety culture improvement plan – the 'CORE plan' – containing corporate actions as well as actions for the two Belgian NPP sites. As of early 2019, this was completed and closure of the plan was agreed with the regulatory body, FANC. However, the 8th Review Meeting National Report explains that ongoing further improvements have been identified and are being implemented under regulatory supervision.

A stress test action plan – the 'BEST plan' – which was issued in 2012 has now been completed by ENGIE Electrabel although some documentary work remains for FANC in order to complete its acceptance of the last items.

The LTO plans for Doel 1 & 2 and Tihange 1 have been completed and the safety improvements have been confirmed by PSA results.

The Belgian fire safety improvement plan (which combines the actions identified through the fire hazard analysis and fire PSA) has now been completed for all units.

The WENRA 2014 action plan relates to actions identified following a gap analysis on the implementation of the WENRA 2014 Reference Levels at Belgian NPPs. Implementation of the plan is ongoing. The Seismic PSA (except the spent fuel pool PSA) has been stopped given the shutdown dates of 2025 (at the Joint 8th and 9th Review Meeting, Belgium explained that these will need to be restarted if the proposed lifetime extension goes ahead for Doel 4 and Tihange 3). The licensee has put in place a process to decide on which safety improvements are justified given the remaining plan lifetimes. Updates against the actions that are retained are regularly provided to the Safety Authority (the last being April 2022).

Follow Up Status: Closed (new Challenge identified – depending on the decision regarding LTO)

Challenge 3: The regulatory body and the licensee should complete preparations to support the final shutdown and subsequent decommissioning.

The NPP operator, ENGIE Electrabel, started with a programme for the preparation of the Belgian nuclear fleet in 2018, with a focus on Doel 3 and Tihange 2 as the first units to be taken out of service. The programme includes experience feedback from previous work for Doel 1 & 2, which had been originally planned to be taken out of service in 2015, as well as contact with other operators and the Belgian safety authorities and waste management organisation.

The regulatory body started an internal competence building project in 2014. This work has produced a number of reference documents and remains ongoing.

Follow Up Status: Closed

Challenge 4: Belgium to finalize the implementation of the IRRS action plan.

Belgium received a full scope IRRS mission in 2013 and the regulatory body received a follow-up mission in 2017. This found that, of the 31 recommendations and 24 suggestions of the original mission, 2 recommendations and 2 suggestions remained open. The follow-up mission identified 3 new suggestions and 2 good practices.

The Belgian regulatory body developed an action plan to cover the remaining issues. Belgium confirmed at the Joint 8th and 9th Review Meeting that all the actions within the scope of CNS have now been completed.

Follow Up Status: Closed

2.2 Suggestions

The 7th CNS Review Meeting identified no Suggestions for Belgium.

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 of the following changes to the regulatory framework and the national nuclear programme

- In May 2017, the law was amended to: allow the government to publish a national declaration regarding nuclear safety, nuclear security and radiation protection (see below); to state that the licensee has the prime responsibility for its activities; to require each licensee to set-up a health physics department; to allow the regulatory body to issue binding technical (non-policy) regulations on matters fixed by royal decree; to provide a legal basis for Bel V as part of the regulatory body. This law resolved three recommendations from the 2013 IRRS mission.
- As reported in Section 2.1, Belgium completed and published the new Nuclear and Radiological Emergency Plan (NEP) in March 2018.
- In May 2018, the law was amended in relation to the transfer of licences and to waste management and dismantling. It addressed certain recommendations of the 2013 IRRS mission. It: addresses the transfer of licences; requires the provision of information in relation to radioactive waste and decommissioning as part of licence applications; requires licensees to maintain full inventories of all radioactive substances in their installations; allows the regulator to order removal of radioactive substances; and requires surveillance and regulatory notifications of on-site waste storage fill levels.
- In response to recommendation R8 of the 2013 IRRS mission, the government issued a national declaration regarding nuclear safety, nuclear security and radiation protection in October 2018. It addresses: the principles of continuous improvement, justification and defence-in-depth; the safe management of radioactive waste; co-ordination between safety and security bodies; and the needs for a high level of competency and for transparent communication.
- In October 2018, the law on the safety requirements of nuclear installations was modified mainly to include the Nuclear Safety Objective of the EU Nuclear Safety Directive 2014/87/EURATOM.
- In December 2018, amendments were made to existing radiation protection legislation to legally define the mission and responsibilities of Bel V, the technical subsidiary body of the regulator, FANC. It also integrated the concepts of radiation protection officers and radiation protection experts, as defined in EU Basic Safety Standards Directive (BSSD) 2013/59/EURATOM, into Belgian law. In July 2020, it fully completes the transposition of the EU directive 2013/59/EURATOM into Belgian regulations and amends dose limits, exemption and clearance levels.
- A regulatory project, started in 2015, to translate the 2014 WENRA Safety Reference Levels into Belgian requirements made significant progress.
- The FANC issued several Technical Regulations such as event notification, periodic safety reviews, safety demonstration, surface clearance levels to turned previous FANC guidance into binding acts.
- In November 2020, the FANC issued a technical regulation setting out the procedures for compiling the dose report and transmitting the results of individual dosimetry monitoring to the FANC, as well as the procedures for consulting the doses contained in the exposure register and for obtaining the radiological passport.
- This licensing process for nuclear facilities has been updated in May 2020, to complete the transposition of the European Directive 2014/52/EU amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.
- On the basis of the WENRA TF Report on Interfaces between Nuclear Safety and Nuclear

Security of 2 June 2021, a law has been issued to amend the law on the physical protection of nuclear materials and nuclear installations and the law on safety requirements for nuclear installations (SRNI-2011), with the objective to introduce requirements on such "security by design" concept, the management of safety-security interfaces in modifications, the management of potential safety-security conflicts.

- Two projects related to the WENRA reference levels are still ongoing.

3.2 Safety Improvements for Existing Nuclear Power Plants

The Country Group took note of the following implemented and planned safety measures for existing nuclear power plants in Belgium:

- A number of safety enhancements to the NPPs at Doel and Tihange have been implemented or planned to be completed as a result of the execution of ongoing action plans as described in Section 2.1. These improvements cover a number of areas: safety culture, stress tests, long-term operation, fire safety and alignment to WENRA 2014 Safety Reference Levels. Improvements include:
  - Regular safety culture days being organised at Tihange.
  - Implementation of leadership and coaching 'in the field', training and mentoring programmes.
  - All of the stress test action plan items are complete.
  - Improvements at Doel and Tihange mean that both sites are now adequately protected against natural hazards such as flooding, including complete station black-out and loss of the ultimate heat sink.
  - Filtered containment venting has been provided at all reactor buildings.
  - Fire safety improvements including additional fire detection, extinguishers & sprinklers, improved physical separation, an additional firefighting pumping station, coating and re-routing of cabling and work process improvements.
- During the 8th and 9th Review Meeting, Belgium explained that it had undertaken some additional actions in relation to emergency preparedness and response in light of the current situation in Ukraine in case of a radiological release, to address the concerns of its citizens:
  - It had created a Crisis Team composed of experts from FANC and Bel V and the National Crisis Centre. There was an electronic links for information sharing between the FANC and the National Crisis Centre. This is on permanent standby and issued regular situation reports.
  - It is in the process of considering whether the national emergency plan needed to be revised depending on how the situation evolves.
  - It has noted an increased demand for iodine prophylaxis and other concerns being raised by the public and would continue to provide public communications as necessary.
  - Belgium explained that it has considered a number of scenarios for radioactive releases from other countries and the range of consequences and responses that would be required, including any consequences of the situation in Ukraine.
- During the 8th and 9th Review Meeting, Belgium highlighted work undertaken to assess and develop the safety culture for the regulatory body. The licensee has also undertaken a safety culture assessment. It is noted that WANO judged the continuous examination of safety culture as a strength at Doel NPP.

- During the 8th and 9th Review Meeting, Belgium also explained it had implemented a capability to be able to inject sodium hydroxide into the containment buildings of 3 NPP units in order to manage long-term corrosion following a severe accident.

3.3 Response to International Peer Review Missions

In the reporting period, Belgium received a follow-up SALTO mission at Doel 1 & 2 in June 2019 (the initial mission was in February 2017). This concluded that sufficient progress had been made.

The regulatory body received a follow-up IRRS mission in November & December 2017 (the initial mission had been in December 2013). From the 31 Recommendations and 24 Suggestions of the original mission, 2 Recommendations and 2 Suggestions remained open. The IRRS Follow Up mission identified 3 new Suggestions and 2 Good Practices. An action plan was developed and Belgium considers that all actions related to the CNS have now been addressed.

Belgium participated in a workshop in May 2018 organised by ENSREG as part of the European Topical Peer Review on ageing management. Belgium received positive findings and two good practices associated with the BR2 research reactor. With respect to NPPs, it was judged to have a good ageing management programme in comparison to the average European level. 7 good performances and one good practice was also identified.

An IAEA Peer Review mission on the ageing management of research reactors was carried out in November 2017 at the BR2 research reactor, with findings reported to be in line with those from the European Topical Peer Review.

An IPPAS follow-up mission took place in June 2019.

No missions were received from 2020-2022 due to COVID-19 restrictions, but Belgium has a number of missions planned in 2023 and 2024 (IRRS, ARTEMIS, OSART to Tihange 2, INSSAR to the BR2 research reactor and the 2nd EU Topical Peer Review). At the Joint 8th and 9th Review Meeting, Belgium reported that the INSARR Mission to BR2 was completed in early 2023. A Follow-Up Mission is expected in 2025.

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 Country Group made the following observations:

- While the Belgian National Report for the 8th Review Meeting did not provide explicit information on the implementation of the VDNS, Belgium provided further information on how it is meeting the Principles of the VDNS in its presentation to the Joint 8th and 9th Review Meeting.

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 Belgium 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 generally comprehensive and reader friendly.

With regards to the compliance with the requirements of the CNS and its Guidelines, the members of the Country Group made the following observations:

- The Report for the 8th CNS Review Meeting was submitted before the deadline of 15 August 2019.
- The Report for the Joint 8th and 9th CNS Review Meeting was submitted before the deadline of 5 August 2022.
- The content and structure of Belgium National Report for the Joint 8th and 9th CNS Review Meeting complies 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 Belgium's participation in the review process, the members of the Country Group made the following observations.

In the 8th CNS Review Cycle, Belgium

- posted questions to Contracting Parties.
- delivered answers to the questions of Contracting Parties on time.

In the 9th CNS Review Cycle, Belgium

- posted questions to 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 Challenge(s) for Belgium.

- Challenge 1: If appropriate, depending on the decision regarding LTO, to complete the seismic PSA.
- Challenge 2: Updating the financing model to ensure adequate resources are provided to FANC into the future, following the decommissioning of NPP units.
- Challenge 3: Continuing to prepare the licensee and regulatory body for both the final shutdown and decommissioning together with the possible political decision regarding lifetime extension.

5.4 Suggestions

The Country Group identified no Suggestions for Belgium.

5.5 Good Practices and Area of Good Performance

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

There were no Good Practices identified by the Country Group.

The following Area of Good Performance of Belgium were commended by the Country Group:

- Area of Good Performance 1: Changes to the regulatory framework, specifically the turning of FANC guidance into binding acts.
- Area of Good Performance 2: Completion of the post-Fukushima European Stress Test Action Plan, including for example the implementation of filtered containment venting.
- Area of Good Performance 3: Putting in place a pragmatic and useful Safety Culture Observations process that is now fully operational and is based on observations in the field.
- Area of Good Performance 4: The high protection level against accidents of external origin that would result in a greater redundancy or diversity in some cases, of the protection and engineered safety systems, including the bunkered control room and the bunkered specific equipment.
- Area of Good Performance 5: Each site has a field simulator for work practices and human performance tools as part of its training centre.
- Area of Good Performance 6: The establishment of standard conditions that will be part of any dismantling licence in advance of receiving applications from the operator.

5.6 Response to COVID-19 Situation

In the National Report, Belgium did not report on the COVID-19 situation in detail; however, Belgium presented details during the Joint 8th and 9th Review Meeting including in relation to infection control precautions, the use of remote working and on the impact of inspection activities. Belgium considers that nuclear and radiation safety was not affected during the pandemic.

6 Fulfilment of CNS Review Requirements

The Country Group concluded that: Belgium

- 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, and therefore complies with Article 20.3