Question / Comment	Answer
Instead of the Chief Nuclear Officer (CNO), now the Chief Executive Officer (CEO) is mentioned in having been established and supporting the “Policy Declaration on Nuclear Safety”. Could Belgium point out if this is a result of modified responsibilities within ENGIE Electrabel? If so, could your country please point out the reasons for this modification?	Due to a reorganisation of Business Units at Engie group level, the CEO and CNO functions for nuclear are now grouped into 1 role of CEO Engie Electrabel.
In comparison to the previous report, the “Electrabel Nuclear Safety implementation plan” has been replaced by the “Nuclear Leadership Program”, which is less detailed text wise and misses keywords like “human performance” and “continuous improvement of nuclear safety performance”. Could your country please point out why this new program has been introduced and since when it is in place? Furthermore, it would be considered beneficial to explain how this new program addresses the keypoints of the previous program (or establishes links to the corresponding parts of the report where they are provided).	The previous action plan was completed and closed. Nevertheless, some weaknesses were observed in the Leadership domain, and hence a new action plan was developped focusing on Leadership. For Human Performance, the action plans developped at both sites continue - in order to reduce the number and significance of human errors. Continuous improvement is now fully embedded in the Nuclear Generation Management System.
In comparison to the former report changes to the responsibilities of departments at nuclear power plant level have been introduced and described. However, it is not described when and why these changes have been introduced. Could your country please explain when and why these changes have been introduced?	The only change at nuclear power plant level organisation is the creation of Decommissioning departments on both sites in 2021 to prepare for the future decommissioning of all units.
The newly introduced paragraph on nuclear safety culture mentions a 2-year survey initiated by Fleet Management, which complements the yearly safety assessment within the yearly improvement cycle. Furthermore, it is mentioned that the INSO performs independent Safety Culture Evaluations. Could your country please explain if these have been newly introduced since the last report and if there are already results available, which allow to draw conclusions regarding the effectiveness of the process, i.e. improvement of the nuclear safety culture?	The results of the survey show a positive trend in nuclear safety culture. The main issue coming out of the latest surveys is the uncertainty about the future of nuclear in Belgium.
Please provide more information on the number of staff part of the Local INSO and of the Corporate INSO, and on their training and qualification.	The number of INSO staff, including supporting functions is: Corporate INSO 15, Local INSO 30 (in total, for Doel and Tihange together). Some minimal training and qualification requirements of the INSO staff are established in the Safety Analysis Reports of the ENGIE installations. Noteworthy is that local INSO engineers working on power reactors in operations need to be follow the complete training programme of a senior control room reactor operator of that unit. All INSO engineers have been formally qualified to fulfill their function.

Figure 9 illustrates the nuclear leadership program of ENGIE which consists of three elements (preparing for the future; working together; achieving our goals) and is supported by a manager in-the-field program. The later is a internationally well applied WANO initiative. Over the years this initiative was discussed also critically in Switzerland, as it might be associated with the leadership mindset "command and obedience" and therefore might undermine the leadership principle "working together" (see ENGIE leadership program). What are the experiences of the Belgian nuclear facilities with the management in-the-field program, especially in the course of the ENGIE leadership program where leadership is associated with collaboration, trust as well as think and act collectively.	ENGIE understands the concern about the possible link with a 'command and control' approach. This is not the way ENGIE proceeds. The managers in the field are supposed to verify compliance with expectations but above all to interact with station staff in their work environment and exchange on possible challenges and difficulties in performing routine/specifique tasks. It is also focusing on our attributes defined under 'working together'.
FANC performs FLITS-inspections (Fast and Limited Inspection with Thematic Scope). Switzerland has read with interest about this type of inspection and supports the view that regulatory activities also need to contain moments of surprise. Therefore we support the idea that FLINTS inspections as well as unannounced inspections give a good oversight insight into how a NPP actually works.	Thank you for the comment
Could you further elaborate on the description of measures to ensure sufficient resources are in place in support of any nuclear installation throughout its entire life cycle?	For ENGIE Electrabel, some issues around critical skills began in 2015 in the Doel power plant. Since then this is continuously monitored and actions are taken. As of 2016, a retention bonus was put into place for technical qualified personnel. In 2018 a Strategic Workforce Planning was put into place to give management insights on available ressources versus work demand. In November 2020, the government decided the full nuclear phase out in 2025. An HR strategic plan was deployed around 3 axes : Strategic Workforce Planning, Employability and Social dialogue. In March 2021, ENGIE Electrabel took the commitment to guarantee full employment until December 2027. In December 2021 Engie Electrabel took the commitment to guarantee full employment till end of career for staff of 45 of age and more, a reconversion budget, a leave premium in 2026 on voluntary basis in 2026 for everyone. In March 2022 Engie Electrabel decided to give a retention bonus in 2023 and 2024 for every staff member of our power plants. A large scale employability program will be deployed as of 2023.

Similar to above, there is no mention of potential personnel resource issues, either existing or anticipated, that have identified in their National Reports.	For ENGIE Electrabel, some issues around critical skills began in 2015 in the Doel power plant. Since then this is continuouslu monitored and actions are taken. As of 2016, a retention bonus was put into place for technical qualified personnel. In 2018 a Strategic Workforce Planning was put into place to give management insides on available ressources versus work demand. In November 2020, the government decided the full nuclear phase out in 2025. An HR strategic plan was deployed around 3 axes : Strategic Workforce Planning, Employability and Social dialogue. In March 2021, ENGIE Electrabel took the commitment to guarantee full employment until December 2027. In December 2021 Engie Electrabel took the commitment to guarantee full employment till end of career for staff of 45 of age and more, a reconversion budget, a leave premium in 2026 on voluntary basis in 2026 for everyone. In March 2022 Engie Electrabel decided to give a retention bonus in 2023 and 2024 for every staff member of our power plants. A large scale employability program will be deployed as of 2023. For SCK CEN, the required number of operating personnel and their qualification is mentioned in the safety assessment report of the reactor. Of course, this is the minimum. The personnel policy is that a number of additional persons have also the necessary qualification. For example, a reactor operator team for BR2 consists of 5 persons, with one qualified team leader. At this moment, each team (7 in total) has at least 6 persons with 2 qualified team leaders. This principle is kept for all levels (starting from reactor manager). A last remark is that the research reactors are not operated continuously. BR2 is operated for 6 or 7 cycles of 3 or 4 weeks. Although of course not desirable, it is possible to omit cycles in case of shortage of operating personnel. BR1 is operated on daily basis and can only start if the necessary qualified personnel is available. The availability of operating personnel for BR1 is also increased by the fact that operators are shared with another critical facility.
In comparison to the former report the so-called “multifunction simulator” is not listed among the Tihange training facilities. Could your country please explain, if it is not in use anymore and, in this case, if there have been specific reasons for it?	The "multifunction simulator" at Tihange still exists a and is still in use, mostly for training of field operators. The use is rather sporadic since the construction of the full scope simulator of Tihange 1 in the framework of its LTO project. The two full scale simulators provide sufficient capacity for training of control room operators.
Please provide information on the implementation of the systematic approach to training and qualification for personnel selected for managerial and supervisory positions important to nuclear safety.	ENGIE Electrabel leadership identified a number of "future-proof competencies" that reflects the expected leadership behaviours in our transition context (e.g. "motivating people in uncertain times"), in addition to the existing requirements and qualification processes in terms of nuclear safety, etc.. ENGIE Electrabel HR ensured that these future-proof competencies are at the heart of the selection and individual development processes for key management positions (interviews, assessments, development actions).
The section about knowledge management makes some very good points that many other research reactors are also trying to address. However, the idea of having a back-up to every person with a key function is difficult to implement in practice, especially in the current environment of resource limitations within operating organisations and the general employment market.	Thank you for the comment
In comparison to the previous report the management expectations have been extended to “… and Site (or department) Fundamentals”. Could your country please explain if this is a result of the changes, which have been depicted in Article 10 II.F.1 regarding the Nuclear Leadership program?	The site and department fundamentals are an evolution or upgrade of the existing management expectations. The site and department fundamental booklets have been improved, for example made more visual with pictures and drawings, to become more user friendly e.g. during team meetings or prejobbriefings. The changes are not directly linked to the nuclear leadership program; leadership is one of the fundamentals, as one of the attributes of a healthy nuclear safety culture. Site fundamentals treat nuclear safety, health and safety, security, radiation protection, waste management. For some services or departments the management expectations booklets are still valid and used because their content is still up to date.

The reset of the “HU Clock” day count is performed every time a “significant event” is caused by human error and two performance indicators (HU Index and HU Ratio). In the previous report the corresponding section stated “an event caused…”. Could your country please indicate whether the basis for assessment of such events has changed or if this is a purely editorial change?	The basis for assessment of events leading to a reset of the HU clock has not changed. The HU clock is only reset for events with significant effects; the judgement of significance is based on INPO criteria. Adding of the word significant in the report is in fact a clarification. More low level human performance events, not leading to significance effects, are monitored with the other mentioned HU indicators.
The Kingdom of Belgium is to be commended for putting in place a Safety Culture observations process that is now fully operational.	Thank you for the comment
The NPP's Human Performance Program is described in detail. It consists of a policy, the human error reduction tools (HU tools) and other measures (e.g. Human Performance Simulator). Is it possible to elaborate the (expected) impact of these tools on the safety culture of the facilities (e.g. impact on the actions and decisions made by the staff)? Is it primarily the reduction of human errors?	The ENGIE Human Performance program's first goal is to reduce the number and significance of human errors. At the same time, this is considered as increasing the overall focus towards nuclear safety and as such improving safety culture.
Switzerland understands that the Belgian Regulator performs Safety Culture Observation to identify persistent signs of problems or good practices. Hence, this observation targets on errors and outstandig performance, i.e. good practice. Safety research (e.g. research in the context of hign reliability organisations HRO), however, also reveals that the focus on positive, every day performance gives also good indications on how to improve or strengthen safety. Is the issue of Safety-I vs. Safety-II (Safety-I [focus on error] vs. Safety-II [focus on positive performance]) also discussed in Belgium?	The process captures negative and positive observations. This does not mean that these observations are focussed on error or outstanding performance. Any observations including observations of "day-to-day" operations are collected. Only in a later stage, on the basis of several observations, signs of persistent problems or good practices are identified.
According to the report, Bel V conducts systematic inspections, including assessments of nuclear facility management systems. What are the training requirements and content for regulatory body to perform management system inspections?	Thematic inspections on the management systems of nuclear facilities are performed by the FANC using a specific "inspection guide" F-INS-IMS-1, which contains reference to the applicable regulatory requirements (art. 5 of SRNI-2011) and several supporting documents (such as IAEA safety guides). The inspectors performing these inspections have a thorough knowledge of the regulatory requirements and have (through the inspection guide) also access to the specific references in preparation of the inspections. A specific training session on management systems was also given to inspectors when the first "management system" inspection was performed.

How does the licensee ensure that his integrated Management system still complies with the regulatory framework if there are changes of the regulatory requirements? Is there any systematic monitoring process of the regulatory requirements implemented. / In 2014 and 2015, an inspection campaign was conducted to verify the compliance of the management systems of the Belgian NPPs and other nuclear facilities (Belgoprocess, IRE and SCK CEN). The conclusion of the inspection campaign was that management systems were on the whole compliant with the regulatory requirements.	ENGIE has a regulation watch process in place, focused on nuclear safety and radiation protection requirements, which is linked to the improvement cycle foreseen in the nuclear generation management system. This process includes different steps, e.g. source oriented (e.g. Belgian regulator, USNRC, IAEA) and document oriented (new versions of documents already in use) scanning of texts, analysis of compliance, definition and follow-up of action plans. Depending on the scale of the compliance analysis and action plans a specific project can be started, e.g. for the implementation of a new version of the WENRA Reference Levels. The systematic monitoring of compliance with regulatory requirements is foreseen in the nuclear generation management system, e.g. in the periodic functional area strategic reviews. This regulation watch process is inspected by the Safety Authority. For SCK CEN, twice a year a meeting is held with FANC and Bel V to discuss general aspects on the operation. During this meeting, the regulator announces eventual future modifications the regulatory framework. In this way, it is possible to be prepared for changes in the regulatory framework. In case of significant changes in the regulatory requirements, a transition period is normally foreseen. Both FANC and BEL V perform regularly inspections, both general and specific. Subject of such an inspection can be the performance of the integrated management system.
How is the effectiveness of a specific action being checked by the licensee? Is there any process or concept in place? / Actions for improvement are monitored until their completion and the effectiveness of the improvementis checked.	Depending on the type or origin of an action different processes exist to review the effectiveness. Within the operating experience program, effectiveness reviews are done on a selection of corrective actions which are specifically important to avoid reoccurrence. Typically these are the actions that are defined based on root cause analyses of significant events. For larger action plans, e.g. human and organizational factors improvement plans, effectiveness is mostly reviewed based on the evolution of the key performance indicators linked to the subject. In addition, within the nuclear generation management system periodic self-assessments are done for all processes, assessing the progress that was made based on the action plan defined during the previous self-assessment. For SCK CEN, all deviations from the integrated management system are noted in a database with defined actions. Both deviations from the procedures of the system and observed shortcomings of the system itself are notified in the database. On regular times, an overview of the database is made with specific attention for actions that are not yet finalized. The effectiveness of the system is also monitored during the inspections by the regulator (see answer to question 33467). Further, the integrated management system is also used for commercial isotope production. For these items, inspections are also done by an external accredited organisation or by the client.
Are the inspections of the Managmement system dedicated to a specific topic and if so how is it defined? / Bel V performs systematic inspections, with some dedicated to the assessment of the management system procedures related with the operation of the plant…	Thematic inspections on the management systems of nuclear facilities are performed by the FANC and Bel V using a specific "inspection guide" F-INS-IMS-1, which contains reference to the applicable regulatory requirements (art. 5 of SRNI-2011). The different topics that can be addressed during this inspection are defined in this inspection guide (and are linked to the regulatory requirements of SRNI-2011): documentation of the management system, strategy and leadership, resources, proces implementation, monitoring/evaluation and improvement, safety culture.
How PSA is used in the regulatory decision-making process?	The PSA is not directly used in the regulatory decision-making process. It is used by the utilities to support/justify/analyse their demands and to complete the safety demonstration.

You mentioned your involvement in the Cooperative Accident Research Program (CSARP) agreement with USNRC among others, could you explain what different safety improvements have been implemented in nuclear power plants with regard to severe accident mitigation in addition to filtered venting systems on all reactor buildings ? Why seems Tihange 3 the only reactor that has not a passive cavity flooding device installed to allow molten core cooling in order to mitigate containment base-mat melt through?	Safety improvements, among others regarding severe accident mitigation, have been done in the framework of periodic safety reviews and the BEST action plan, the Belgian stress tests after Fukushima. Some information can be found in the annexes of the Belgian report. Noteworthy examples are the installation of passive autocatalytic hydrogen recombiners in the reactor building of all Belgian units and the implementation of mobile means (diesel generators and pumps) to be able to inject water to the primary circuit, the reactor building, the steam generators and the spent fuel pools in case of complete station blackout. Regarding base-mat melt through the situation is different between Doel and Tihange. The reactors in Doel have a wet cavity strategy where water from the reactor building sumps flows into the reactor cavity before vessel failure. The reactors in Tihange have a dry cavity strategy where water will be injected into the reactor cavity only after vessel failure. For Tihange 1 and Tihange 3 an IPCAA system has been installated (injection puits de cuive et aspersion alternative = injection in reactor cavity and alternative spray). This IPCAA system has dedicated mobile pumps and power generators. For Tihange 2 the implementation time of the project was not compatible with the remaining lifetime of the unit and the strategy still relied on water entering the reactor cavity through the breach in the vessel.
What risk criterion is used for fuel damage in the spent fuel pool?	There is no acceptance criterion on PSA (CDF, LERF, FDF) values in Belgium. These values are considered for information, for example to assess the importance of modifications for the definition of action plans resulting from the PSR.
What are the impacts on the regulatory review and on the maintenance of the safety level arising from the inclusion of the used fuel pool?	After Fukushima, more attention was given to the spent fuel pools. Belgium, adopting the new version of WENRA RLs, added also explicitly the spent fuel pools in several articles of the SRNI-2011. It implied a more extensive review of the spent fuel pools and associated design basis. Several verifications were performed ; it results in several improvements (for example: improvement of the electrical feeding of the CTP pumps with regard to the separation with non-qualified part, single failure criterion…)
What are the risk criteria used in the decision-making process?	We do not have fixed risk criteria. The PSA values (CDF, LERF, FDF) are considered in the assessment of the demands of the utilities. For modifications, not requiring a license modification, it is required that they have no negative impact onsafety, hence no increase of CDF/FDF or LERF.
Have the two documents been used or are planned to be used to adjust the radiation protection program? If you have already used it, what changes have been made? / It is said that the development of the radiation protection program was carried out taking into account the recommendations of the IAEA guideline NS-G-2.7 (2002). This document has now been substituted by SSG-40 (2016) and GSG-7 (2018).	1) The evolutions of the GRR-2001, reflecting amongst others the transposition of the Directives 96/29/EURATOM and 2013/59/EURATOM, have been taken into consideration in ENGIE's RP program as this is a legal requirement. All necessary changes have thus been made to comply with the updated Belgian regulatory framework. Some important (non-exhaustive) changes following the transposition of the Directive 2013/59/EURATOM in the GRR-2001 with respect to operational radiological protection have already been listed in II.K.2. a). IAEA NS-G-2.7 (2002), on the other hand, is covered by the GRR-2001 (Art. 23 relative to Health Physics). 2) Screening of the SSG-40 (2016) and GSG-7 (2018) has occurred within the internal Regulatory Watch Process. Legal requirements as per the (evolutions of the) GRR-2001 are always respected and thus reflected in ENGIE's RP program.
What exposure criteria and requirements are used to identify the specified areas? What exposure rate is to be in the area for it to be considered as "green"? / There is a practice of identifying and designating areas with a low exposure rate ("green" areas).	1) The exposure criteria to identify the different areas are defined in GRR-2001: - Controlled area: access is controlled, spread of contamination cannot be excluded, E > 6 mSv/y (3 µSv/h for 2000 working h/y; - Supervised area: area is monitored, spread of contamination must be excluded, 1 mSv/y (0.5 µSv/h for 2000 working h/y) < E ≤ 6 mSv/y (3 µSv/h for 2000 working h/y); - Public area: all areas besides controlled or supervised areas 2) The exposure (dose) rate limits defined for different areas inside the RCA are the same in Doel and Tihange NPP, although a different colour code is used: - Doel NPP: ≤ 20 µSv/h (yellow), > 20 µSv/h (orange), > 200 µSv/h (purple), > 1000 µSv/h (red) - Tihange NPP: ≤ 20 µSv/h (green), > 20 µSv/h (yellow), > 200 µSv/h (orange), > 1000 µSv/h (red) These dose rate limits are in line with those defined in GRR-2001.

If this is not a misprint, could you please explain what does it mean? / Perhaps the phrase "training on make-up facilities" should be stated as "training on mock-up facilities," since the text refers to one of the ALARA tools that enables to reduce the time of work.	Indeed a misprint, should be mock-up.
What is the specified "fixed amount": "detection level", a fixed fraction of the detection level (for example, 0.5) or another value? / It is noted that when controlling the release of aerosols by NPP, the activity of 20 radionuclides does not exceed the level of detection ("detection level") of the radiation monitoring tools used, therefore, the activity of these radionuclides is assumed equal to a fixed value ("fixed amount").	ENGIE follows the rules set in FANC document 010-106 version 01. This document refers to the standard ISO/IS 11929. The declared activity of an isotope (among a list of 20 radionuclides) is 1/4 of the detection limit, when the activity of the concerned isotope is below the detection limit.
Your report shows that the permitted release limits are significantly higher than the actual releases from the facilities. Do you plan to revise the release limits to be more representative of real releases? If not, why ? In your report it is specified that there are also operational release limits (limiting the release on time based assumptions), related with a scheme to notify the operators, the Health Physics Department, Bel V and the FANC. What actions are taken in the event that the limits are exceeded?	As the maximal impact of the release limits were found acceptable (well below 1mSv/y) and in line with international practices, it is not planned to modify the release limits (Bq of specified nuclides). Moreover, an ALARA approach is considered for setting the internal plant objectives on radiological liquid and gaseous releases, which are set at values much lower than legal limits. Those internal objectives are set at ALARA values based upon the actual releases of the past years, and actual performance is controlled by the organization. Dose impact to the public is reassessed every year based on the radiological releases. Gaseous and liquid radioactive releases are performed after a storage period optimizing dose and decay time. Comparative analyses of the releases are performed between our plants, monitored by the physical control department, and presented to the Safety Authorities. This contributes to challenging the internal practices and processes, and adjust the organization for an effective ALARA approach. Each month, the licensee sends the gazeous and liquid releases made in his installations to FANC and Bel V. Every year the licensee sends also an annual report over his releases to FANC and Bel V. The limits are never exceeded in routine. When a release limit would be exceeded, the FANC can apply its different enforcement measures (reactive inspection, safety measures up to the shutdown of production) taking into account the causes and impact of this release. For example, after a Selenium accident in SCK in 2019, one annual release limit was exceeded. A reactive inspection was performed by the FANC to assess the impact of the release and identify licensee actions to prevent such a release in the future. Specific radiological impact assesments showed that this higher release had no significant impact on the population or the environment.
How are arbitrages made between gaseous/ liquid waste releases?	Gazeous releases happen by the chimney and liquid releases are made into the Meuse.
According to your experience, is direct irradiation taken into account in the evaluation of the effective dose to the population? If yes, what is the estimated order of magnitude?	Yes, direct irradiation is taken into account (via ground deposition, cloud, swimming, water sports, professional navigation, deposition on the banks and sludge dredging). The order of magnitude is about 25% of the total dosis to the population.
What are your exchanges with the belgium authorities that supervise chemical discharges in the event of arbitration between safety and chemical-radiological discharges?	The FANC (responsible for the oversight of radiological discharges) and the regional authorities (responsible for the oversight of chemical discharges) exchange information and advice whenever a new regional or federal (discharge) license is issued to a nuclear facility. This allows each authority to verify that the license limits are not contradictory or interfering. In addition, on a yearly basis, the regional authorities contact FANC to know if there were any violations of environment rules on the last year.

Are there any regulatory criteria to be checked before discharging liquid radioactive effluents in order to limit the impact on the natural environment (e.g. minimum river flow) and if yes, what are these criteria? How are the storage capacities for liquid radioactive effluents before discharge into the environment sized? Are there requirements on a minimal storage capacity that must be available at any time to deal with possible accidental conditions? In particular, for nuclear power plants located along a river, which specific conditions are planned about liquid radioactive discharges management if the river flow becomes very low?	The annual limits are defined in the licenses. Those limits need to be part of the Safety Analysis Report of the licensee. The licensee is responsible for ensuring that the discharge can be done or not. Other criteria are not within our competence (e.g. minimum river flows). For the nuclear power plants, regulatory criteria are indeed to be checked before discharging liquid radioactive effluents. These limits and the means to check whether those limits are respected are put in the Technical Specifications of the installations, in the Safety Analysis Report. For both sites, Doel and Tihange, regulatory criteria include the activity concentration in the discharge flow and an annual total activity limit. Additionally for Tihange, at the river Meuse, the flow rate of the river needs to be taken into account. This is not the case for Doel, because the flow rate of the river Schelde is much bigger. Storage capacities have been calculated at the design of the plant, taking into account certain scenarios (number of shutdowns during a year, frequency of load adaptations) which are a large envelope for the current operational regime of the plants. These hypotheses are documented in chapter 11 of the Safety Analysis Reports of the facilities. These storage capacities ensure that, although no requirements exists regarding minimal storage capacity for accidental conditions, operational margin is comfortable. For Tihange a derogation mechanism exists in case of very low flow rate in the river Meuse where the operator could ask temporary authorisation to surpass normal limits. This derogation mechanism has however never been used up to today and it has always been possible to respect the limits by discharging with a very limited flow rate if necessary.
In your country, are specific environmental monitoring plans implemented on the impact of the thermal discharges of the NPPs on the environment, by whom are they carried out, and are the results available?	The thermal discharges of the plants into the river (Schelde at Doel and Meuse at Tihange) are indeed regulated. These environmental regulations are regional (Walloon for the Tihange power plant, Flemish for the Doel power plant). The temperatures of cooling water flowing into the river is monitored permanently and several limits exist (immediate, daily, monthly). This monitoring is controlled by the regional Authorities, not by the FANC (responsible for the nuclear safety and radiation protection aspects). The results of the cooling water temperature monitoring are publically available annually in the environmental declarations of the two nuclear power plants. (e.g. https://nuclear.engie-electrabel.be/en/powerplant/doel-nuclear-power-station/environmental-statement for Doel and https://nuclear.engie-electrabel.be/en/powerplant/tihange-nuclear-power-station/environmental-statement for Tihange)
In your country, how and by whom are hot water discharges into the environment (river, lake) from nuclear power plants regulated? If possible, give examples of limit values, specifying whether or not the nuclear power plant has cooling towers and the kind of the receiving environment (river, large lake).	Examples for limiting values can be found in https://nuclear.engie-electrabel.be/en/powerplant/doel-nuclear-power-station/environmental-statement for Doel and https://nuclear.engie-electrabel.be/en/powerplant/tihange-nuclear-power-station/environmental-statement for Tihange

Which requirements exist for radiation risk assessments as well as for the planning and preparation of radiation protection for jobs (i.e. during outages)?	Regulatory related feedback 1) Developing a radiation protection "RP" program for individual dosimetric monitoring and radiological control of the workplaces is a legal requirement (GRR-2001). For the individual dosimetric monitoring, for example, the GRR-2001 requires that this program specifies for each workstation which body parts must undergo dosimetric monitoring. 2) Regarding planning and preparation of radiation protection for jobs such as outages, the GRR-2001 requires that any exposure should be kept as low as reasonably achievable (ALARA), taking into account economic and social factors. In the context of optimization, certain dose restrictions may be imposed as a general rule by the Safety Authority for each source, action or task. The Health Physics Control is furthermore legally responsible (i.e. as per GRR-2001) for proposing dose restrictions, additional means of protection or means of individual dosimetric monitoring and for establishing appropriate procedures. Operational feedback ENGIE Electrabel 1) All workers accessing the RCA (radiation controlled area) have to wear an electronic and a passive dosimeter. The individual doses are monitored and limited in order to respect the annual legal dose limit and annual internal dose constraint and the ALARA principle . Electronic dosimeters have dose and dose rate alarms which are set in order to prevent unexpected dose uptakes. These alarms are set in function of the job and the dose estimation for this job. 2) For each workshop in the RCA, the job is analysed and the collective dose is estimated on the basis of the ALARA principle. In function of the estimated collective dose, an “ALARA level” is defined for each workshop with specific actions and monitoring to keep the doses ALARA.
Which requirements or measures exist to prevent uncontrolled release of activity into the environment? Which requirements exist concerning enclosure of airborne, fluid and solid radioactive substances within the RCA?	Numerous measures or requirements exist to prevent uncontrolled release into the environment, e.g. all the requirements set forth in SNRI-2011 (II.C.4 in the Belgian report). This Royal Decree introduces also the principle of defence in depth. The confinement of radioactive material is one of the fundamental safety functions addressed by the requirements of SNRI-2011. Requirements related to RCA are given in GRR-2001.
How are limits for releases derived?	The text above table 6 is somewhat outdated, as it was added in previous versions of the report to explain the difference between the lines "2008-2010 average" and "2011-2015 average" where the significant impact of the changed reporting method can be seen in the aerosol releases. For other releases, iodine and liquid, the effects of changed reporting appear to be offset by the "real" changes in the releases due to operations. The new report method, inspired from the 2004/2/Euratom Recommendation and ISO 11929 standard, had a visible impact only on aerosols releases for both Tihange and Doel sites and on nobles gazes for Doel site.
Iodine releases: more than 10 % increase, Aerosols releases: more than 100 MBq/year in total for both sites, due to the fact that about 20 isotopes are below detection level and must be declared as a fixed amount. Liquid releases: about 2 times the previously declared values for both sites, due to the reason mentioned for aerosols. C: The numbers in the Table 6 do not reflect these increases.	The initial release limits were determined according the US rules 10 CFR 50 appendix I (design criteria) and 40CFR190 (ALARA aspect). In 2001, the GRR-2001 transposed the European Directive 96/29/Euratom into the Belgian regulation. Following entry into force of this Decree, the radiological impact of the existing release limits of the NPPs were reevaluated according the new dose definition, the new conversion factors, and some improvements in the calculation methodology (consideration of additional radionuclides, review of pathways, integration of local habits, ..). As the newly calculated radiological impacts were found acceptable (well below 1mSv/y) and in line with international practices, the release limits (Bq of specified nuclides) were not modified.
Surveillance programme performed by ENGIE Electrabel. Q: Is the dose assessment for the public based on these measurements? Is there enough data or there are some additional inputs?	No, the dose assessement to the public is not based on these measurements. Dose assessment is calculated based on the releases.

How were the emergency preparedness arrangements for the Operator and the Regulatory Body adapted for COVID-19?	By ministrial decree, the nuclear and radiological sectors are defined as "essential sectors". These include a.o. nuclear power plants and research reactors. Hence, the mandatory homeworking, as was the case for 53 days in Belgium, may be replaced by additional measures (social distancing, face masks, ...). The 24/7 duty role for FANC and Bel V was maintained throughout the whole pandemic. For the operator, ENGIE, all roles that need to be assured within the emergency plan were maintained throughout the whole pandemic. The duty roles were exempt from the mandatory homeworking: on the contrary, they were asked to come to the plant to work in the office during the work week to stay sufficiently connected with the plant. On site, the usual covid protection measures where off course applicable. Training and exercises where organised at distance, with Microsoft Teams.
Belgium may kindly elaborate on the steps taken by the regulatory bodies (FANC and Bel V) to maintain oversight over the NPPs and ensure emergency preparedness during the Covid-19 pandemic, including the challenges faced during this time.	During the pandemic, homeworking was manadatory for everybody. However by ministrial decree, the nuclear sector was considered as an "essential sector" and hence, the mandatory homweorking may be replaced by other means such as social distancing (1.5 m), wearing facemasks, ... On the sites of the NPPs and RRs, a large reduction of on-site personnel was observed and some non-prority activities were delayed, additional safety measures were installed, specific actions were taken to guarantee critical supply and contractors and the planning of the outages was modified (without modifying the scope). The business continuity plan of FANC was put in place, resulting in homeworking, virtual meetings, etc... The FANC/Bel V 24/24 duty role was kept active during the pandemic. International exchanges were held on virtual basis. Specific exceptional measures were put in place like for example prolongation of individual certificates (medical examination). In general, oversight and follow-up during the pandemic concentrated on evaluating the impact on safety and the licensee and assuring that the requirements (e.g. minimal staff) were respected. This was achieved by frequent conference calls, verification on site and a regular follow-up of the projects. The regulatory oversight of the nuclear facilities continued, including on-site inspections where needed (however, the size of the inspection teams was reduced to a minimum where possible): •Systematic routine inspections on-site continued; •Thematic (process based inspections) were put on hold during the first weeks of the pandemic. Some thematic inspections were carried out on site if warranted (e.g. commissioning of new installations). Otherwise, if feasible, some inspections were carried out via conference calls, while the remaining thematic inspections were postponed; •Reactive inspections (incidents,…) were done where needed. As for the inspection of the reactor control room, the frequency has been reduced to protect the operators and all topics that can be verified remotely are verified remotely. One of the challenges during this period, was the increased use of conference calls which did not facilitate some technical discussions which in the past would have been more effectively done during a physical meeting.
The intervention criteria levels set in the NEP make reference to 5 mSv total effective dose integrated over 24 hours and 50 mSv expected total effective dose integrated over 7 days. How are these criteria levels measured in the event of an emergency? Have Operational Intervention Levels been derived?	Belgium has not developed operational levels because the authorities' approach mainly emphasises the preventive aspects of the protective action(s) considered before measurable values are available. The exception is the reflex phase which is based on observable values.
In your country, how do you take into account organizational and human factors in the crisis organisation of the licensee ?	Training on the human performance error reduction tools is part of the initial and refresher training program of all employees, including those with a role in the crisis organisation. The personnel involved in the crisis organisation is trained on simulator (operating crews and engineers on duty immediately interacting with operating crew) or during emergency plan exercises. During emergency plan exercises organisational and human factors impacting the crisis organisation are trained and tested. Such topics are also included in the dedicated thematic inspections on EP&R. In addition, each exercise organised by the federal authorities are observed on-site by a Bel V inspector.

How does the predefined 'reflex zone' differ in size, i.e. radius, from the emergency planning zones for evacuation?	The predefined reflex zones for class I sites in Belgium vary between 1.15 km (IRE), 3.5 km for the two nuclear power plants and 3.8 km for the Regio Mol-Dessel (SCK CEN & BP). No reflex zone is foreseen for the JRC-Geel site. The emergency planning zone for evacuation is 10 km, plus the principle of extension zone up to 20 km.
Is sheltering also an option if on one hand the effective dose (integrated over 7 days) is expected to exceed 50 mSv but forecasts of the time until releases show that there is little time available for an evacuation?	Sheltering is always the first option in the implementation of protective action(s). In this case, the answer is positive because it is important to avoid as much as possible that the population concerned is even partially under the radioactive cloud, thus risking a significant exposure. If the estimated time to release is too short, the authorities will recommend to keep the population sheltered. In any case, the evacuation could be staggered according to the circumstances in the different blocks/zones concerned.
Understood from presentations on the BR2 research reactor in other forums that another potential significant external event was forest fires impacting the site and that additional protective measures had been implemented to address this. Is this correct?	In order to limit the risk of forest fire, two actions were taken. First of all, trees around the nuclear installations are removed up to a distance of 36 m. The majority of these trees were pine wood, with a high risk for spreading a fire. The second action is the installation of a dedicated fire extinguishing network on the whole site, equipped with its own water feed system. This network can take water from different sources (stored water in tanks, canal water, ground water or tap water). In case of fire, the fire brigade has the availability of an unlimited quantity of water at a sufficiently high pressure.
On page 91 it is outlined to which speed of a Boeing 767 Tihange 2 and 3 and Doel 3 and 4 can withstand. In addition, it is stated that Tihange 1 and Doel 1 & 2 have less resistance. This information can be used to optimize a terroristic attack. Such specific design values should be classified.	This information confirms the resistance -and not weakness - of NPPs to external hazards (airplane crashes) and has been made public since 2001.
In the context of the stress test ENGIE performed a probabilistic seismic hazard assessment (PSHA). What was the result of the new PSHA, more particular: does the new PSHA lead to a higher hazard assumption?	More details about the results of these studies can be found in the final national report on the stress test, available on the FANC website (https://afcn.fgov.be/fr/dossiers/centrales-nucleaires-en-belgique/stress-tests-nucleaires/rapports). It states that for Doel NPP, the original hazard levels were confirmed whereas for Tihange a greater peak ground acceleration ("PGA") needed to be used. It also mentions that a safety margin assessment was performed for both sites on the basis of a review level earthquake ("RLE") as high as 1,7 time the PGA of the original design basis. As a result some hardware actions to improve the seismic resistance have been caried out. All the actions were carried out by the end of 2015; they are summarised in appendix 6 of the Belgian report of the previous convention on nuclear safety.
The protection against extreme temperatures is currently being reassessed. What are the extreme air temperatures design levels?	The design temperatures are of course different for Doel and Tihange. During the WENRA 2014 study program ENGIE defined updated design temperares for dry bulb (DBT: max 1h, 6h, 1d, 1w, 1m; min 1h, 1d) and wet bulb (WBT max 1h, 6h, 3d). E.g. Doel: max DBT 1h = 44,9°C; max DBT 1d = 34,6°C; Tihange: max DBT 1h = 46,2°C; max DBT 1d = 35,1°C.
A safety assessment on bad weather condition was conducted during the stress test. Which weather phenomena (extreme winds, tornados, extreme air temperatures, etc.) were considered? Was climate change considered and if so which method was applied?	During the stress test, adequate protection against tornadoes, heavy snow- and rainfalls and lightning was confirmed. To be noted that in the meanwhile more recently, in the framework of the WENRA reference levels 2014 study program, the necessary studies to confirm that the safety demonstration is compliant with those reference levels have been conducted, and this for all natural hazards screened in as credible. In the WENRA study program climate change was considered for extreme temperatures, heavy rain, extreme wind, flooding, tornado and lightning. For some of the hazards, these are based on literature study (IPCC and others) combined with trend analysis of historical data, for others only on literature study.
Area of good performance: 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 .	Thank you for the comment

»For instance, at Tihange 1, considering a design earthquake of 0.17 g acceleration (value of the Safe Shutdown Earthquake defined in the safety analysis of Tihange 2 and 3) instead of the original value of 0.1 g used in the design of unit 1, resulted in recalculating with much more elaborate methods the seismic behaviour of all the buildings, and strengthening a number of structures…« Q: Could you further elaborate the approach used in already established seismic analysis. Is a linear or non-linear approach used in the analysis? What is the value of uncertainty used in analysis? How much conservatism is applied due to the above-mentioned fact?	Several approaches have been used recently. In the framework of the stress tests, a seismic margin review was done on the selection of SSC's necessary to bring the reactor to a safe shutdown state. This seismic margin review was done using design documents, walkdowns and engineering judgement mainly, with some HCLPF calculations (according to EPRI-6041) for a review level earthquake of 1,7 times the design earthquake (0,17g Doel; 0,3g Tihange). In the framework of LTO D12 a much more elaborate and systematic seismic margin analysis was performed, based on the same EPRI report NP-6041: methodology for assessment of nuclear power plant seismic margin). To be noted that in the WENRA RL 2014 study program the seismic risk was evaluated further deterministically (maximum credible earthquake determination) and probabilistically (seismic spent fuel pool PSA). If LTO beyond 2025 will be done, a seismic reactor PSA study will be done.
Will the new SF2 installations also be sufficient for the possible longer operation of Doel 4 and Tihange 3 after 2025?	Yes, the capacity of the new installations SF2 installations is sufficient to cover longer operation of Doel 4 and Tihange 3 after 2025.
Article 19, page 102 states “The OLCs for the BR1 are: The maximum temperature of the cladding of the fuel…” How does the BR1 operator monitor the temperature of the cladding of the fuel? is it by direct reading through a sensor mounted on the fuel, or on the cladding, or by measuring the temperature of the water adjacent to the fuel cladding which is then calculated?	Note that BR1 is a graphite moderated air-cooled reactor using natural uranium. The fuel is metallic uranium with an aluminium cladding. A fuel element has a length of 203.4 mm and a diameter of 25.4 mm. These are placed in channels in the graphite matrix. This matrix contains 829 channels. A number of these channels is loaded with uranium. Temperature measurement on the cladding of 30 well-chosen elements is made using thermocouples. When the temperature reaches 250 °C an alarm is given. Upon reaching a temperature of 260 °C, an automatic power reduction is triggered.
The report states that the new interim storage facilities will, together with the current interim spent fuel storage building on site, allow the storage of the spent fuel elements from the nuclear units (4 units in Doel and 3 units in Tihange) after their final shutdown. Could your country please clarify if the potential long-term operation might impact the interim storage capacities, i.e., are they sufficient or are additional storage capacities necessary in case a long-term operation is authorized and put into action?	The additional new interim spent fuel storage capacities (the SF² facilities) together with the current interim spent fuel storage capacity (Doel: SCG-building / Tihange: DE-building) ensure the evacuation of all spent fuel from the nuclear units after their final shutdown to allow the dismantling of the units. The SF² interim storage facilities includes a total of 120 storage positions for Tihange and 108 cask storage positions for Doel (physical limit), defined based on: - The evaluated minimum number of casks to be stored in the SF² facilities considering following hypotheses: o An operating period of the units as specified in Belgian nuclear phase out law of January 31, 2003; o The estimated saturation of the current spent fuel storage buildings (SCG for Doel and DE for Tihange); o A cask loading sequence with assumptions on cask type and capacity. - A number of positions which have to remain free of casks allowing the manipulation of casks in all situations. - A certain margin is included to cover technical contingencies, ensure operational flexibility or to cover additional production in case a long-term operation of Doel 4 and Tihange 3 would be authorized. As a conclusion: the potential long-term operation of Doel 4 and Tihange 3 is therefore covered by the capacity of the new interim spent fuel storage facilities.
Have you already taken into account the French feedback on stress corrosion discovered on safety injection circuits of pressurised water reactors (IRS number 9063)? If yes, how? Have specific Inspections been carried out ?	A detailed analysis exists of the EDF SCC REX and has been communicated to the Safety Authority. A a result, ENGIE has committed to perform some additional inspections on the shutdown cooling suction lines of Doel 4, Tihange 1 and Tihange 3 during the 2023 outages. Bel V was regularly informed of the results of the analyses in France through the Belgian Licensees on the one hand and through direct (REX) channels and contacts with the French safety authorities on the other. Bel V assessed these analyses and the actions (inspections) proposed by the Belgian licensee.

You mention in II-B-1"Ageing is systematically investigated in order to ensure the availability of all safety systems". How do operators manage the obsolescence of structures, systems, and components (SSCs) important to safety? The maintenance of parts whose production has been stopped? Or the software maintenance?	ENGIE Electrabel has implemented an obsolescence management program. It is inspired by NUC industry best practices such as EPRI procedures and sharing of operating experience via the International Nuclear Utilities Obsolescence Group (INUOG). Besides proactive screening of safety related inventory for obsolescence there are processes for mitigating or solving obsolescence issues. As explained in I.C.4.d of the report a project EQO (Equipment qualification & Obsolescence) has resulted in validated processes and procedures identifying different possible solution paths for the replacements of obsolete QA items. Depending of the degree of obsolescence of an SSC it can be decided to search and qualify a replacement item, or to continue to maintain the installed obsolete component. In the latter case the obsolescence program aims to provide/procure all necessary sub-parts or third party services to be able to keep the installed obsolete operational.
How is the supervision of manufacturing operations of nuclear equipment carried out, particularly when manufacturing is carried out abroad? How do the licensees exercise control over the suppliers? If applicable, how are on-site inspections of contractors and sub-contractors carried out?	Suppliers of SSC that are important to safety, or service providers working on SSC important to safety, have to be qualified before manufacturing or service delivery. This qualification is performed by means of periodic (tri-annual) supplier audits, following the reference of the US 10 CFR 50 Appendix B. Fully qualified suppliers are in principle exempt of specific follow-up of manufacturing operations once qualification was obtained, except for pressure boundary equipment. For suppliers that are not fully qualified, and for mechanical pressure bearing equipment, a specific QA/QC plan is established prior to manufacturing or start of services. This plan is typically based on the existing QA management system of the supplier (which has been previously surveyed), complemented by specific additional inspections, hold- and witness points ; access to the manufacturing facilities has to be granted by the supplier. The follow-up itself is performed on-site (also for foreign contractors) either by the Licensee ENGIE Electrabel, the Owner’s Engineer TRACTEBEL, or in case of pressure boundary equipment the Authorized Inspection Agency Vinçotte. Control of suppliers is done by an independent organisation. Bel V verifies the correct performance of this organisation's tasks and analyses/assesses the findings/non-conformities and the corrective actions taken. On-site control of contractors and sub-contractors is done via the independent verification of the controls organised by the health fysics department of the licensee and the organisation of a control via HoldPoint and WitnessPoints and the follow-up of non-conformities.
Is there a procedure in place to reduce the emission of chemical pollutants? Can you describe it?	Chemical pollutants are subject to regulatory requirements; the competent authority for environmental regulatory requirements in Belgium are the regions (Flanders for Doel; Walloon region for Tihange.) The releases of chemical pollutants in the water have to be monitored and reported to the regional competent authority. The existing nuclear generation management system covers all aspects, both federal regarding nuclear safety and regional regarding environment, and foresees action plans to reduce the environmental impact of the plant.
Based on feedback from the Fukushima accident, what actions are implemented regarding the management and reporting of key parameters (such as temperature, water level...) from research reactors that would be inaccessible after an extreme hazard?	As feedback from the Fukushima accident, BR2 is equiped with an independent monitoring system that allows to follow a number of key parameters measured within the reactor building, even when the building is isolated and not accessaible. The system is designed to operate during 72 hr independent of any power source (even after loss of emergency diesel generators). The following parameters are measured: •Radiation levels in the reactor and storage pools; •Temperature in reactor builiding; •Temperature in de reactor and storage pools; •Pressure in the reactor building; •Water levels in the different pools. For monitoring the water levels pressure transmitters are placed on the bottom of the pools. The electronics of these transmitters have been replaced by electronic components with a very high radiation resistance. As the water level in the pools is the most important parameter, a back up with level switces was added. Temperatures are measured using resistance temperature detectors. From its original design, BR2 was also equiped with accident radiation monitors. It was sufficient to connect these monitors to the new system. For BR1, as this is a graphite aire cooled pile, this type of monitoring was not judged usefull.

»The information related to operating experience is accessible to all plant personnel, both on the intranet and in the document management system. The use of the available operating experience information is integrated into the different department processes and methods, in order to evaluate their own performance, to identify hidden weaknesses and to pro-actively avoid events.« Q: Could you specify how many improvements were introduced or implemented at NPPs as a result of OPEX lessons learned in the last decade?	Providing exact numbers is not possible given the large variety of improvement actions and action plans, which are most of the time to a large extend based on lessons learned from operating experience. When looking at the lowest level of corrective actions based on operating experience, e.g. changes to procedures, there are several hundreds of those actions defined on each plant (Doel and Tihange) each year.
»A policy for operating experience has been established at ENGIE Electrabel. Comprehensive programmes have been set up for detecting, processing and communicating operating issues in order to optimize the use of international, national and local experiences in operating nuclear power plants.« Q: How many dedicated regulatory inspections have been conducted in the field of OPEX in this reporting period and how many foreign operating events were selected and reviewed by the NPP and/or regulatory body?	OPEX thematic inspections (process-based) have to be performed every 36 months on site level (1 inspection has been performed during this period). OPEX systematic inspections (performance-based) have to be performed every 12 months on site level (2 inspections have been performed during this period). In 2022 2 NRC RIS, 79 IRS, 12 IRSRR and 7 FINAS reports were analysed and commented by Bel V. Bel V also analysed and documented information from the French OPEX, Clearinghouse and WGOE.
Please provide information on whether Technical Specifications have been developed also for the plant equipment credited in the response to design extension conditions, including severe accident management (permanently installed, portable and mobile equipment used for accident management).	Yes, ENGIE has decided to put the dedicated severe accident means in the Technical Specifications, in the paragraph programs, comparable to the approach for fire protection equipment.
The article states that “Aging is systematically investigated in order to ensure the availability of all safety systems”. How often do these investigations occur?	ENGIE installed a so-called "living ageing management program". This program ensures ageing follow up of all SSC's important for safety and is to a large extent based on what is called "the expertise triangle" which is the combination of system health, component health and program health reporting. These health reports collects inputs from periodic in service inspections, tests, maintenance, operational activities. The frequence of updates of health reports is flexible and could be yearly to three yearly, based on a graded approach which takes into account the level of health. Besides this living ageing management program there is also an ageing management evaluation during each periodic safety review (10 yearly), as explained for example in the report § II.J.1.b.
As you have three kind of modifications in your regulations, what are the amounts of the various kinds of modifications to the plants ? (per period or per review..). And, what are the period or occasions of Technical Specifications modifications ?	There are very few important or "major" modifications leading to a modification of the licence. At Doel the last years there is an average of 100 "less important modification" and 80 "without impact on safety" each year, at Tihange these averages are 35 "less important" and 15 " without impact on safety". As the practical implementation of the modification process is somewhat different in Doel (e.g. always separate modification for each reactor) compared to Tihange (e.g. combined modifications for all reactors possible), the numbers should not be compared.

»Indeed, for the four most recent units, it was requested at the licensing stage that accidents of external origin had to be taken into account, such as an aircraft (civil and military) crash, a gas explosion, a major fire and the effects of toxic gases. « Q: Could you specify the major contributors calculated or derived from the PSA study for aircraft crashes.	There are no specific PSA studies for aircraft crashes. The studies of the effects of an aircraft crash on the plant are mainly deterministic, demonstrating that specific buildings can withstand a crash of specific types of airplanes. The probabilistic evaluation regarding aircraft crash demonstrates that the probability that aircraft crashes cause unacceptable radiological consequences are below a certain limit. But these probabilistic evaluations use very conservative assumptions (e.g. aircraft crashing above the design basis immediately leading to unacceptable radiological consequences with probability equal to 1) and are thus not used to look for major contributors.
What is the scope and level of detail of the PSA studies?	The most recent updates of the PSA models are described in §I.C.4.c of the Belgian report. The last years many developments have been made, based on the WENRA 2014 reference levels. The most important missing part, to be fully compliant with those reference levels, (which is to be tackled in case of long term operation of the concerned units,) is the seismic PSA for the reactor (for both sites) and a flooding PSA for the reactor for Tihange (not needed for Doel ~ site specifics).
What are the main PSA applications in the Belgium?	PSA is used to evaluate if the design is well balanced, to identify the most important potential safety improvement, to evaluate the impact of foreseen modifications, to assess the impact on safety of important events and to plan maintenance in a risk-informed way. A particular noteworthy example is the evaluation of the systems to be kept available to ensure safety of the spent fuel pools during the post operational phase, the so called definition of the "POP nuclear island."
What are the modes of operation covered by the PSA studies?	Legal requirements regarding PSA are set in SRNI-2011 and its updates. All modes of reactor operation are covered by the PSA studies, at power and shutdown. Recently, also spent fuel pool PSA studies are available.
How is FANC's and/or Bel-V's R&D financed?	R&D projects of FANC and Bel V are mainly financed by allocation of resources from their own budget. Some R&D work is performed in the framework of EC-sponsored research projects, which are then sponsored by EC according to the project contractual agreement. Financing can also come from pre-licensing fees from future applicant (waste disposal for example).
What is the status of completion of the phase out law?	Doel 3 and Tihange 2 have been shut down in accordance with the phase out law, the other reactors are still active.In case of a LTO for Doel 4 and Tihange 3, the phase out law needs to be modified.
This article states that “A mandatory international consultation and/or a voluntary consultation of the European Commission may take place”. How is the decision made to conduct a voluntary consultation?	Article 6.3.2 allows the Scientific Council of the FANC, at its own initiative, to voluntary consult the European Commission on potential safety or environmental issues. It however never happened.
The report describes the content of the Royal Decree of 20 July 2001, which outlines the requirement for prior licencing for Class I (and some Class II) facilities. Does prior licencing imply a pre-licensing programme that must be completed before the facility can apply for a licence?	No. "Prior" to licensing means that the license has to be granted before starting the construction of the facility. Prelicensing is optional and only organized at the licensee request.

In chapter I-C-1 , it is mentioned several Technical Regulations (TR) were written to turn previous FANC guidance into binding acts. One of them is related to Declaration of modifications. Could you give a short description of it? Or may be could you describe the content of article 15 of the Royal Decree of 30 November 2011 which mentioned what changes are to be considered as a modification ? (What criteria lead to a modification being investigated by the Safety Authority? If possible, give examples of modifications reviewed by the Safety Authority) Could you also explain the mentioned "additional requirements with respect to the safety assessment and the execution of the modification".Then could you detail what proportion of the modifications are subject to an examination by the Safety Authority prior to be authorized or implemented? .	Article 15 of SNRI-2011 indicates that the following changes are to be treated as modifications: – Modifications to the installation: Modifications made to structures, systems and components important to safety; – Replacement of a component of the facility if this component is not replaced by an identical spare component or by a component whose previous safety analysis has not shown its equivalent character; – Modification made to process software which can impact nuclear safety; – Modification of the operational limits and conditions; – Modification of the organisational structure of the licensee, as described in the safety report. The technical regulation for modifications requires licencees to categorize and describe the process of treating the modification in function of the categorisation. See II.J.1. item c) for further details that apply to all class I installations, not only NPPs.
Are there specific rules applicable to the management of modifications by a power plant licensee? If yes, could you please describe their main provisions?Are they applicable to all reactors or only to nuclear power plants ?	The requirements for modifications as provided by article 15 of SNRI-2011 are implementing the WENRA SRLs of issue Q and apply to all nuclear class I installations, not only research reactors and NPPs. As such they describe the scope, the process, safety assessments and review, and implementation. Art 15.5 of,SNRI-2011 deals specifically with temporary modifications.
« Counterfeit and fraudulent items (CFIs) are of increasing concern in the nuclear industry » (IAEA site)). Does it exist in your country any regulation addressing this concern?	No particular regulation about this issue exists in the nuclear regulatory and nuclear legal framework in Belgium. Classification, qualification and quality assurance are required for SSCs importants to safety (art. 8 of SRNI-2011).
Your report mentions the royal decree of 30 November in article 5 requires that "An integrated management system (Art. 5) giving priority to safety shall be established, implemented, assessed and improved on a continuous basis. " and that article 6 sets out the requirements with respect to training and formal qualification of the personnel. Based on those general articles, in your country which are regulations or guidelines about safety culture or human factors?	Legal requirements related to safety culture have been introduced in the SRNI-2011 (article 5.7) by the royal decree of 9 october 2018. These requirements are similar to the WENRA 2014 reference levels C7.1 to C7.3. Legal requirements on human factors consideration will be introduced in the SRNI-2011 in accordance to the WENRA 2020 reference level C3.3 in the near future.
You mentioned that a possibility of admendment of the law of 31 January 2003 on the phase-Out of Nuclear Energy to allow a lifetime extension for the two most recent unit (Doel 4 – Tihange 3) has been agreed by the federal government in March 2022. Could you explain what is the process to extend the life time of those reactors which were supposed to stop definetly really soon ? What is the impact on needed modifications, crews and organizations ?	In case of a LTO of Doel 4 and Tihange 3, the FANC position concerning the LTO for Doel 4 and Tihange 3 (https://afcn.fgov.be/fr/system/files/2021-11-28-afcn-position-lto-final-fr.pdf) needs to be applied.
Area of good performance: The Belgian approach in examining the safety culture on the base of observations on the field is considered pragmatic and useful.	Thank you for the comment

According to the Law on the Phase-out of Nuclear Energy, the construction of new NPPs is forbidden. Does this mean there is a ban on on technology or is the nuclear research still allowed, and is it supported by Belgium?	Nuclear research and technology survey is still allowed and supported by Belgium. A recent example is the allocation of funding, in May 2022, to SCK CEN for SMR technology development and survey.
There is a possibility of amendment to the Law on the Phase-out of Nuclear Energy to allow a lifetime extension for the two most recent units agreed upon in March 2022. Could you please outline the requirements for a lifetime extension even though the law has not been modified yet?	In case of a LTO of Doel 4 and Tihange 3, the FANC position concerning the LTO for Doel 4 and Tihange 3 (https://afcn.fgov.be/fr/system/files/2021-11-28-afcn-position-lto-final-fr.pdf) needs to be applied
According to the Law on the Phase-out of Nuclear Energy, the operation of Belgian NPPS was initially limited to 40 years. In general, once the operation of a NPP comes to its end, does FANC issue a decomissioning order, and if so, is the procedure similar to a licence application?	That's correct. Before starting any dismantling activities, the licensee has to apply for a dismantling license. The licensing process is similar to other license applications (Art. 6 of GRR-2001). More information on the decommissioning aspects can be found in the section I.C.2. of the report.
The licence procedure consists of various steps (examination by FANC, advice of the Belgian Waste Management Agency, advice to the Scientific Council, international consultation, public enquiry, etc.). With respect to the final advice by the Scientific Council, it may propose particular conditions to be attached to the licence related to the commissioning of the installations or in view of ensuring the safety and the wholesomeness of the future installation. Please specify how the public is addressed to. Apart from that may ONDRAF/NIRAS as the Scientific Council also propose particular conditions to be attached to the licence with respect to waste and future dismantling of the facility aspects?	According to figure 5 of page 37 of the report, the resuls of public consultations are centralized at the FANC. The remarks, comments and opinions of the public are reported to the Scientific Council in the summary report, prepared for the delivery of its second advice. The Scientific Counsil considers the resuls of the public consultation for its final advice containing license conditions proposals. The ONDRAF/NIRAS advice may also include proposals of license conditions, in relation to the waste management or future decommissioning. The advice of ONDRAF/NIRAS is submitted to the Scientific Council which determine the license conditions.

Please elaborate on the participation of FANC in the working groups of NEA Committees.	FANC and/or Bel V participate in the following Committees and working groups of OECD/NEA: - Steering Committee - Committee on Nuclear Regulatory Activities (CNRA) - WGPC - Working Group on Public Communication - WGIP - Working Group on Inspection Practices - WGOE - Working Group Operating Experience - WGSC – Working Group on Safety Culture - WGOE / Joint IAEA-NEA TCM IRS - WGSAR – Working Group on Safety of Advanced Reactors - WGDIC – Working Group on Digital Instrumentation & Control - Committee on the Safety of Nuclear Installations (CSNI) - WGFCS - Working Group Fuel Cycle Safety - WGFS - Working Group Fuel Safety Margins - WGAMA - Working Group Analysis and Management of Accidents - WGIAGE – Working Group Integrity of Components and Structures • Sub-group on the integrity of metal components and structures • Sub-group on the Ageing of Concretes • Sub-group on seismic behaviour of structures and components - WGRISK - Working Group RISK Assessment - WGHOF - Working Group Human and Organisational Factors - Halden Reactor Projet Programme Group - Committee on Radiation Protection and Public Health (CRPPH) - ISOE - INEX - WPNEM - Working Party on Nuclear Emergency Matters - Radioactive Waste Management Committee (RWMC) - Regulator's Forum (RWMC RF) - Integrated Group on safety case (RWMC IGSC)
It is stated: “The operation of the FANC is entirely and directly financed by the companies, organisations or persons to whom it renders services.” Will FANC continue to have enough finances when NPP units will be shut down in the coming years?	It is clear that the FANC financing from the taxes perceived for the operating NPP (which is linked to the energy production capability) will significantly decrease when the units will move form an operating license to decommissioning license. This fact has been anticipated, and the FANC management, with an internal working group, is preparing proposals for new financing mechanisms in the future, to the Minister of Interior to adress this issue. New activities such as increase of (oversight of) dismantling activities, new facilities namely linked to waste management (and also clearance, treatment and disposal), development of international activities for Bel V, possible emerging new technologies (SMR), .. have also to be taken into account in the forecasts.
There is no mention of the potential personnel resource issues, either existing or anticipated, that other Regulatory Bodies have identified in their National Reports. Is FANC experiencing or anticipating possible personnel resource limitations?	Operational plans are prepared within FANC and Bel V for long, mid and short terms and staffing plans are derived, allowing to determine the ressources needed to fullfil the plans. The number of FANC and Bel V employees remained stable (or even slighly incerased) for several years without significant staffing issues. FANC is anticipating future changes in the context of the nuclear energy phase out. See also Q29324.

« Regulations and guides shall be reviewed and revised as necessary to keep them up to date, with due consideration of relevant international safety standards and technical standards and of relevant experience gained. » (IAEA, GSR part 1, requirement 33). You mentioned that he regulatory function “development of regulations and guides” is allocated exclusively to the FANC. Does FANC have internal rules about the periodicity for revising regulations and guides? Both FANC and Bel V can also issue technical guidances, what are the rules and periodicity for revising guidances?	Both FANC and Bel V have internal regulatory watch processes, documented in their respective management systems. Collaboration and exchanges between FANC and Bel V is also organized in this field. Theses regulatory watch processes include a survey of : - the (development of) European Directives; - the reports of groups such as HERCA, WENRA, ENSREG, EACA ...; - IAEA publications (including drafts standards of the Safety Standards Committees), reports from NEA working groups and committees; - the IEC and ISO standards, and others (eg ANSI, ..); - the publications of the USNRC; - the regulations and guidelines developed in other countries, such as the USA (NRC), France (ASN), the Netherlands (ANVS), ..;. In addition to other triggers such as experience feedback, this process enables the Belgian regulations to be kept up to date, as requested by R33 of GSR part 1. The revision of FANC and/or Bel V guidance is performed on an "in case of need" basis.
Do the employees of FANC and BELV have the possibilities to do advanced trainings?	Yes, individual trainings needs are laid down in indidividual competence development plans. Advanced trainings may include university courses, trainings at licensee's facilities (simulators), or in Belgian or foreign nuclear research centre or organizations (French CEA or INSTN for example). Continuous training is mandatory for maintaining inspector accreditation, both at FANC and Bel V. In Bel V an annual in-house training program is developed for all colleagues. An annual training on radiation protection is mandatory.
Is FANC's management system certified according to ISO 9001:2015?	No, the FANC management system is based on the IAEA Standard GSR Part 2 and takes on-board some relevant issues of the ISO9001:2014 standard, such as risk analysis and process description
Only FANC inspectors are authorized to enforce; Bel V inspectors can only make recommendations to FANC. How is enforcement between FANC and Bel V ensured in cases of urgency?	In case of urgency, a process is in place requesting Bel V inspectors to call on (immediately if needed) FANC inspectors who have enforcement powers. Both FANC and Bel V have 24h/24 and 7d/7 duty-call.
How is the collaboration between FANC and Bel V with regard to knowledge management organised (responsibilites, working groups, etc.)? And are there specific tools implementented to improve the knowledge management in both organizations?	Collaboration in the field of training is part of the general cooperation agreement between FANC and Bel V, signed in September 2019. Coordination of R&D activities (increasing synergies, avoiding duplications, exchanges of results) as well as coordination of participations in international activities are also included in this agreement. FANC and Bel V inspectors are subject to the same competence requirements as laid down in article 73 of GRR-2001. More practically : - FANC and Bel V experts may participate jointly to similar (university) courses, trainings or conferences; - Internal trainings organized by one organiszation are open to the members of the orther organization; - FANC experts may occasionally participate in Bel V TRCs (Technical Responsibility Centers); - Specific common developped programs can be and have been set up to anticipate evolutions in the Belgian nuclear landscape (e.g. decommissioning and dismantling). - ...
Internal Crisis Center: How many members of staff? Which functions are members of the crisis center? How is it organized?	About ten persons are mobilised within the internal crisis cell, including two persons from Bel V to ensure the technical and radiological analysis in support of their colleagues from the FANC. In addition to these roles, the FANC will also provide staff for the secretariat, the presidency, communication aas well as for the follow-up of the CELMES-Fed missions. All these persons will mainly have the task of preparing to relieve the teams mobilised within the Evaluation and Measurement cells and/or to remotely provide them with technical/administrative/radiological support if the situation requires it.

The report stats that in view of implementing certain IRRS recommendations, the Law of 15 April 1994 has been amended by the Law of 7 May 2017. What impact does that amendment have on the overight of the Belgian nuclear power plants? With impact Switzerland understands e.g. application of new oversight subjects or oversight methods.	The main impacts of this amendment of the law of 15 April 1994 were as follow: - explicit assignment of the prime responsibility of the licensee; - reinforcement of the role of the Health Physics Department and Experts : Organisational structure, duties, responsibilities in safety, mandatory tasks, training requirements for the Experts, ...; - legal formal mechanisms for the delegation of regulatory tasks to Bel V and surveillance of FANC on Bel V with connected requirements in the GRR-2001 (article 38).
How is the process of developing an internal competence building project for the Regulatory Body implemented in practice?	The process of competence management is not yet fully described and documented within the FANC Management system. However, at the entrance of a new staff member, a mentoring program is put in place by the section head. This program could be very open and encomprise exchanges, on-the-field trainings,.. Expertise autonomy is the objective. During its career, the possibility of specific trainings are evaluated each year with the section head. The Bel V process of competence management is fully documented and is based on the SAT approach. More precisely, regarding the competence need analysis (CNA) step, Bel V applies the SARCoN tool. The version used is a customized version adapted to the Bel V specificities. A CNA is requiered for new comers and in the case of a new job to take over.
The seismic PSA, which was conditional on a lifetime extension of the considered units, has been stopped given that no new long-term operation after 2025 was allowed by the federal government. What is the status of the Seismic PSA knowing that some Units will continue to operate beyond 2025?	The seismic PSA for the reactor will be done for Doel 4 and Tihange 3 in case of a LTO project for these units.
The strategy of the Licensee to improve safety was developed taking into account the scenario where all units are shut down in 2025. For the action plans focusing on the installations, this scenario has led to an increased focus on the spent fuel pools. What is the contingency plan for the Operator and the Regulatory Body knowing that some units will continue to operate beyond 2025?	Within the projects to prepare long term operation beyond 2025 the necessary design improvements will be identified and implemented. The SNRI-2011 has been updated to make a distinction between "needed" design improvements to respect minimal safety requirements, which are to be implemented before restart, and "opportunity" design improvement which are to be implemented within 3 years after restart. The discussions between ENGIE and FANC regarding the necessary design upgrades are ongoing.
During the discussion between the licensee and the Government about lifetime extension of the newest plants: what is the role of FANC and how does it make sure that no matter the pressures, it requires the necessary steps and procedures related to safety?	FANC is not involved in the discussions between the licensee and the government. FANC has contacts with the licensee with regards to the preparation that is in accordance with the pre-defined FANC approach regarding an LTO. FANC's contact with the government is done through the minister of the interior (who is not involved in the discussions with the licensee) and not with the ministers involved in the discussion between the licensee and the government.
The three security-safety interface issues in the Decree: are these covering all items of the TF report? If not, what happens with the remaining issues?	Only three "high level" requirements have been included in the SRNI-2011. The objective was to enable the oversight of the regulatory body and of the licensee's HPD on the licensee processes related to the management of the interface between safety and security. Currently, no plan exists to include the remaining issues in the regulation, but these remaining issues are taken into account in the regulatory assessments .

In Belgium, government policies on final closure or continuing operation of NPP seem to change from time to time. Apart from knowledge development, what does FANC do to keep staff motivated to ensure staff retention and to recruite new staff? Is the Government supporting these staffing activities of FANC in some way?	Within FANC, a dedicated process of the policy “HRM” deals with “Work Force Planning”. This process provides information for the establishment and the reviewing of the personnel planning strategy, especially for medium and long-term planning. This process combines qualitative and quantitative approaches. The Human Resource policy"HRM" ensures the satisfaction of each staff member through four axes: - learning and development; - on-boarding and departure from the organisation; - the workplace and well-being; - remuneration and recognition. In addition, while the FANC ensures that all staff members are treated equally, the FANC takes into account the personal situation of each staff member. For example, one can choose between two working arrangements, one more teleworking-oriented than the other. If the government is not actively involved, the agency has access to the exchange and training platforms set up at ministry level.
The general policy of the Belgian Government on nuclear energy is phase-out (apart from the newest reactors). It is stated that the construction of new NPPs in Belgium is forbidden by the phase-out law (Article 3). In this context, why is BelV collecting information on existing/emerging SMRs? Is this somehow connected to the Governments R&D budget of 100M€ for advanced SMR? Are SMR currently also forbidden by the phase-out law? And does this imply that the law has to be changed in order to have the possibility to build such reactors? If so, does Belgium have plans to change the law?	Generally speaking, it is usefull, not to say necessary, for a technical support organisation such as Bel V to stay informed on technocolgical developments and initiatives. Bel V, up till now, did not participate in the technological assessment of SMRs for which the Belgian government allocated funds. However, Bel V does perform such assessments in the framework of its international collaborations and activities.. The nuclear energy phase-out law, forbids constructing any new nuclear reactors intended for industrial production of electricity by fission.
The licensing process for nuclear facilities has been updated. The update addresses a.o. the public enquiry process. Question: Does this update imply that a broader public (also in parts also in The Netherlands) will be actively approached?	The public inquiry is now organized by FANC and entails a notification of the inquiry at the site concerned, on the website of communities within 5 km of the site, on the website of FANC and in the Belgian official journal. Dutch communities within 5 km of the site will thus also be asked to publish this notification. In addition, FANC has an agreement with the Ducth regulatory body ANVS, wich allows for a more broad information exchange on a license procedure and public inquiry. More specifically, FANC will inform Dutch communities, provinces and other authorities within 20 km of the site as well as the ANVS of an upcoming public inquiry. ANVS provides the contact information of the authorities concerned.
Bel V is working on cyber security.What will be the influence of developments with respect to new EU-directives on information (NIS2) on the regulations with respect to this subject for nuclear installations?	Historically, the NIS does not specify explicitly nuclear installations as part of the coverage. In Belgium, a specific and independent legal framework (compatible with the NIS transposition) has been developed for the Nuclear Sector. After a short assessment of the published version of the NIS 2, some modifications may be necessary, but the global strategy will remain unchanged. Since NIS 2 has only been published recently and does not target specifically the nuclear sector, it remains difficult to give a precise view of the potential influences on the current regulations.
Belgium may like to share the implementing experience of three new requirements related to nuclear safety-security interface in 2011.	New requirements on Safety-Security interface have been introduced in the SRNI-2011 by the Royal Decree of 2 June 2021. Only "high level" requirements have been included in the SRNI-2011. The objective was to enable the oversigth of the regulatory body (FANC and Bel V) and of the licensee's HPD on the licensee's processes related to the interface between safety and security, in particular to the licensee management of potential conflicts between safety and security during the design phase of a new installation or planned modification of an existing facility. Safegards still remains an exclusive competence of the FANC.

After the nuclear power plants/research reactors are shut down, how is it planned to reserve the operational and scientific knowledge gained there?	The operator of the nuclear power plants ENGIE Electrabel has processes and action plans to identify critical skills, taking into account the future of the units. As the first units, Doel 3 and Tihange 2, have gone into the postoperational phase, focus is increasing for skills and competences related to dismantling, radiation protection, waste management and project management. However, different measures in the Human Resources strategic plan around axes like Strategic Workforce Planning and Employability ensure that sufficient staff with operational experience remains at the nuclear power plants. It is to be noted that the Research Reactors will not be shut down in the coming years. Operation of BR2 is at least planned up to 2036, while no defined shut down date for the other reactors (BR1 and the critical facility VENUS) exists. This already garantees that operational knowledge will be available for the coming yeares. In addition to this reactor operation, SCK CEN works also on the design and construction of innovative reactor concepts. SCK CEN has also developed, in cooperation with universities, a number of training programs intended for persons working in the nuclear industry. These programs include reactor theory, operation, radiation protection, waste management and sociological aspects.
SCK CEN was recently given funding to investigate the feasibility of deploying non-light water small modular reactors to help meeting the country's energy needs. Deployment of non-light water reactor technologies may necessitate updating the regulatory infrastructure to address issues unique to those technologies. (1) Please describe what role, if any, FANC will play in assessing the feasibility of these technologies. (2) Please clarify if the assessment will consider the regulatory changes that may be needed to support the potential deployment of these technologies.	Up till now, FANC does not play a role in the assessment of the feasibility of SMR technologies. However, FANC did launch a project to gain more insight in the development and specifities of SMRs as well as the applicability of the regulatory framework to SMRs. As such FANC follows-up international activities in this area such as those by the IAEA, WENRA and the EC. Bel V, in its role of TSO, supports the FANC in this context.
The 9th National Report mentions that international peer reviews and the Tihange national large-scale exercise were impacted by the COVID-19 pandemic. (1) Please discuss any additional challenges to maintaining appropriate oversight or other activities that have been experienced by FANC during the pandemic. (2) Discuss how those challenges were addressed.	Due to the COVID-19 situation, several exercises (including Tihange 2020) had to be rescheduled and/or modified while trying to respect the legal obligations as much as possible. In this context, the FANC with its partners was able to maintain their organisation and the reception of the participants in the FANC crisis infrastructure instead of the NCCN, occupied by the management of the Covid crisis. We were thus able to experiment with the partial mobilisation of the crisis cells and hybrid work within certain sub-groups of experts (particularly at the level of radiological analysis). This allowed significant progress to be made on the methods of analysis and consultation, and on the means of communication (Teams, ICMS, etc.) with the operator and the administrative authorities. The FANC also made essential changes to its crisis infrastructure so that the usual precautions (distance, plexiglass, disinfection material, etc.) are fully respected. Peer review missions have been postponed in agreement with the corresponding organisations.
The 9th National Report notes that in 2021 FANC initiated the process to replace reactor-specific authorizations with a single site-wide authorization. (1) Please discuss any challenges that may have arisen with this approach since implementation. (2) Explain how reactor-specific variances are accounted for in this approach.	Due to the set-up of the rewritten authorisation, that contains a general part of authorisation conditions (valid for all reactor units and other installations) and several specific sets of conditions that are valid for a specific reactor-unit (or other installation e.g. spent fuel storage building) that also refers to the specific Safety Report that is valid for that reactor, the reactor-specific variances are taken into account similarly as in the past. No challenges have arisen yet with this approach.

This section states that the seismic PSA, which was conditional on a lifetime extension of the considered units, has been stopped given that no new long-term operation after 2025 was allowed by the federal government. However, towards the enf of section I.B., it is stated that "In March 2022, the Belgian government agreed to allow a long-term operation for the two most recent unit (10 years extra for Doel 4 and Tihange 3)". Does this mean that the seismic PSA for these two units will now be completed?	The seismic PSA (reactor) will be reinitiated and done for Doel 4 and Tihange 3 in the framework of the LTO project. To be noted that the seismic PSA for the spent fuel pools has already been done within the WENRA Reference 2014 action plan.
This section also does not appear to reflect the Belgium governments decision in March 2022 to allow the LTO of Doel 4 and Tihange 3.	Although the government did make a decision to allow an LTO, the legal situation has not been changed yet (hence, an LTO is not yet legally possible) and the licensee decided to not start any actions before an initial agreement was found between the government and the licensee. In January 2023 there was a partial agreement, that resulted in the decision to start the necessary studies. Hence, there are no concrete aspects that could be added, besides the mentioning of the government decision.
It is stated that the INES level 2 event was initially given a level 1 rating but that this was increased to level 2 as it was a repeat of a similar incident the year before. Could you confirm that the earlier incident was rated as INES level 1?	In 2019 FANC was notified by the licensee of a historical practise that on hindsight could have led to a violation of the OLCs. No INES analysis was carried out for that notification. During the event in 2021 the OLCs were violated during a different but similar practise. For this event an INES analysis was required which resulted in a basic rating of 1 which was increased with 1 because of safety culture issues (insufficient lessons had been learned from the notification in 2019). This led to a final INES rating of 2.
Are there any differences in the results of the PSAs on what should be near identical units (e.g. between Doel 1, 2, 3 and 4)? Note that this comment is prompted by the Czech national report where marginal differences in the CDF between the near identical units and Dukovany NPP.	It is an inherent part of the review process of PSA studies to identify and explain differences in the results between units. Differences in results are to be explained based on characteristics of either the installation and/or the site (e.g. seismic and flooding PSA). As all units of the Belgian fleet are somewhat different (except twin units Doel 1 and Doel 2) PSA results are never exactly the same.
Periodic safety reviews are required every 10 years. It is stated "The next PSR is ongoing in the framework of final plant shutdown before dismantling and decommissioning". At the same time, efforts for an agreement between the Belgian government and ENGIE Electrabel for LTO are being pursued. Kindly elaborate on how Belgium is preparing to meet the challenge of LTO given the short timeframe within which it has to address, including the aspects of human & organizational factors as well as knowledge management.	The PSR assessment of Doel 3 and Tihange 2, which have been shut down, have been conducted taking into account this final plant shutdown. The PSR assessments of the other units, for which shut down is planned in 2025, are scheduled to start in 2023. These assessments will off course be done taking into account the retained scenario: the scope and methodology will be adapted to the LTO scenario for Doel 4 and Tihange 3, if LTO is confirmed. As the efforts to reach an agreement are still ongoing and the situation is evolving, the up-to-date status on the topic LTO will be treated during the Belgian presentation.
Could Belgium elaborate, how the initiated process to rewrite the authorisations per reactor of the licensee works and how grouping them in one single authorisation for all reactors on a site will be handled with some reactors still being operated after the first reactor on a site has been shut down?	The authorisations have been, over the years, adapted several times, with specific modifications or articles that no were longer valid, and this spread over several documents. For each reactor, the conditions that are still valid (part of these several documents) were collected and compared with the other reactors. The wording was harmonized and modification of the legal framework were taken into account. The common conditions were put in a general part and are valid for the whole site (and all units/installations on it) and are considered to have to remain valid also for units that are in shutdown. The other conditions are put in a section that is only valid for one specific installation/reactor. If a reactor will be shut down, the reactor-specific part of the authorisation can be adapted (which has already been done for Doel 3 after its shut down).

It is stated that solution paths for replacements of obsolete QA items include, amongst others, like-for-like procurement from non-qualified suppliers. For which cases is this solution path considered, i.e., for what type of equipment? Which quality requirements are put in place for those items and the non-qualified suppliers, respectively?	Like-for-like procurement from non-qualified suppliers is performed via the process of Commercial Grade Dedication. The process has been developed based on the EPRI procedure (Product ID: 3002002982). This solution path is considered when the product can no longer be procured under the manufacturer's nuclear quality assurance program (10CFR50 Appendix B). Commercial Grade Dedication is performed most frequently on safety related EI&C items that have been qualified (environmental and/or seismic). Commercial Grade Dedication is not performed on items that are designed and manufactured following the ASME code and require follow-up of our Nuclear Inspector. We typically procure these commercial grade items from manufacturers with an industrial quality assurance program (i.e. ISO-9001) and a proven industrial quality (REX). The overall level of reliability of the supply chain (including the quality assurance programs of supplier, sub-suppliers and distributors) affects the sampling plan applied during the commercial grade acceptance testing of the ordered items. The commercial grade dedication program is a process which is entirely covered by ENGIE Electrabel's (the operator's) 10CFR50 Appendix B quality assurance program.
It is said that the development of seismic PSAs was stopped due to the fact that no LTO was forseen beyond 2025. Could you update the situation after the decision to extend the operation of D4 and T3?	The seismic PSA (reactor) will be reinitiated and done for Doel 4 and Tihange 3 in the framework of the LTO project. To be noted that the seismic PSA for the spent fuel pools has already been done within the WENRA Reference 2014 action plan.
Is there any specific communication chanel with the public or with employees to convey safety or security concerns to FANC? What about the NPPs?	From the side of the regulatory body, the public is informed by - the website of FANC, for general information on all matter for which FANC is the competent authority; - a specific mail adress has been provided via the website of FANC to address specific questions from the public; - participation of FANC to info sessions - ... Employees of the licensee may inform the inspectors from the regulatory body on specific issues, or use the same mail address as is used for public. The regulations foresee this even as a "duty" of all workers to notify, at least to the health physics department, all irregular situation or malfunctioning of the protective measures. From the Licensee's side, the public is informed via: -The website and via the contact form: Contact | ENGIE Electrabel (engie-electrabel.be); -Contact details published in to the magazines Doelbewust and Tihange Contact; -Various social media channels like Facebook, Instagram, Twitter etc; -The different sounding board councils of Doel and Tihange; as for the Internal employees of the licensee: -Same as above plus; -4444 internal phone number; -Colleagues of Internal Communication and/or the internal mailbox of Communications; -Colleagues of Health & Safety and/or the internal mailbox of Health & Safety; -OESAP, the in-house Operating Experience tool with event reports ;
Could you provide more details about the external assessors mentioned in the PSR processes and ellaborate a little bit more the different roles and interactions among the 3 main actors (plant staff, external assessors and FANC) in the identification and scheduling of safety improvements?	The assessors assigned by ENGIE for the different safety factors are mainly internal ENGIE Electrabel staff but also some Tractebel staff. The internal ENGIE Electrabel are mainly fleet staff, to get a more independent view on the site situation. These assessments and the resulting summary report and action plans are reviewed internally by the health physics department and then sent to the Safety Authority. Each safety factor is then assessed by Bel V. The results of the assessemnts are incorporated in Safety Evaluation Reports transmitted to the FANC to support the final opinion of the Regulatory Body.

Ireland thanks Belgium for its comprehensive national report which is structured in accordance with the articles as given in the Convention. / Ireland thanks Belgium for its comprehensive national report which is structured in accordance with the articles as given in the Convention.	Thank you for the comment
Has the law of 31 January 2003 on nuclear energy phase out been updated to take into account the long-term operation of Doel 4 and Tihange 3?	No, it has not yet been adapted
The update of article 6 of GRR-2001 addresses a clear definition of scope of projects within EIA obligations or screening. Does extension of life of existing nuclear facilities require EIA?	In case of an LTO, several modifications to the NPP installation could be required. In that case it needs to be evaluated if a license modification is needed and could therefore lead to the application of art. 6 of GRR-2001 and hence an EIA or EIA screening (modification to an existing NPP).
The Kingdom of Belgium is to be commended for changes to the regulatory framework, specifically the turning of FANC guidance into binding acts.	Thank you for the comment
The Kingdom of Belgium is to be commended for the completion of the European Stress Test Action Plan	Thank you for the comment
The report lists several amendments of legislative acts. Since 2017 the FANC is responsible to set up and manage an exposure register and since 2020 for radiation passport. Please provide information on how the collection and management of doses of exposed workers were organised prior to the introduction of the change in legislative acts, as well as whether the data collected thus far were transferred to the new register.	Article 25/2 of the law of 15 April 1994 entrusts the FANC with the competence to create and manage an exposure register. This article entered into force on 1 April 2017. Previously, this competence belonged to the Federal Public Service of Employment, Labor and Social Dialogue. The system which was then applied was the following: The employers had to establish an annual exposure and decontamination table for each worker, in a paper format, which included the dosimetric records by monitoring period during the year. These tables had to be signed by the employer and by the occupational physician responsible for the medical follow-up of the workers and sent in three copies to the FPS Employment by the 31th of March of each year. One of these copies was sent to the FANC. At the level of the FPS Employment, the data contained in the paper exposure tables were manually encoded in an electronic database (type 'MS Access') and the paper exposure tables were filed in an individual file for each worker. These files were arranged in alphabetical order by the worker's name. During the transfer of competence, the archived individual files were taken over by FANC. Storage has been respected and these archives can be easily consulted if necessary. In addition, the content of the electronic database of the FPS Employment has been transferred to FANC and kept in a separate database. Consequently, when requesting a dose history for a worker (for example, in the context of an occupational disease recognition file), we can therefore easily find the doses preceding the transfer of competence.
The Figure 2 in the report presents the timeframe for the decommissioning and dismantling of NPPs. Could you please explain the main differences between the dismantling and demolition phases depicted in Figure 2? Which phase includes the release of the nuclear power plant site from regulatory control?	As shown on the right blue arrow of Figure 2, there is a milestone where the unit is released from regulatory control after the dismantling phase. After this moment, buldings are released and can be conventionaly demolished. It should be noted that for the first unit, this release will be limited to the buldings and do not include the ground. The release off the whole site we be preformed with the end of the decommissioning of the last unit.
What are the kind of technical requirements resulting from the modification of Royal Decree to introduce management of safety-security interfaces in modifications potential safety-security conflicts ?	Only "high level" requirements have been included in the SRNI-2011. The objective was to enable the oversigth of the regulatory body and of the licensee's HPD on the licensee's processes related to the interface between safety and security, in particular to the licensee management of potential conflicts between safety and security during the design phase of a new installation or planned modification of an existing facility.

Is there a political commitment or support to build or to develop SMRs? If yes, for what use? What are the ongoing projects and what are the perspectives in 2030? 2040? Will these projects rely on proven or on new technologies? Will these projects be first of a kind or reactors with abroad operating experience? Is there a particular type of reactors that is considered in your country to be more mature or more suited to your country's needs?	In december 2021 the Belgian government decided to allocate funds to the technological assessment and development of SMRs. SCK CEN was tasked to, possibly in cooperation with other parties, to carry out this technological assessment and development. This decision also aims to establish a long-term program.
Among actions of WENRA 2014 action plan, your report indicates that it is to be noted that the seismic PSA, which was conditional on a lifetime extension of the considered units, has been stopped given that no new long-term operation after 2025 was allowed by the federal government. However, the seismic part of the spent fuel pool PSA has been continued. Would the seismic PSA now be re-initiated ? What nowadays are the main Safety improvements from findings on the studies in the Wenra Action Plan ?	Yes, the seismic PSA (reactor) will be done for Doel 4 and Tihange 3 in the framework of the LTO project. The WENRA Implementation Plan which is mentioned in the Belgian report collects all safety improvements from the WENRA studies action plan. This plan is split up in 2 parts, part A for the spent fuel pools and part B for the reactors. Part A includes reinforcements of the robustness of the spent fuel pool cooling, procedural, organisational and hardware such as foreseeing a spare pump, improving electrical protection of the motor of the pumps, upgrade of procedures to ensure injection to the pools. It also includes corrective actions based on plant walkdowns in the framework of the seismic PSA. Part B for the reactor includes accident procedures updates based on DEC A studies, severe accident management guidelines updates based on DEC B studies, the implementation of a system to inject NaOH in the reactor building during DEC and both procedural and hardware protection concept reinforcements to cope with extreme high temperatures (mobile cooling groups, misting systems).
Have any requirements been changed or improvements been requested to take into account the feedback from the Covid-19 pandemic period? On which topics?	No, the existing requirements and processes were deemed adequate to ensure business continuity.
Challenge : The regulatory body and the licensee should continue their preparations to support the final shutdown and subsequent decommissioning of the concerned Belgian NPPs. They also are challenged by the possible decision to postpone some reactors definitive shut-down.	Thank you for the Comment
Chapter II.C.4: It is mentioned that the European Directive 2014/87/EURATOM has similar safety objectives as the Vienna Declaration on Nuclear Safety. Could more be said related to the principles 1, 2 and 3 of the VDNS?	VDS principles 1 and 2 are embedded in article 8.a of the European Directive 2009/71/EURATOM, as modified by the Directive 2014/87/EURATOM. Articles 8.b, 8.c, 8.d and 8.e addresse additional requirements on Implementation of the nuclear safety objective for nuclear installations, Initial assessment and periodic safety review, On-site emergency preparedness and responses and on Peer reviews. The European Commission regularly organizes workshops allowing to exchange on the implementation of these principles amog the EU member states.