Questions posed to Sweden on its seventh National Report under the Joint Convention and Sweden's answers

Explanatory notes:

1. In the table below, "Article" refers to an article number in the Joint Convention (see INFCIRC/546 - Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (iaea.org)).
2. Sweden's seventh report under the Joint Convention can be downloaded from Sweden's seventh national report under the Joint Convention on the safety of spent fuel management and on the safety of radioactive waste management - Regeringen.se

Article	Ref. in National Report	Question / Comment	Answer
Article 12.1	A.8.1.8,P23 last para	In the text, some wastes slightly contaminated with Uranium will be produced during the manufacturing process, such as CaF2mental, construction waste, electronic products, combustible waste, sludge, filter, protective suit and so on. If Westinghouse company obtains license from SSM, wastes with low uranium (usually CaF2, mental, construction waste) will be transported to municipal landfills for disposal. Most of the Uranium in the wastes has been extracted through special recovery process in Vasteras before disposal. (1) It is a tough problem to the disposal of CaF2 solid slag in uranium conversion and nuclear fuel production. Please briefly explain the technological process of uranium recovery from CaF2, solid slag. And whether secondary waste will be generated in the recovery process and how to deal with the secondary waste? (2) Are wastes with very low uranium such as CaF2, metal and construction waste measured for contamination before they are sent to municipal landfills and how to ensure the sample's representativeness ?	1) Calcium fluoride occurs when calcium carbonate reacts with solutions containing fluoride, mainly ammonium fluoride. This is done in WSE's chemical recycling system: the lime tower and the mini-lime tower. It generates just over one ton of calcium fluoride per ton of produced uranium dioxide. Most of the calcium fluoride comes from the lime tower and a smaller amount from the mini-lime tower. The task of the lime tower is to dispose of fluorine residue (ammonium fluoride solution) from the fuel plant's conversion plant. The liquid has an uranium content of less than five ppm; typically about one ppm. The liquid has an excess of daughter nuclides because all chemical processes in the conversion are selective on the return of uranium. The liquid is pumped from a staging tank to the lime tower, which is filled with crushed limestone (calcium carbonate, CaCO3). The calcium carbonate reacts with fluoride and forms calcium fluoride, i.e. the carbonate is replaced by fluoride. Some uranium and daughters get stuck in the generated calcium fluoride. Pre-treated liquid goes on to ammonium carbonate recycling, where most of the ammonia and carbonate is driven by, the residual fluid then goes to the mini lime tower, where pH adjustment with sulfuric acid causes uranyl sulfate to form and remain in the lime sand, while the now even cleaner liquid is pumped to the emission tank. 2) The activity in spent limestone is measured via a sampling test procedure, when the lime bed is replaced. The radiation level of used calcium fluoride is low and the storage in lift dump containers does not entail the need for delimitation as a protected or controlled area. After the uranium daughter activity has subsided to equilibrium with the uranium, a fair nuclide-specific analysis can take place. Analysis of mass numbers via ICP-MS also takes place. Calcium fluoride is recorded locally on the server of the manufacturing

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			unit and stored on average less than a year outdoors in lift dump containers. Thereafter it is placed in class-1 landfill after conditional clearance procedure according to dispensation SSM2017-3345. Various methods including peroxide precipitation and disposal as a flux to the metal industry have existed since the conversion plant was started in 1975 when there was neither a lime tower nor a mini lime tower at the factory. After various trials with external end users for the ammonium fluoride solution or calcium fluoride that occurred, WSE, although uranium content and dose consequences are minimal, chose the precautionary principle of depositing the resulting calcium fluoride in a class-1 landfill. WSE's assessment is that handling and disposal as described above is an optimized process and BAT from a chemical recycling perspective.

Article	Ref. in National Report	Question / Comment	Answer
General	N/A	Proposed Area of Good Performance 2: Management of Non-Nuclear Fuel Cycle Wastes It is important to ensure that there are long-term management solutions for radioactive wastes from non-nuclear fuel applications (i.e., medical use, research activities, industry, and consumer products). Sweden has put in place measures to manage these wastes within the solutions developed for the nuclear fuel cycle wastes.	Comment noted, thank you.
General	N/A	Proposed Area of Good Performance 1: Modernization of Legislation, Ordinances, Regulations Modernization of radioactive waste and spent fuel legislation demonstrates the importance that governments, industries, NGO's, including citizens place on this important public policy issue. To this end, Sweden just passed a new Radiation Protection Act which was entered into force on 1 June 2018, including eleven new SSM regulations. In Sweden, a government-appointed inquiry proposed that the current Nuclear Activities Act be repealed and replaced by a new act based on the new Radiation Protection Act. It is a good practice for all nuclear producing nations to conduct independent reviews of current legislations and regulations to ensure their continued relevance and to reflect new policy.	Comment noted, thank you.

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General	General	The Swedish report concretely shows that great efforts are being made to improve the long term management of radioactive waste and more generally the back end of nuclear cycle. The progress made deserves to be highlighted and congratulated. For instance, six reactors have plans for long-term operation beyond 2020, it has been decided to permanently shut down the four oldest electricity-producing reactors at Oskarshamn and Ringhals before the end of 2020, and actual large-scale dismantling activities will commence at the Ågesta, Barsebäck and Oskarshamn sites in 2020. Also, regarding the project of deep geological repository for spent fuel, SKB submitted additional information requested from the government in April 2019 and after SSM reiteration of its earlier statement regarding the site suitability, SKB's license applications are now awaiting licensing decision by the government.	Comment noted, thank you.
General	Page 64	Australia applauds the establishment of 'local safety boards' within municipalities hosting nuclear power plants is considered a good practice from a stakeholder engagement perspective. (aligns with preamble IV)	Thank you, comment noted.

Article	Ref. in National Report	Question / Comment	Answer
Planned Activities	Section K.3.2.2	Maintaining and retaining highly qualified people with the relevant competencies is vital to the nuclear sector. To face these challenges, what innovative strategies are being considered to develop and retain people with the appropriate skill sets to meet future needs of the industry?	SSM has generated a proposal of a national strategy for the Swedish knowledge management within the radiation protection area, which was recently delivered to the Swedish government. It includes an overall vision, which is broken down in five strategic areas with a proposal of in total 21 prioritized actions with the purpose of strengthen the knowledge management during the coming 10-year period. Many different actors, e.g. universities, the industry, authorities, have been involved in the process of developing the strategy and are also appointed in the various proposed actions.

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General	Section A.9.4.1 & K.1.1	The Swedish Court requested SKB to provide more documentation to clarify the long-term protective function of copper canisters. Could Sweden provide a detailed explanation of what the Court is looking for, what is the impact on the design requirements, and how SKB is planning to meet that request? In addition, what communication plans and messages are planned to inform stakeholders and the public on this issue?	In its statement to the Government in January 2018, the Land and Environment Court recommended that the planned system for final disposal of spent nuclear fuel could be considered permissible according to the Environment Code if: - SKB provides data showing that the long-term storage facility meets the requirements of the Environmental Code in the long term, "despite the uncertainties that remain" about how the canister's protective capacity is affected by five specific degradation processes; - It is made clear who has responsibility for the facility under the terms of the Environmental Code in the long term (after closure). The second point was addressed by a change to primary legislation in 2020, which clarified that the state takes over responsibility for a geological repository after all associated conditions associated with Government approval for its closure have been fulfilled. The five processes were: - corrosion of copper due to reaction with pure oxygen-free water - pitting corrosion caused by reaction with sulphide, including the influence of the so-called "sauna effect" - stress corrosion cracking in the presence of sulphide, including the influence of the so-called "sauna effect" - hydrogen embrittlement - the effect of ionising radiation on pitting corrosion, stress corrosion cracking and hydrogen embrittlement It can be noted that the specific canister degradation processes identified by the Court had been addressed in the supporting technical material for SKB's licence application according to the Act on Nuclear Activities, which had been reviewed in detail by SSM. Nevertheless, that the Court was of the opinion that certain specific concerns raised by opponents to SKB's plans had not been adequately addressed by SKB

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			during the Court's main hearings. SKB submitted its supplementary information to the Government in April 2019. The supplementary material (including a major report on the identified canister degradation processes - SKB Report TR-19-15) was then circulated by the Government to a wide range of stakeholders and institutions as part of a nationwide consultation process. SSM's review was conducted with the support of independent consultants, and the Authority's conclusion - communicated to the Government in a report providing an in-depth analysis of the issues, as well as being presented to the host municipality Östhammar - was that the new material did not give rise to anything other than marginal changes to the safety analysis, which was judged to be robust. Nevertheless the environmental organisations and researchers who particularly raise these issues as matters of concern have expressed that they are not satisfied with the additional information and effectively maintain their original assessments. The Government's decision on licensing according to the Act on Nuclear Activities, as well as the permissibility of the final disposal system according to the Environmental Code, was made on 27 January 2022. Updated information on the status of the licensing process will be provided as part of Sweden's presentation during the review meeting.

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General	Section E.2.8	How are local safety board members appointed and for how long? What are some of the challenges and benefits of having a local safety board in place?	The Local Safety Board members are appointed by the Swedish Government for a period of maximum three years. The role of the local safety boards, as prescribed in the legislation, is to ensure transparency as regards nuclear activities in the municipality. Thus, the local safety boards have a specific responsibility and mandate to inform inhabitants about nuclear activities in the municipality in question. The local safety boards have no specific role in the licensing process in addition to inform the public about the process.

Article	Ref. in National Report	Question / Comment	Answer
Article 8	p. 117	"Additional requirements concerning the long-term radiation protection and nuclear safety of a disposal facility are stipulated in the regulations concerning safety in connection with the disposal of nuclear material and nuclear waste (SSMFS 2008:21), as well as in the regulations and general advice on the protection of human health and the environment in connection with the final management of spent nuclear fuel and nuclear waste (SSMFS 2008:37)." Is there a clear dose criterion (e.g., in the range of 10 microsieverts/yr) that must be met?	SSM implements a risk criterion for the post-close phase of final repository for spent nuclear fuel and other radioactive waste as stated in 5 § (SSMFS 2008:37). The paragraph states that a repository shall be constructed such that the annual risk for harmful effects for a representative individual in the critical group (the group exposed to the highest risk) is limited to a maximum of 10-6. The probability of harmful effects shall be calculated based on the conversion factors between risk and dose which has been established by the International Commission of Radiation Protection (ICRP) volume 101a, 2006 and volume 103, 2007. For a particular scenario or calculation case if one assumes the conditional probability of one the prescribed annual risk corresponds to an annual dose of about 15 µSv. For a particular case, if it can be shown that the probability of occurrence during the post closure period is lower than one, a higher annual dose than 15 µSv can be accepted. For this reason, SSM does not prescribe a fixed dose criterion. The above description is based on existing regulatory requirements. It could be mentioned here that SSM is currently in the process of updating and developing these regulations. The updated regulations are expected to be implemented approximately 2-3 years from now.

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General	page 153	The Swedish National Report indicates that SSM decided to develop guidelines for its regulations in order to achieve a better understanding of the provisions and thus compliance by the licensees by putting them into a context where the purpose, background, requirements of the provision as well as the recommendations on how they should be met. Question: Could Sweden explain the legal status of these guidelines? Are they legally binding or just non-binding auxiliary documents?	The guidelines are not legally binding. However, it can be reasonably assumed that they indirectly have a fairly strong impact on operators; partly through their increased understanding of the legal requirement, and partly in the way in which they chooses to meet the requirement.
General	Section A.8.3 & E.2.1.4	Has there been any issues raised by the Debt Office regarding its review of SKB's latest cost estimates that would be relevant to other nuclear nations?	In connection with the authority's review, it is normal for SKB to receive views on what can be improved prior to the next cost calculation. Most recently, the Debt Office provided views on the areas of historical development of estimated costs for the nuclear waste program, real price and wage developments, SKB's uncertainty analysis and the licensees' forecasts for electricity production.

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Article 19	p. 65	"This shall nevertheless not apply in cases where another site is considered to be more appropriate for the activity, or if an appropriate site has been designated for the activity in another municipality that is likely to approve the activity." Thus, the site with the best possible safety is not necessarily selected. Are there also critical voices about this approach?	Swedish legislation does not require that the "best site" should be selected for final disposal of nuclear waste or spent nuclear fuel. Rather, the selected site shall meet the safety and radiation protection criteria set up by competent regulatory authority (SSM). The municipal veto, as well as the policy of voluntary participation in the siting process, are important both for the municipalities' right to self-determination and the possibility to reach municipal acceptance for hosting a repository. Although, the conditions for applying the municipal veto were discussed in the early phases of Swedish Nuclear Fuel and Waste Management Co (SKB) siting process (during the 90ies), the principle is generally accepted.

Article	Ref. in National Report	Question / Comment	Answer
Article 26	p. 98	"The main criteria for clearance of potentially contaminated waste, materials, and buildings are: – Removal of contamination as far as reasonably achievable – Dose criterion in the order of 10 µSv per year to any member of the public. – The main criteria for site release are: – Removal of contamination as far as reasonably achievable – Dose criterion 100 µSv per year to any member of the public – In the case of release for restricted use: Reliable restrictions must be in place such that the effective dose to any member of the public would not exceed 1 mSv per year if the restrictions should fail." Why is a higher dose than in the range of 10 microsievert/yr allowed for site release?	SSM's considerations behind the dose criterion 100 µSv per year are given in the supporting document of regulations SSMFS 2018:3, i.e. "Vägledning till SSMFS 2018:3", page 34: 1. According to Chapter 2, Section 1 of the RPO, the dose limit for the public is 1 mSv per year. 2. The criterion should not exceed the dose restriction for members of the public during operation of the facility, which is 100 µSv per year according to Chapter 3, Section 5 of the RPO. 3. The criterion should not be too low since this could lead to consequences and costs for remediation, sampling and measurements that cannot be motivated from a radiation protection point of view 4. Guiding values ("riktvärden") for conventional contaminants are based on a risk for damage of about 1E-5, which corresponds to about 100 µSv. 5. The criterion is combined with requirements on clean-up as far as reasonably practicable, see Chapter 3, Section 7 of SSMFS 2018:3. 6. IAEA, USA and Spain have adopted dose criteria for site release in the order of 100-300 µSv per year.

Article	Ref. in National Report	Question / Comment	Answer
Article 4	p. 106	It is reported that as part of its application for construction and operation of the combined encapsulation plant and interim storage facility, Clink, also applied for increasing the interim storage capacity to 11,000 tonnes. How is this extension of the storage capacity for SF at Clab planned to be realized? Has criticality safety been considered in these plans and how is sub-criticality ensured in Clab in general?	The Clab facility today uses two types of storage canisters in the pools for the spent fuel. One is called "normal" canister and utilizes geometrical configuration only for criticality safety (adds enough space between spent fuel elements). These were used until ca 1995 in the facility. The other type is called "compact" canister and uses borated steel as criticality safety. "Compact" canisters allow for much tighter packing in Clab. To accommodate up to 11000 tonnes Clab needs to place the fuel today in "normal" canisters in "compact" canisters. This, together with some other measures such as removal of core components, will free up enough space. Criticality analysis is a part of the safety analysis reports and is extensive and calculated with high safety margins for all kinds of the fuel that can be accepted at the facility.

Article	Ref. in National Report	Question / Comment	Answer
Article 4	p. 106	Existing documentation shows that there is a small number of fuel assemblies with leaking fuel rods at Clab. A detailed plan for handling these fuels will be established as part of current RD&D programme, taking account of experience from the emptying the nuclear power plants of damaged fuel. Are there short-term measures foreseen or in place to avoid further leakage into the system before the detailed plan for handling these fuels is established and realised? Has the reason for leakage been identified and can it be excluded that this is a systematic effect due to the storage conditions?	Studies made and the aging program in place for fuel inspection at the interim storage, Clab, indicated no effect on the fuel integrity caused by the storage conditions. The number of leaking rods in Clab arise from former policies allowing leaking fuel rods to be transported to Clab. Today's policy does not allow any leaking fuel rods to be sent to Clab and an encapsulation solution is in place for the NPP's. Any other short term measures for Clab are not planned.
Article 32	J 1.1, page 146	What is planned to be done in the future with disused radiation sources that cannot be accepted by the specialized company Cyclife Sweden AB for disposal and are stored at the enterprise that owns the sources?	This is a challenge which is addressed in K.3.2.1 in the Swedish Report. Until solutions are in place, the enterprise will have to continue storing the disused sources.

Article	Ref. in National Report	Question / Comment	Answer
Article 32	General	As there is no repository for long-lived low and intermediate level waste yet available in Sweden the waste is stored at the NPP-sites, at Clab and at Studsvik. However, regarding radioactive waste inventory only information on short-lived radioactive waste disposed of at SFR and the inventory of the storage facility (AM) at Studsvik (without information whether it is long-lived or short-lived waste) is provided. Please provide further information regarding long-lived low and intermediate level waste in storage.	There are compiled forecasts for long-lived waste to SFL from each operator similar to the forecasts for the short-lived waste to SFR.

Article	Ref. in National Report	Question / Comment	Answer
Article 19	p. 62	SSM has issued conditions regarding institutional control of existing shallow land burials, stipulating that institutional control shall continue until the radioactivity is no longer a 'significant' hazard to public health and the environment. What are the specific reference values or limits quantifying the term 'significant hazard' in regarding the duration of institutional control of existing shallow land burials?	In the separate licence for the different shallow land burial the total activity is specified. The total inventory of alpha-emitting nuclides is also specified. In addition, also nuclide specific activity concentration are given for a number of key nuclides. These activity concentrations are to be applied with at the time in the future when the institutional control period can be ended from a radiation protection point of view. The institutional control period will be at least 30 years after the last disposal of waste at the facility. After this period, from SSM's point of view the shallow land burial can be controlled like any other disposal facility for non-radioactive waste. The following activity concentrations have been specified: Nuclide, Bq/g H-3 100 C-14 10 Co-60 0,3 Ni-59 100 Ni-63 100 Sr-90 1 Nb-94 0,1 Tc-99 1 I-129 1 Cs-137 3 Eu-152 1 U-238 1 Pu-238 0,1 Pu-239 0,1 Pu-240 0,1 Pu-241 10 Am-241 0,1 Cm-244 1 If several nuclides are present, then the sum of the ratio between the

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			nuclide specific content and limit should be less than 1. Nuclides with a specific activity less than 10 % of the limit need not to be taken into account in the summation.

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Article 28	J 1.1, page 145	How is the financial reserve for the safe management of disused radiation sources formed in the event that the licensee has ceased operations or has become insolvent?	In order to get a licence for a high-activity sealed radioactive source, an applicant is required to include in the application a documented agreement with the supplier for the return of the disused sourse, or with Cyclife Sweden AB for the management of the disused source. The applicant also has to provide a financial guarantee of the safe management of the high-activity sealed source. The documented agreement with Cyclife Sweden AB includes the estimated cost for the safe management of the source. The financial guarantee has to be equivalent to that cost.
Article 28	J 1.1, page 146	Is there a document in Sweden that establishes conditions for the transfer of sources for storage to Cyclife Sweden AB, under which the company cannot refuse to accept spent radioactive sources?	No, there is no such document. Cyclife Sweden AB operates on a commercial basis and is fully entitled to refuse to accept any disused sealed sources.

Article	Ref. in National Report	Question / Comment	Answer
Article 7	G.4.3, page 116	What operational occurrences are considered in the safety analysis report on spent fuel storage canisters in the KBS-3 disposal concept?	The operational occurrences considered are; Dropped canister (maximum lift is about 5m above ground), explosion nearby, truck/vehicle collision, earthquake as well as fire-hazards. A special method (Hazid - hazard identification process) is used to identify operational occurrences. The method follows the canister through the main processes and uses experiences from both external sources (I.e. IAEA documents) as well as operational experiences from similar facilities in Sweden (mainly Clab and SFR in this case). All hazards found are then evaluated and the most damaging for the canisters are analysed to either make sure no breaches are possible or to define changes needed in the design or operation of the facility to make sure the hazard is mitigated by design.
Article 11	H.1.1.4, page 126	What main measures aimed at minimizing the generation of radwaste are taken at Swedish nuclear power plants?	Minimize the generation of waste, sorting of waste, ensuring the right waste to the right storage/repository, clearance and applying the waste hierarchy.

Article	Ref. in National Report	Question / Comment	Answer
Article 4	G.1.2.2, page 107	What operational requirements are applied to spent fuel assemblies for transport in the TN17/2 container?	SKB strictly follows all handling and loading requirements and limitations defined in the TN17/2 Safety Analysis Report (TN17/2 allows transport of leaking fuel but SKB does not accept any reception of leaking fuel and hence that is a limitation applied by SKB). The fuel is vacuum dried and the TN17/2 is transported in a Helium pressure of 220 mBar. Several important steps and tests, for example leak tests and shielding measurements are performed before the shipment.
Article 7.1	G.4.1.1, page 111	How is the integrity of all barriers ensured during spent fuel transport and storage?	SKB strictly follows all handling and loading requirements and limitations defined in the TN17/2 Safety Analysis Report. The barriers for the transport package (TN17/2) are designed according to IAEA SSR-6. The integrity during transport is ensured by the maintenance program and the pre-transport tests. Several important steps and tests, for example leak tests and shielding measurements are performed before the shipment. The barriers for the interim storage, Clab, are ensured by an aging program, a maintenance program as well as daily facility surveillance and monitoring by the operations team (on site 24/7). The requirements are included in the Safety Analysis Report (SAR) and are based on the safety analysis for the facility.

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Article 26	F6, page 97	What decommissioning strategy is adopted in the country: immediate dismantling, deferred dismantling, or Entombment concept? What funds are used for financing of decommissioning activities? Is there a state fund to finance decommissioning measures?	1. Immediate decommissioning of all nuclear facilities is required by the Swedish Radiation Protection Act (2018:396), 5 ch. 3 sec. “If an activity involving ionising radiation is decommissioned or relocated, the party conducting the activity must take the necessary measures as soon as is reasonably practicable to ensure that building structures and areas that may have been contaminated by radioactive substances from the activity can be covered by the regulations concerning exemption from the Act [SSM regulations SSMFS 2018:3 on clearance of materials, building structures, and areas].” The annual dose to members of the general public from the radiological end state of remaining building structure and the site, including ground water etc., is not allowed to exceed 100 µSv. 2 and 3. Decommissioning of nuclear power plants and the disposal of spent nuclear fuel and waste are funded by fees on nuclear energy production, accumulated in segregated funds (the Nuclear Waste Fund). The disposal of non-nuclear power waste is financed by the producers/owners of the waste. Government funding is available for legacy wastes.

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Article 4.1	G.1.2.1, page 105	What methods are used to inspect canisters during encapsulation?	Typically the weld is controlled using a combination of NDT techniques (ultrasonic, Eddy-current and X-ray), final surface of the copper canister will also be measured for cleanliness and surface roughness. Final decision of techniques will be developed during qualification and subsequent licensing of the encapsulation facility.
Article 4	G.1.2.2, page 107	The Report mentions that the capacity of the centralized storage facility for interim storage of spent fuel would be sufficient until 2034. What is the further concept of spent fuel management? Is it planned to construct additional facilities for interim storage of spent fuel? If so, are dry storage facilities considered for this purpose?	The plan is to have the final repository and encapsulation facility operational in the early 2030's and thus be able to transfer spent fuel from Clab. But if that is not possible additional space in Clab can be freed up by moving core components (CRB etc.) to an alternative intermediate storage (dry). This would be the last effort to free space and have the possibility to receive fuel in Clab to around 2040 before reaching the maximum practical limit of 11000 tonnes. If there still is not an operational final repository another type of interim storage need to be constructed (probably dry storage or adding another fuel pool in Clab).

Article	Ref. in National Report	Question / Comment	Answer
Article 24	F 4.1.2, page 86	What are the requirements for monitoring of releases and discharges for radwaste management facilities? Are these requirements differ from those established for NPPs?	For all practices with ionizing radiation, there are general requirements on monitoring of releases and discharges in the Radiation Protection Act (2018:396). For all licenced facilities more specified requirements are provided in the Swedish Radiation Safety Authority's regulations on basic provisions for activities with ionising radiation subject to licence (SSMFS 2018:1) and for radioactive waste facilities also in SSMFS 2008:23. For NPP in operation, more specific requirements are given in (SSMFS 2021:6). The requirements for radioactive waste facilities are similar to the requirements for NPP, but they are adapted to the facility and the expected discharges and releases from such facilities. A graded approach has been applied. For example, there is not a requirement for the monitoring of noble gaseous or carbon-14 at the waste facilities.

Article	Ref. in National Report	Question / Comment	Answer
Article 25	F 5, page 89	Does the National Action Plan for stress tests after the Fukushima accident provide for the development of conceptual solutions for the management of large volumes of radioactive water that may result from the management of a beyond design basis accident with severe core damage?	Yes, the National Action Plan for stress tests provide for the development of conceptual solutions for the management of large volumes of radioactive water. All NPPs have investigated the need for means to manage large volumes of contaminated water and plans on how to manage this are in place.
Article 24	F 4.1, page 85	What standards are established to limit exposure to pregnant and breastfeeding women?	This is governed in the radiation protection law chapter 4. 7-11 §§. The dose to a foetus shall not exceed 1 mSv. Worker who are breastfeeding should not perform tasks were they could intake or be contaminated with radioactive substances that cause the child to be exposed to ionizing radiation and receive a radiation dose that exceeds a dose limit that applies to people in general.
Article 24	F 4.1, page 85	How (by what entity) is the national dose register maintained? What is the procedure for providing information for the register?	The national dose register is operated by the Swedish Radiation Safety Authority, as mentioned in section E 3.2.1. The information to the national dose register is provided by recognised dosimetry services and the licensees.
Article 32	B 1.1, page 38	After 30 years of storage in the centralized spent fuel storage facility, spent fuel is sent for geological disposal. What is the maximum heat release of spent fuel subject to geological disposal?	The maximum allowed thermal output from a disposal canister loaded with fuel elements is 1700 W. The elements (12 in a BWR canister and 4 in a PWR canister) are to be selected such that the total heat output from any canister does not exceed 1700 W at deposition in the final repository.

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Article 24	F.4.1.1, page 85	How are training results assessed? Is it possible to suspend an employee from the fulfillment of responsibilities upon results of periodic training?	All employees have to undergo adequate training prior to working within a controlled area. The type of training depends on the scope and type of work to be performed and to the existing radiological environment. The training normally consist of practical as well as theoretical parts. After completing the training, knowledge and skills are tested and the results are documented and saved. If the employee fails, access to controlled areas are denied. The employee has to repeat the training until passing the test. If the employee fails to pass the test despite more and repeated training, he or she is deemed not suited for work in controlled areas.
General	A.6.4, page 20	If the Nuclear Waste Fund has not accumulated enough funds to implement projects for the construction and operation of spent fuel storage facilities and low- and intermediate-level waste, is it possible to invest from other sources?	According to the Financing Act, a cost calculation must be made every three years until the nuclear waste program is completed. This means that the licensees are obliged, as long as there is a deficit in the fund, to pay fees (funds) in to the fund throughout this period.
Article 32	A.8.3.1, page 27	What technologies are used at NPP sites for conditioning of liquid low- and intermediate-level waste?	Cement and bitumen solidification, drainage and drying.

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Article 32	B 1.1 page 37	What alternatives were considered in developing the concept of long-term spent fuel storage?	Reprocessing was the preferred option for spent fuel management when the Swedish nuclear power programme was established in the 1970's. However, already in the mid-70's a State Inquiry concluded that increased interim storage was needed because 1) the global reprocessing capacity was believed to be insufficient and 2) storage pools at the existing Swedish nuclear power plants were expected to be full in the early 1980's. Based on the experiences with wet storage at the NPPs it was decided to construct a centralized wet storage (Clab).
Article 28	J.1, page 145-146	Please provide data on the number of disused radiation sources in Sweden.	Cyclife Sweden AB is the company where the majority of disused sources go for treatment and storage before disposal. Cyclife keeps records on all disused sources and SSM can request this information when necessary. Cyclife receives approximately 250-300 disused sources on a yearly basis, not counting a number of discarded ionising smoke detectors.
General	A.6.4, page 20	What formula is used for waste producers to deduct money to the Swedish Nuclear Waste Fund, which is intended to cover the waste disposal costs?	When the licensees withdraw means from the fund, a special payment plan is drawn up and presented to the Debt Office. In order to be able to withdraw means from the fund, the cost of the activity you plan to withdraw means for needs to be included in the latest cost calculation.

Article	Ref. in National Report	Question / Comment	Answer
Article 28	J.1, page 145-146	What are the criteria for acceptance of spent radiation sources for disposal in the SFR repository for low-level and intermediate-level waste?	Activity that does not originate from nuclear activities (eg. radiation sources and/or fire alarms/smoke detectors) must be reported separately and information on occurrence must be reported per waste package.
Article 28	J.1, page 145-146	What are the features for disposal of spent radiation sources?	Activity that does not originate from nuclear activities (eg. radiation sources and/or fire alarms/smoke detectors) must be reported separately and information on occurrence must be reported per waste package.
Article 28	J.1, page 145-146	What are the preliminary criteria for acceptance of spent radiation sources to the SFL repository for disposal of long-lived low- and intermediate-level waste? Please provide some examples of the acceptance criteria.	Activity that does not originate from nuclear activities (eg radiation sources and/or fire alarms/smoke detectors) must be reported separately and information on occurrence must be reported per waste package. Preliminary waste acceptance criteria for SFL are under development.
Article 32	D.1.4.2, page 48-49	When the SFR repository is described, it is indicated that radwaste immobilized in a bituminous matrix is disposed there. However, it is stated that the amount of organics is kept to a minimum. Is there no contradiction here? How is the safety of bituminized radwaste disposal justified?	The wide expression minimisation of organic material addresses in general more specific criteria such as fire restrictions applicable in the operational phase and limitations concerning complexing agents that could reduce the sorption factors for radionuclides in the long term. Safety analysis for the operational phase have demonstrated that forecast amounts of bitumen are acceptable.

Article	Ref. in National Report	Question / Comment	Answer
Article 32	D.1.6, figure D7, page 53	Analysis of the timeline shows that reactors are to be decommissioned and dismantled immediately after they have been shut down. However, holding the reactor for a certain time before its dismantling provides certain advantages in reducing the radiation doses on personnel and reducing the amount of radwaste. Why was the decision on its immediate dismantling made?	According to the Swedish Radiation Protection Act (2018:396), 5 ch. 3 sec., a licensee must take the necessary measures as soon as it is reasonably practicable to ensure that building structures and areas that may have been contaminated by radioactive substances from the activity can be released from regulatory control, i.e. cleared. This requirement went into force in 2018. The general policy behind the requirement is the notion that the generation benefitting from operating the facility also is responsible for its decommissioning. Still, the Ågesta reactor was in care and maintenance operation since the mid-‘70s before dismantling and demolition commenced in 2020. Also, Barsebäck Units 1 and 2 have been in care and maintenance operation since 1999 and 2005, respectively, before the first dismantling projected commenced in 2016. The overall radiological state of a facility might improve after its permanent shutdown, if radionuclides are allowed to decay before dismantling and demolition commences. Still, (substantial) measures are required to ensure the safety of the facility during this time period, e.g. removal of spent nuclear fuel, disposal of operational waste, and drainage and shutdown of systems. In practice, the radiation levels are also significantly reduced by chemical decontamination of the primary system. During an extended period of delayed dismantling, detailed knowledge of the facility and its operational history may be lost. This could complicate the postponed planning of dismantling and demolition measures. It is not guaranteed that possible radiological advantages of delaying dismantling and demolition measures outweigh the complication arising from possible loss of knowledge.

Article	Ref. in National Report	Question / Comment	Answer
Article 32	B.1.3.1, table B1, page 39	How are the numerical values of “restricted quantities of long-lived radionuclides with a half-life greater than 31 years” for very low-level radwaste, as well as for short-lived low- and intermediate-level radwaste, determined? Please provide an example of restricted quantities of Ni-59, C-14, Cs-135 allowed for the SFR facility.	With regards to the inventory restrictions for long-lived radionuclides at the SFR repsoitory, these are based on the inventories that have been specified in the licence applications by the SKB. As the barrier performance differ between the different parts of the disposal system, the inventory restrictions for the different radionuclides also differ. Below examples of the allowed nuclide content in two of the rock caverns (BLA and BMA, as well as the silo, is given BLA BMA silo C-14(org) 3E8 1E11 8E11 Ni-59 2E10 3E12 7E12 Cs-135 2E8 9E8 5E9 Pu-239 3E8 1E10 2E10 For shallow land burial the inventory rerstriction with regards to nuclide specific activity concentration where derived from a combination of matching the levels with general clearance levels and the results from schematic intrusion scenarios. These activity concentrations are to be applied with at the time in the future when the institutional control period can be ended from a radioation protection point of view. The insitutional control period will be at least 30 years after the last disposal of waste at the facility. After this period, from SSM:s point of view the shallow land burial can be controlled like any other disposal facility for non-radioactive waste. The following activity concentrations have been specified: Nuclide, Bq/g H-3 100 C-14 10 Co-60 0,3 Ni-59 100 Ni-63 100 Sr-90 1

Article	Ref. in National Report	Question / Comment	Answer
			Nb-94 0,1 Tc-99 1 I-129 1 Cs-137 3 Eu-152 1 U-238 1 Pu-238 0,1 Pu-239 0,1 Pu-240 0,1 Pu-241 10 Am-241 0,1 Cm-244 1 If several nuclides are present, then the sum of the ratio between the nuclide specific content and limit should be less than 1. Nuclides with a specific activity less than 10 % of the limit need not to be taken into account in the summation.

Article	Ref. in National Report	Question / Comment	Answer
Article 32	D.1.2.2, table D2, page 45	The table indicates that 22 tons of MOX fuel from Germany is stored in the CLAB facility. Does this mean that Swedish legislation allows the disposal of spent fuel (radwaste) from other countries? If so, under what conditions?	The main rule is that it is prohibited to dispose of, or store foreign spent fuel and/or radioactive waste pending final disposal. However, if there are extraordinary reasons and the implementation of the Swedish R&D program is not hindered, permission can be granted.
Article 32	D.1.4.1, page 47	It is stated that after melting of the contaminated metal, “slag and dust are returned to the customer.” Does this mean that the customer must have a license for management of radwaste?	Within the EU, a procedure applies that has been set out in Council Directive 2006/117 / EURATOM of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel. Under this procedure, the relevant authority of the country to which the radioactive residues are to be returned certifies that the recipient has the required authorization. For countries outside the EU, before shipment to Sweden can be approved, return guarantees must be issued which clearly state that residual products must be returned to a competent recipient in the recipient country.
Article 28	p. 14, 145	Cyclife is SSM’s contracted waste treatment company for dealing with orphan sources. It is also a licensee regulated by SSM. Are there special arrangements to address any possible conflicts between these roles?	The employees at SSM working with orphan sources are located within the Department of Regulation and Knowledge Development, whereas supervison of Cyclife is performed by employees from the Department of Supervision.

Article	Ref. in National Report	Question / Comment	Answer
Article 32.2.2	D.1.1, p. 43	Why was the corroded metallic fuel assembly from research reactor R1 not reprocessed with the intact fuel: unsuitability for the reprocessing process or difficulty in transporting it to the UK? What treatment/disposal route is foreseen for the corroded fuel?	In 2007, irradiated metallic uranium fuel was sent from the R1 reactor to Sellafield for reprocessing. However, some of the fuel could not be sent away due to corrosion damage. The remaining waste (36kg) on the Studsvik site consists of the coarse fraction of the corroded fuel since the fine fraction has been sent to CLAB for interim storage. The fuel consists of natural uranium with very low combustion, <1 MWd / kgU. This is part of AB Svafo's project to handle Sweden's Legacy Waste. There is not yet any final decision on how to handle this material but the reference alternative is that all metallic uranium is oxidized and placed in intermediate storage in CLAB. Oxidation aims to reduce the risk of hydride formation as well as gas development in the final repository. An alternative process for oxidation involves dissolving the fuel residues in acid, the fuel solution is then solidified with cement before final disposal. The final repository that is deemed relevant for the waste is the repository for spent nuclear fuel (via CLAB) and final disposal in copper canister. In the alternative, the repository for long-lived nuclear waste (SFL) might be a possible final repository.

Article	Ref. in National Report	Question / Comment	Answer
Article 32.1.3	Section F - page 99	Sweden's report indicates that "There are a number of other old facilities at the Studsvik site that are to be decommissioned in the future. Preliminary decommissioning plans for these facilities have been prepared by the licence holders and submitted to SSM for evaluation, in accordance with requirements contained in the general regulations". Could Sweden specify the type of facilities that are concerned? Could Sweden indicate how the funds are collected for such tasks? What kind of waste will be generated following the dismantling of these facilities?	The older as well as newer and still used facilities at the Studsvik site are laboratories, offices and storage buildings for low and intermediate waste. These will of course at some time all be decommissioned. All operating nuclear facilities are obligated to produce a documented decommissioning plan that is updated periodically. Since 1989, a fee was levied on the nuclear power plant licensees under the provisions of the so-called 'Studsvik Act', in order to cover expenses for liabilities originating from the establishment of a nuclear programme in Sweden. The fees were intended to function as a contribution to help cover expenses for management of nuclear waste from old experimental facilities and primarily contributes to cover the costs for decommissioning of old installations. The fees were collected in a unit in the Nuclear Waste Fund which is commonly called the 'Studsvik Fund'. The Studsvik Act ceased to be in effect by the end of 2017 and the Financing Act regulates disbursements from the Studsvik Fund after 2017. If the fund's assets are insufficient to cover future liabilities for facilities that are still in operation, the licensees of these facilities are required to pay the additional fees necessary according to the provisions of the Financing Act. More specific information is provided in section F.2.1.2 and E.2.1.4 in the report. Dismantling of these facilities will probably mostly generate building material and equipment that can be cleared. The amount of contaminated material will be a smaller part. At this point we do not have exact knowledge of what type of waste that will be generated. This will be part of the process for permission to dismantle each facility.

Article	Ref. in National Report	Question / Comment	Answer
Article 32.1.4	Section D - page 51	The Table D7 in the Swedish report indicates that the amount of waste disposed of at the Oskarshamn shallow land burial (11,252 m3) exceeds the licence conditions (i. e. 10,000 m3) Could Sweden define how this case is managed at Oskarshamn and on the potential consequences in terms of radiation potection and/or safety? The volume capacity of the shallow landfill at Ringhals is not far from being reached. Are there potential projects (at Oskarshamn or other locations) to manage the new very low level radioactive waste to be produced in the future?	The existing shallow land burial facility in Oskarshamn consists of two separate unit, MLA and MLA2. MLA was licensed in 1984 and MLA2 in 2000. The maximum allowed volume of waste is not regulated in the decisions taken by SSM i accordance to the Act on Nuclear Activities, the licence and licence conditions regulated the maximum allowed weight of the waste as well as the radionuclide content. However, the allowed volume of the waste is given in the two licenses issued according to the Environmental regulation. The first unit consists of 5800 m3 and the second unit allows the disposal of 10 000 m3 of waste. This distinction should have been clarified in the report. Oskarshamn has in 2021 handed in a licence applications for a new separate disposal unit of the shallow land disposal facility. The applicaations were filed according to the Environmental Code and the Act on Nuclear Activities . The review of these applications are still in process. With regards to the facility in Ringhals it is correct that the volume capacity is close to being reached. Ringhals therefore applied to re-licence the existing facility with the aim to increase the allowed amount of waste, and have plans for a new separate facility. However, these plans have not yet been realized. Disposing the waste in the SFR facility, with or without pre-treatment by incineration or smelting in the facilities in Studsvik, is an alternative to direct disposal in shallow land burials.

Article	Ref. in National Report	Question / Comment	Answer
Article 19	Section E/ E. 2.1.4/ Page 58-59	a) According to the report content the regulatory responsibility for the review of nuclear power utilities' cost estimates changed from SSM to the National Debt Office. b) Please describe the rationale and the practical advantages for these changes in the financing system for decommissioning, nuclear waste management and disposal	A key principle in the Swedish financings system is that the the reactor owners shall pay all the costs related to the production of nuclear energy. SSM's main - and overarching - task is to review nuclear activities with regard to nuclear safety and radiation protection. The National Debt Office was already responsible for important regulatory activities related to the finansing system, e.g. review of guarantees to be provided in case the moneys invested in the Nuclear Waste Fund would be insufficient. The rationale for moving the responsibility for review of cost assessements to the National Debt Office was an expectation that it would further improve financial security.

Article	Ref. in National Report	Question / Comment	Answer
Article 28	p.145, J.1.2.1	How do the licensees record the sources in their possession? Is it possible to report the movements of radioactive sealed sources throughout their complete lifecycle, in order to reduce ALARA finding and management of orphan sources?	According to SSM's regulations SSMFS 2018:1, the licensee shall keep a register of all radiation sources intended for exposure that are available in the activity. The register shall be kept up-to-date, include information that makes the radiation sources traceable and shall indicate every radiation source's identification number, location, application, and specific characteristics. For high activity sealed radioactive sources additional information specified by SSMFS 2018:1 shall be included in the register. Furthermore, according to SSM's regulations SSMFS 2018:1, any change in the scope of radiation sources intended for exposure that are handled within the framework of the licence shall be reported to SSM for registration before the change takes place. For sealed radioactive sources, transfers and assignments shall also be notified for registration.

Article	Ref. in National Report	Question / Comment	Answer
Article 26	Section F - page 97	Could Sweden specify, if aleady defined, what is the end state targeted for the lands (and undergrounds, if appopriate) after decommissioning of Nuclear Power Plants, research reactors or any other facilities of nuclear cycle and what are the associated regulations? If not already defined for some types of facilities, is there a plan to integrate it in the regulation?	The Swedish Radiation Protection Act (2018:396), 5 ch. 3 sec. "If an activity involving ionising radiation is decommissioned or relocated, the party conducting the activity must take the necessary measures as soon as is reasonably practicable to ensure that building structures and areas that may have been contaminated by radioactive substances from the activity can be covered by the regulations concerning exemption from the Act [SSM regulations SSMFS 2018:3 on clearance of materials, building structures, and areas]." The annual dose to members of the general public from the radiological end state of remaining building structure and the site, including ground water etc., is not allowed to exceed 100 µSv. This corresponds to the dose restriction for members of the general public during the operation of the nuclear facility according to the Radiation Protection Ordinance, 2018:506, Chapter 3, Section 5). Appendix 4 to SSMFS 2018:3 specifies the clearance levels for building structures for free-use and demolishing of the building structures, respectively. SSM's regulations do not contain specified clearance levels for areas. These have to be derived by the applicant on a case-by-case basis in accordance with the dose criterion 100 µSv/a for members of the general public. SSM has to approve the clearance of building structures and areas.

Article	Ref. in National Report	Question / Comment	Answer
Article 32.1.1	p.38, B.1.2	Could Sweden, please, elaborate on the means for waste retrieval, if it is foreseen?	The Swedish legislation and regulations do not require that waste should be possible to retrieve from a repository. SKB has made full-scale tests (wihout spent fuel) in the Äspö Hard Rock Laboratory demonstrating that it would be possible to retrieve spent fuel from a repository.
Article 32.2.1	p.44, D.1.2.2	Does Clab have sufficient storage for all the spent fuel until the commissioning of the final geological repository?	Clab is in the progress of getting a license to go from 8000 tonnes to 11000 tonnes of fuel (initial weight of U) in the interim storage. 8000 tonnes is the limit for the facility today but physically Clab can store 11000 tonnes. As of the plans for the total Swedish nuclear programme (6 NPPs today running to 2040-2045) the total amount of spent fuel will exceed 11000 tonnes by a small amount. The encapsulation facility and the repository for spent fuel are planned to be operational in the early 2030s. This means that fuel can be encapsulated and shipped to the final repository before the 11000 tonnes limit is reached. So the answer is yes, but with some constraints.
Article 32.2.1	p.46, D.1.3.2	The report mentions that "waste is treated differently at the different nuclear power plants". Could Swenden provide more details on how it is ensured that waste will meet the acceptance criteria for the final repository, and how responsibilities are allocated between producers, WMO and regulator ?	The work process with WAC and the division of responsibilities between operator, WMO and regulator is described in section F.3.

Article	Ref. in National Report	Question / Comment	Answer
Article 32.2.2	D1.4.1	What the orders of magnitude of radioactivity for the most waste streams (like spent resins, Trash and Metal scrap, sludge) are?	The requested type of compilation of the radioactive inventory for different waste streams is not readily available. However, the radioactive inventory expected at the time of closure year 2075 in the different rock caverns in the SFR and SFL disposal facilities are as follows: The SFR disposal facility for low- and intermediate level waste: - Rock cavern for low level waste (mainly trash and scrap metal): 5E12 Bq - Rock caverns for intermediate level waste (mainly trash, scrap metal and ion exchange resins): 3E14 Bq - Rock cavern for reactor pressure vessels from BWR: 2E13 Bq - Silo (mainly ion exchange resins): 7E14 Bq The SFL disposal facility for long-lived low- and intermediate level waste: - Rock cavern for core components: 2E17 Bq - Rock cavern for legacy waste: 4E15 Bq
Article 13	H3.2.2	What's about the generally public acceptance with regards at repository disposal facilities for the radioactive waste?	In SKB's latest opinion poll in 2020 on national level, 66% of the Swedish population was in favour of the Government to allow the building of the final repository of spent fuel in Forsmark in Östhammar municipality.

Article	Ref. in National Report	Question / Comment	Answer
Article 24.2	P.86-87	3) Also, please provide the actual amounts of each gaseous and liquid radioactive wastes released or discharged annually into the environment from nuclear facilities between 2016 and 2020, especially, for annual discharge amounts of tritium and other nuclides in forms of gas and liquid, per types of nuclear facilities (NPPs with reactor types, reprocessing facilities, others) 4)For an evaluation of exposure dose from tritium, if other than the radiological concentration factor of 1 is used for the evaluation, please provide the used radiological concentration factor and the basis for its use.	3. Unfortunately, it is not possible to provide the information requested in this context. It is far too much data. We recommend you to contact SSM directly with your request for discharge data via e-mail: registrator@ssm.se 4. For tritium the radiological concentration factor is set to 1 for pythoplankton and macro-algaes.
Article 24.2	P.86-87	Is there a concept of generalized clearance threshold for gas and liquid waste from nuclear facilities ?	No, there are no clearance levels for waste in the form of liquid or gaseous form from nuclear facilities. Such waste shall be treated as liquid or gaseous discharges in accordance with the discharge regulations

Article	Ref. in National Report	Question / Comment	Answer
Article 32.2.2	D1.4.1	What are the considerations for which there were chosen different conditioning matrix for spent ion exchange resins: concrete or bitumen. What is the embedding rate of spent resins in cement and respectively bitumen?	Earlier considerations, when starting the conditioning facilities at the nuclear power plants in Sweden, were dependent on local preferences and available technology. The waste load in the different waste packages could differ from a few percent of waste up to 60 % depending on the waste matrice, avaible void volume for swelling in the package, dose rate and limitations of radionuclide content for the package, and the rock vault limitations where the waste are planned to be disposed of.

Article	Ref. in National Report	Question / Comment	Answer
Article 24.2	P.86-87	1) Are there total annual discharge limits, that are only distinguishable between liquid and gas in Bq, set for radioactive wastes generated from nuclear facilities, i.e. NPPs, reprocessing facilities, etc.? If there are, do the total annual discharge limits for liquid and gas, consist of nuclides specific or groups of nuclides specific limits? Also, what are, the set limits per nuclides/groups of nuclides especially for tritium, as well as the basis for those set limits? For examples, discharge limits are set based on, expected annual release calculated from actual discharge amounts of previous years, calculation assuming upper limit of 1mSv over a year for each nuclides, committed effective dose received by the public of 1mSv over 70 years, etc. The report indicates there are discharge target values, please provide how the discharge target values are set and their basis.	No, for normal operation there are no limits for discharges set in Bq. The focus is on optimisation of protection and the application of BAT. The dose constraint for a nuclear site is set to 0,1mSv a year to a representative person. This includes the total effective dose from all discharges of all radionuclides to air and water from all nuclear facilities located at the same site as well as any contributing external exposure. The effective dose to the representative person is calculated with a site-specific methodology reviewed and approved by the SSM. The effective dose (committed effective dose with an integration time of 70 years for intakes) is calculated taken into account the accumulation of radioactive nuclides in the environment over 100 years.

Article	Ref. in National Report	Question / Comment	Answer
Article 24.2	P.86-87	2) Are there nuclides specific or groups of nuclides specific concentration limits set for each gas and liquid discharges into the environment? What are those discharge concentration limits and the basis for the set concentration limits, especially for tritium? For examples, discharge concentration limits are set based on, expected annual release calculated from actual discharge amounts of previous years, calculation assuming upper limit of 1mSv over a year for each nuclides, committed effective dose received by the public of 1mSv over 70 years, etc. If there are discharge target concentration values recommended by a regulatory body for nuclear facilities licensees to be achieved, which are lower than the set concentration limits, please provide the basis for the target concentration values.	No, see answer to q. 81.
Article 32	D.1.4.1,P47, para 4	As mentioned in section D.1, up until 2006 ash has been stabilized in concrete for further disposal. However, as of 2016 SKB did not accept ash conditioned in concrete for disposal and work is ongoing to develop a new method for conditioning and packaging of ash. How do you dispose the ash generated before 2016? What's the technical difficulty in it? Why did not SKB accept ash conditioned in concrete for disposal? Any reasons or standards?	For the future deposition of ashes SKB foresee a more optimised waste package. Also, there are limitations concerning deposition of metallic aluminium that could generate gas under alcaline conditions and neagtively influence the safety. The deposited waste will not be reconditioned. Small and limited amounts of gas generating materials, such as aluminium, iron and zinc, are included in the safety assesment.

Article	Ref. in National Report	Question / Comment	Answer
Article 10	G.7.1,P152para 8	It is mentioned in the text that there is no reprocessing of spent fuel at the back end of nuclear fuel cycle in Sweden. The policy and practice is to put it in clab for about 30-40 years and then dispose it. What's the reason for choosing such policy and practice? Although there is no reprocessing for spent fuel in Sweden, is there any scientific research on spent fuel reprocessing being conducted?	When the Swedish nuclear power programme was initiated in the 1960's and 1970's reprocessing was the main alternative although direct disposal was identified as an option. There was an intense deabate on the use of nuclear power in the late 1970's, and a national advisory referendum was held in 1980. Based on the outcome the Govenment and the Parliament took the position that nuclear power should be phased out by 2010. One consequence was that direct disposal became the preferred alternative for managing spent fuel. There are some university institutions that carry out research related to reprocessing, often in collaboration with international partners.

Article	Ref. in National Report	Question / Comment	Answer
Article 24.2	P.86-87	There are descriptions on the reference and target values set for specific radionuclides or for group of radionuclides, for discharge control of gaseous and liquids as well as their limits. Please elaborate those reference and target values.	Reference and target values should represent normal discharges, when radiation safety is optimised. The values are specific for each reactor and take into account the BAT-principle. Reference and target values are set for individual radionuclides or groups of radionuclides. The licensee sets the values, which are reviewed and formally accepted by the SSM. These values are not limits and it is not forbidden to exceed the reference value or not reach the target value on time. However, if these values are exceeded the licensee has to explain why and, if possible present measures to reduce the discharges. The difference between reference and target values is that the reference value reflect the actual situation and the target value reflects what is possible to obtain in the future when BAT is fully implemented. For a modern reactor reference and target values are expected to be relatively similar but for an older reactor the difference can be more substantial. One can also note that SSM, in the new regulations concerning the operation of nuclear power plants, which entered into force 1 March 2022, have decided not to use reference levels. The concept of target values are the same.

Article	Ref. in National Report	Question / Comment	Answer
Article 32	B.1.3, P38-39, Table B1	Short-lived low and intermediate level waste is disposed of in SFR repository in Sweden. In the Table B1,the quantities of long-lived nuclides with a half-life greater than 31 years are restricted for the short-lived low and intermediate level waste. Are there any specific limit values for different long-lived nuclides in the short-lived low and intermediate level waste?	Yes, there are limits on the amount of long-lived radionuclides that are allowed in the different parts of the SFR. The limited amount of radionuclides cannot significantly deviate from the vector included in the application to the regulator. If criteria are not met a new safety assessment is needed, which must be accepted by the regulator. The limits are based on the inventory that forms the basis of SKB's licence application. Due to the differences in the expected barrier performance of the different parts of the SFR, the limits differ as well. Below the limits (Bq) for a few important radionuclides are given for three of the parts of the SFR where: BLA - represents 5 rock caverns for low level waste BMA - represents 2 rock caverns for intermediate level waste silo - represents i silo for intermediate level waste BLA BMA silo C-14(org) 3E8 1E11 8E11 Ni-59 2E10 3E12 7E12 Cs-135 2E8 9E8 5E9 Pu-239 3E8 1E10 2E10

Article	Ref. in National Report	Question / Comment	Answer
Article 32	D.1.4, P50-51 table D7	In Table D7, the volumes of the very low level wastes buried in the facility in Oskarshamn nuclear power plant and the activity of the very low level wastes buried in the facility in Studsvik (Svafo) Site has exceeded the permission value. What measures have been taken to address this situation?	The existing shallow land burial facility in Oskarshamn consists of two separate unit, MLA and MLA2. MLA was licensed in 1984 and MLA2 in 2000. The maximum allowed volume of waste is not regulated in the decisions taken by SSM in accordance to the Act on Nuclear Activities, the licence and licence conditions regulated the maximum allowed weight of the waste as well as the radionuclide content. However, the allowed volume of the waste is given in the two licenses issued according to the Environmental code. The first unit consists of 5800 m3 and the second unit allows the disposal of 10 000 m3 of waste. This distinction should have been clarified in the report. The given activity in the Studsvik shallow land burial is a typo, the correct figure is 40 GBq (as of in the year 2000 when the last disposal campaign was conducted).

Article	Ref. in National Report	Question / Comment	Answer
Article 4	P27 para 4; P106 para 3; P149 para 2	P27: "At the time of preparing this report, the license applications remained with the Government for decision. …" P106: "… While SKB's license applications remain under consideration by the Government,…" P149: "Upon request from the Government, SKB submitted supplementary information on these issues related to the copper canister in April 2019. After a renewed public consultation and a thorough technical review of the new material, SSM reiterated its earlier statement to the Government that SKB's preferred site is suitable, the disposal concept is feasible and the safety case fulfills strict regulatory requirements. SKB's license applications are now awaiting licensing decision by the Government …" Has the supplementary information been reviewed by the Land and Environment Court? If yes, what is the review statement? Does the government have a timetable or a deadline for the decision of SKB's license application?	The Land and Environmental Court in its statement to Government in January 2018 recommended that further documentation relating to the long-term function of the copper canisters should be provided by SKB before its plans for final management of spent fuel could be considered permissible in accordance with the provisions of the Environmental Code. It should be noted that the Court's recommendations in its statement to Government constitute an opinion, rather than a legal judgement, since according to the Environmental Code it is for the Government, rather than the Court, to determine on the question of permissibility. In making its decision on this matter, published on 27 January 2022, the Government took into account the views of a wide range of consultees on the additional material provided by SKB, including a detailed technical and scientific review undertaken by SSM. The Land and Environment Court was not included as a referral body for this element of the Government's review process. Updated information relating to the Goverment's decision and the status of the licensing process since publication of Sweden's national report will be provided as part of Sweden's presentation during the review meeting.

Article	Ref. in National Report	Question / Comment	Answer
Article 11	K.1.5 P151 para 5	P151: "… In the review statement in March 2019, SSM supported SKB's decision to retrieve the waste. However, in the review SSM identified factors that could point to an earlier retrieval compared to SKB's preferred option to retrieve the waste in the 2030s after the extension of the SFR is expected to be in operation. ... At the time of preparing the present report, SSM had not yet taken a final decision regarding SKB's plans. …" Where is the waste planned to be finally disposed of? In SFL? If the waste is planned to be retrieved in the near future, where will the waste be stored before the final disposal?	After the waste has been retrieved, the waste will be needed to be further characterized. For the individual waste packages that can be shown to comply with the WACs for SFR, the waste might be re-disposed of at the SFR-facility. The remaining waste packages will need to be stored before being disposed of at the SFL-repository. The responsibility for the further storage rests with the waste producers or by the organisation that has been assigned with the responsibility. For the vast majority of the legacy waste (produced before June 30th 1991), the responsibility was assigned by a Government decision to a company (AB Svafo) that is owned by the NPPs. This responsibility has recently been questioned, and AB Svafo has stated that establishing further storage capacity at the Studsvik site requires a clarification of the responsibility, including funding by the Government. The Government therefore assigned SSM to investigate the issue of responsibility and propose further actions. SSM handed in the investigation to the Government in February 2022 with the conclusion that the technical and financial responsibility for the vast majority of the legacy waste rests with AB Svafo. SSM expects that the responsible organisations, including SKB as the operator of the SFR facility, will take the full responsibility and conduct the retrieval in the next coming years according to the plans that previously have been reported to SSM.

Article	Ref. in National Report	Question / Comment	Answer
Article 32	A.8.1.2, P23 para 3	It is mentioned that "Long-lived waste from the NPPs consists of used core components, reactor pressure vessels from PWRs and control rods from boiling water reactors BWRs". And "SKB plans to dispose of the long-lived waste in a geological facility for long-lived low-and intermediate level waste". (1)It is difficult to dismantle the core components, reactor pressure vessels,do you consider disintegrating the components to reduce the volume of the waste disposal? (2) Please describe the conditional requirements of the mentioned waste above.	1.Internals and BWR reactor pressure vessels are segmented and placed in waste containers intended for the current final repository, SFR. PWR reactor pressure vessels will be disposed of in the future repository for long-lived waste, SFL. 2.Long-lived waste that is interim stored pending final disposal must be unconditioned until acceptance criteria WAC for the relevant final repository are in place.
Article 10	A.8.1.8 P23 para 10	P23: "… The plant has been manufacturing fuel since the mid-1960s. Its annual production is approximately 500 to 600 tonnes of UO2 fuel for PWRs and BWRs, mainly for customers abroad." What is the final disposal option of these fuels which have been exported to other countries?	The disposal option is an issue that each country that has imported, used and benefited from the manufactured fuel is individually responsible for resolving. (Spent nuclear fuel is considered a resource until it has been disposed of.)
Article 32	D.1.4.1 P47 para 5	P47: "… However, as of 2016 SKB does not accept ash conditioned in concrete for disposal and work is ongoing to develop a new method for conditioning and packaging of ash. ..." Does it mean that the waste, which has been conditioned in concrete, will be re-conditioned? What's the main problem about the current conditioned waste?	For the future deposition of ashes SKB foresee a more optimised waste package. Also, there are limitations concerning deposition of metallic aluminium that could generate gas under alcaline conditions and neagtively influence the safety. The deposited waste will not be reconditioned. Small and limited amounts of gas generating materials, such as aluminium, iron and zinc, are included in the safety assesment.

Article	Ref. in National Report	Question / Comment	Answer
Article 16.7	Page 157	On face value, the assessment that non-nuclear waste can be managed within the framework and the facilities developed to manage the spent fuel and radioactive waste stemming from the NPPs appears to be reasonable and valid. However, the comparatively small volumes of non-nuclear waste have the potential to absorb a disproportionate amount of resources if Cyclife choses to not receive radioactive waste. Have any contingency plans been developed to address this potential?	This is a challenge which is addressed in K.3.2.1 in the Swedish Report. Until solutions are in place, the enterprise will have to continue storing the disused sources.
Article 10	A.8.1.1 P23 para 3	P23: "…Clab is also used to store 23tonnes of MOX fuel obtained from Germany in exchange for fuel that was sent to France (La Hague) for reprocessing at an early stage of the Swedish programme. …" Is the MOX fuel originally from Germany's nuclear power reactors? Is the MOX fuel similar to the spent fuel from Sweden's reactors? Will the MOX fuel be disposed of in Forsmark's repository?	Yes, the MOX-fuel sent to Sweden, Clab as an exchange has German origin. The MOX-fuel is fully included in the Swedish program for disposal and will be disposed of in the SKB spent fuel repository to be built in Forsmark.

Article	Ref. in National Report	Question / Comment	Answer
Article 10	A.8.1.1 P23 para 3	P23: "…A small amount of spent nuclear fuel from the first reactor at Oskarshamn was sent for reprocessing in Sellafield, England. No fuel or radioactive waste from that reprocessing will be returned to Sweden." Is the spent nuclear fuel initially from England? If not, where is the waste from reprocessing planned to be sent?	1. The spent nuclear fuel from Oskarshamn (OKG) that was sent to Sellafield, England for reprocessing belonged to OKG. It was reprocessed in 1997. The intention with this was to make MOX-fuel (Mixed OXide fuel) that would be used in Oskarshamn 2 and Oskarshamn 3. 2. Since the MOX-plant in Sellafield, England was shut down in 2011 no MOX-fuel was ever produced from the spent fuel that belonged to OKG. In short this resulted in OKG transferring its entire holding of separated plutonium in Sellafield to the Nuclear Decommissioning Authority (NDA) in the UK. Which means that the NDA then also takes over all of OKG's obligations with regards to the material. The separated uranium was sent to Russia and used for production of new fuel assemblies that have been used in Oskarshamn and now shipped to Clab interim storage facility. The remaining radioactive waste remain in England and is the responsibility of England according to the original contract with OKG.

Article	Ref. in National Report	Question / Comment	Answer
Article 16.2	Page 136	It is understood that SSM allows the temporary exemption from authorised OLCs. Can some details of these circumstances when this is done be provided?	The nature of these particular exemptions can be illustrated with two examples. According to Ringhals 1's technical specifications there should be two alternative ways to inject water in the spent fuel pools (SFP) from an external water storage tank in case both trains in the SFP-cooling system are unavailable. The technical specifications require then that it should be possible to inject water into the SFP either through a flow path via a particular plant system or by using mobile equipment. In order to perform maintenance on the plant system the licensee had to make the flow path through this system inoperable, which required a temporary exemption from the OLC in the technical specifications. The exemption was deemed acceptable since its safety significance was small based on the fact that even if both trains of the ordinary SFP-cooling were unavailable, there would still be the possibility of injecting water into the SFP with mobile equipment and furthermore the amount of the decay heat in the SFP implies that few days would be available to perform the required manual actions. A second example relates to the Central Interim Storage Facility for Spent Nuclear Fuel (CLAB). The facility upgraded the service water system and in order to remove a fine screen mesh in the last phase of the project, the separate trains in the system had to be made inoperable one by one. This required a temporary exemption from the OLC since all trains have to be operable according to the technical specifications. The exemption was deemed acceptable since the sea water temperature during the temporary exemption was sufficiently low that the decay heat could be removed to the ultimate heat sink even with an inoperable train.

Article	Ref. in National Report	Question / Comment	Answer
Article 16.3	Page 137	It is understood that there has been some concerns surrounding the swelling of ion exchange resins and the impact that this may have on the engineered barrier. Does this waste need to be removed and undergo treatment or conditioning in order to deal with this issue?	This matter is under investigation. It could imply some rearrangement of the waste packages in some rock vaults but probably not reconditioning of the waste packages.The engineered barrier for the rock vault BMA will, before closure, be complemented with some additional engineered structures.
Article 16.3	Page 151	It would appear that the non-conformities in the 2800 barrels of waste at SFR was outside the WAC (particularly in regard to Ra226). Can you please indicate the amount of Ra-226 allowed by the WAC and how much more radioactivity is expected to be present in these non-conforming barrels and what this would mean in terms of dose if left in-situ? Furthermore, can any lessons be shared for avoiding this situation in the future?	Documentation for some old legacy waste has indicated that that some waste streams by mistake can have been disposed of in the BLA rock vault in SFR. This type of waste including larger amount of Ra-226 are included in waste streams defined as long lived waste and shall be disposed of in the future repository SFL for long lived waste; it is not allowed to dispose this type of waste in BLA SFR. Calculations for documented amounts of Ra-226 indicate that it will exceed limits and acceptance criteria. The lesson learned is to be very careful and have very strict quality parameters and control before conditioning and disposing legacy waste.

Article	Ref. in National Report	Question / Comment	Answer
Article 12	Page 129	It is understood that the former uranium mine was remediated and subsequently released from regulatory control. Was the remaining radioactivity managed on-site, and if so, over what time period was the dose assessment for the future behaviour of the site assessed prior to release?	Some of the contaminated materials were left in the ground on site. A small part of the remaining uranium can be attributed to some of the sludges in the leaching pools in the uranium leaching facility, approximately containing less than 100 kg of uranium that could not easily be remediated. The larger part of the remaining uranium, totally about 2.6 tonnes of uranium, can be attributed to two areas outside the former leaching facility, that were contaminated with uranium as a consequence of storage of large amounts of materials during operation. The anticipated leaching of uranium from these areas (and the small additional contribution from the leaching ponds) was modelled and the dose consequences calculated for a period of 5000 years. As an example, the maximum dose from consumption of water from a well at a distance of 100 meter from the contaminated areas was calculated to about 70 µSv per year.
Article 16.3	Page 136	It is understood that a water proofing membrane was installed to protect barriers and waste in the rock vault for intermediate-level waste (1BMA) and the silo. Was the safety assessment updated to reflect this change and how were the contradictory aspects of the slowing of water accessing the waste vs preventing water from moving away from the waste managed?	Water proofing membranes were installed in the rock vaults to exclude dripping of water into the rock vaults. The initial state for the safety assessment specify some specific conditions before the repository will be saturated with water. Thus, the post closuresafey assessment was not updated because of this installations. The calculation case foresee an intact barrier as a start point for the calculations.

Article	Ref. in National Report	Question / Comment	Answer
Article 11	General	“Another important aspect of the drifts and whole host rock integrity is long-term (dozens of years and more) stress development and relaxation in crystalline rock. As the heat from HLW or SF spreads, the mechanical stress if the far field grows up and can result in the rock creep. It can potentially even influence the ground surface above the DGF. The relaxation of this stress can take centuries.” What models and assumptions are used to account for such long-term stress and possible rock creep related to it?	The 3DEC model is used to analyse thermally induced rock stresses and potential rock alterations related to it. The modelled temperature evolution in the repository is used as input and determines, together with the mechanical properties of the hos rock, the extent of these processes. The analyses are carried out on two different length scales. In Sweden's latest safety assessment, the effects are found to be small.

Article	Ref. in National Report	Question / Comment	Answer
Article 11	Section B-1	What limits have been set for restricted quantities of long-lived nuclides in very low-level waste?	For shallow land burial the inventory rerstriction with regards to nuclide specific activity concentration where derived from a combination of matching the levels with general clearance levels and the results from schematic intrusion scenarios. These activity concentrations are to be applied with at the time in the future when the institutional control period can be ended from a radioation protection point of view. The insitutional control period will be at least 30 years after the last disposal of waste at the facility. After this period, from SSM:s point of view the shallow land burial can be controlled like any other disposal facility for non-radioactive waste. The following activity concentrations have been specified: Nuclide, Bq/g H-3 100 C-14 10 Co-60 0,3 Ni-59 100 Ni-63 100 Sr-90 1 Nb-94 0,1 Tc-99 1 I-129 1 Cs-137 3 Eu-152 1 U-238 1 Pu-238 0,1 Pu-239 0,1 Pu-240 0,1 Pu-241 10 Am-241 0,1 Cm-244 1 If several nuclides are present, then the sum of the ratio between the

Article	Ref. in National Report	Question / Comment	Answer
			nuclide specific content and limit should be less than 1. Nuclides with a specific activity less than 10 % of the limit need not to be taken into account in the summation.

Article	Ref. in National Report	Question / Comment	Answer
Article 16.3	page 49	It is understood that the space above the concrete structure in the rock vault for intermediate waste (BMA) may or may not be backfilled on closure. It is presumed that this vagueness is due to the backfill not being specified in the safety assessment. However, it is inferred from the section on the rock vault for low level waste (BLA) that water ingress from above is present or possible. From an optimisation of design perspective, has the difference in the dose outcomes or speed of migration of nuclides been assessed with and without backfill above the concrete structure?	The space above the concrete structure in the rock vault for intermediate-level radioactive waste (BMA) will be backfilled with crushed rock (macadam) to reduce the impact force from possible rock fall-out and thus to ensure that the concrete structures are not damaged. The high hydraulic conductivity of the crushed rock assures low groundwater flow through the waste. The difference in the dose outcomes or rates of migration of nuclides with and without backfill above the concrete structure has not been assessed. However, since a backfill material of high hydraulic conductivity will be used, no substantial difference is expected.
Article 14	Section H	Are there any plans on the development of a pan-European set of requirements and rules (standardized template) for the exchange of data on nuclear facility decommissioning designs?	The OECD/NEA, in cooperation with IAEA and the European Commmission, developed in 2020 the Interim Technical Document "A Proposed Standardised List of Items for Costing Purposes in the Decommissioning of Nuclear Installations". The document can be freely downloaded from the OECD/NEA website.
Article 11	Section H	What are the bitumen swelling parameters? Were the results of leakage tests presented?	Swelling parameters are depending of the waste load and type of waste conditioned in the bitumen matrice. For our repositories we do not consider bitumen as a barrier, but it is calculated so the bitumen matrice do not negatively impact the barriers. Leaching tests have been performed for some waste types.

Article	Ref. in National Report	Question / Comment	Answer
Article 11	Section H	What type of bentonite has been selected for application?	For the repository for spent fuel, the selection of bentonite material is based on a given set of requirements. The requirements concern swelling pressure, hydraulic conductivity, suppression of microbial activity, long-term stability and possibly other factors as well. This means that SKB will have the possibility to select any material that fulfils the requirements. It is not unlikely that the material will be changed during the operation of the repository. A number of materials have been tested with the conclusion that most, or all, of the tested materials will fulfil the requirements as long as the installed density is sufficient. The material that was used in the SFR facility was selected based on requirements on swelling pressure and hydraulic conductivity. At the time, a soda activated bentonite from Sardinia was selected.

Article	Ref. in National Report	Question / Comment	Answer
Article 32	General	INFCIRC/603/Rev7 presents the definition of a Good Practice stating the criteria of a significant contribution to the safety as its key provision. Please, indicate what criteria of significant contribution to the safety govern the decision-making on denoting some specific program, policy or practice as a Good Practice?	It is not up to an individual Contracting Party to decide on a Good Practice for itself. At the fifth review meeting Sweden received a Good Practice with the following wording and criteria: "Real progress towards a fully-operational deep geological repository for spent fuel involving the Äspö deep geological research facility, site selection for the repository, public engagement, international cooperation and concomitant development of the necessary safety case and regulatory processes" For further information on the basis for this Good Practice please see Section K.3 in Sweden's Seventh National Report.
Article 11	Section H	What were the key changes introduced at the stage of nuclear facility design development or what changes are going to be introduced due to the wide-scale application of the BIM-approach in design development and construction?	Working with concurrent engineering in a BIM-model opens up for a better way of designing the: - Process flow of the plant (from empty copper cylinder to filled and sealed copper canister) - Logistic flow in the plant (man and material), fork lifts e.g. - Operators movement, layout in operator centre. - Maintainability of components e.g. how can we access equipment, lift equipment, areas for dismantling of equipment. - Layout in workshop Connect the new encapsulation part to the existing Clab part.

Article	Ref. in National Report	Question / Comment	Answer
Article 14	Section H	Are there any information BIM-models or comprehensive digital twins of nuclear facilities involving digitally simulated NF operation processes (model of NF operational stage) and NF decommissioning concept (decommissioning concept model) in place or is their development envisaged at the design development and construction stage?	The BIM-model is not a PIM-Model (Digital Twin), however it contains information as: - Sums for construction steel, piping e.g. => The budget is based on the contents in the model. - Working hazards are visualised. - Safety equipment e.g. fire extinguishers are shown in the model. - Room identities are connected with the room function program.
General	Section A. Introduction	In the report it is stated (page 29, 30), that technological development of the repository concept for SFL will commence in the next few years and is planned to result in a choice of concepts for SFL by the mid-2020s. The timeline of establishment of SFL is shown in Figure A10. Is the establishment of SFL on schedule and at what stage are the activities currently?	The establishment of SFL is postponed at least 5 years to allow for characterization of the legacy waste stored at Studsvik as well as results from the ongoing licensing process for the spent fuel disposal facility and extension of the SFR facility. Technological development of the repository concept has also been postponed awaiting results of the characterization. However, development of waste acceptance criteria and standardised waste packages for SFL is ongoing.

Article	Ref. in National Report	Question / Comment	Answer
Article 11	H.3.2.2	Do the national regulations provide any acceptability criteria for the bedrock considered under the deep disposal facility siting process?	SSM's regulations provide basic requirements on the design of the repository barrier system, but the regulations are non-prescriptive and do not specify detailed acceptance criteria for the bedrock or the engineered barrier system. During the siting process the responsible organisation, the Nuclear Fuel and and Waste Management Co (SKB) have developed system of multidisciplinary siting criteria. These have been reviewed and commented upon by SSM in the recurrent reviews of SKB's programme for Research, Development and Demonstration and preliminary safety reports. However, the first formal regulatory assessment of SKB's safety case, including acceptance criteria for the bedrock, was made in SSM's licensing review of SKB's license application submitted in 2011. Although SSM's review covered SKB's complete safety case, the quantitative compliance criteria are expressed in terms of radiological dose and risk. During construction of the repository SSM will review SKB's reporting on verification of the design principles and acceptance criteria for the repository.

Article	Ref. in National Report	Question / Comment	Answer
Article 4	G1.1.3	Page 104/172 In the text it is written “Provision shall be made in design of storage arrangements for reserve capacity to enable relocation of the material”. Please detail.	The Clab facility and its storage pools are designed so that there always is a possibility to empty one part (special gates can be placed to then seal of one part of the pool to empty it for making repairs or similiar maintenance). This goes for the underground pools in the facility. There's also a possibility to lift fuel to the above ground pools (where the spent fuel casks are emptied) and store a number of fuel elements there temporarily. This option is seldom used though because the optimal safety is to have all fuel below ground (mainly due to safety from external hazards that might occur from weather phenomena at ground level).

Article	Ref. in National Report	Question / Comment	Answer
Article 25	F5.8	Page 95/172 Does Swedish nuclear regulations have any requirements for defining a strategy for radioactive waste management resulted from potential emergency situations?	Yes, there are legal requirements for this. The 21 County Administrative Boards in Sweden are, among other things, responsible for rescue services during nuclear emergencies, according to the Act on Civil protection (2003:778), chapter 4, section 6 and the Ordinance on Civil Protection (2003:789), chapter 4, section 15. The County Administrative Boards are also responsible for decontamination following a nuclear emergency according to the Act on Civil Protection (2003:778), chapter 4, section 8 and the Ordinance on Civil Protection (2003:789), chapter 4, section 15. County Administrative Boards are required to develop specific emergency plans for nuclear practices, including decontamination, in emergency preparedness categories I and II according to the Ordinance on Civil Protection (2003:789), chapter 4, section 21. The County Administrative Boards are furthermore required to collaborate with neighbouring County Administrative Boards as well as give relevant authorities, municipalities and County Councils the opportunity to provide comments when developing a program for rescue services and decontamination in connection with nuclear emergencies according to Ordinance (2003:789), chapter 4, section 21. According to the Ordinance on Civil Protection (2008:452), section 15, the Swedish Radiation Safety Authority is charged with the responsibility to give advice on radiation protection, clean-up and decontamination in the event of a nuclear or radiological emergency. According to the Ordinance on Civil Protection (2003:789), chapter 4, section 16, the Swedish Civil Contingencies Agency (MSB) has the mandate to issue regulations about rescue service and remediation after consultation with SSM and other involved authorities and organisations. MSB has issued regulations on decontamination in SRVFS

Article	Ref. in National Report	Question / Comment	Answer
			2007:4 in which information and requirements on persons appointed by the head of the County Administrative Boards to become responsible for the decontamination, with training, drills and exercises is stated. Furthermore, all municipalities are obliged to participate in the planning and exercises for nuclear emergencies, including and subsequent decontamination according to the Act on Civil Protection (2003:778), chapter 6, section 9.

Article	Ref. in National Report	Question / Comment	Answer
Article 19	E2.3	Please briefly describe the process of verification of the compliance with regulatory requirements regarding the employer of outside workers. What kind of document the regulatory authority does grant for the employer of outside workers?	The employer is responsible for verifying compliance with all regulatory requirements regarding the employees, including outside workers. The responsibility includes, for example, to ensure that the workers to have the skills needed to take relevant protective measures, that the workers is given training and information for safe handling and control, that the workers has undergone a medical examination and that their doses is measured and registered.

Article	Ref. in National Report	Question / Comment	Answer
General	A 6.4	Page 20/172 It is mentioned that the funded assets are managed by a Government authority, the Nuclear Waste Management Fund. It is also mentioned that falling interest rates and lowering of discount rate curves used in calculations have a substantial effect on nuclear waste fee. Do you have any examples from Swedish experience on how this relation does affect? How is covered the difference from the interest rate used in calculation and low return rate from fund investment? Is regulated any limit for the proportion/percentage from the fund which can be used by SKB for current investment/project? Is any regulated provisions on how/the mechanism the nuclear licensee cover the insufficiency of decommissioning funds of a nuclear power unit/ estimated after the final shutdown of the unit/plant?	The Financing Act states that the discount rate must correspond to the expected return in the nuclear waste fund. The Financing Ordinance specifies that discounting shall take place with a risk-free discounting curve with the addition of 0.75 percentage points for broader investements. The risk-free discount curve (nominal) is calculated in accordance with the rules for pension companies specified in Sweden's financial supervisory authority ("Finansinspektionen") regulations FFFS 2019:21. In the same way as the nominal discount curve is done, an inflation curve is built up. Together, these two curves form a real discount curve that is used in the fee calculations. For the first ten years, the curves are based on market values. After 20 years, the curves are based on an assumption of a long-term risk-free nominal interest rate (UFR) and on expected inflation. For the years in between, an interpolation is made. The curves are updated every three years in connection with the authority giving proposals for new fees.

Article	Ref. in National Report	Question / Comment	Answer
General	A 8.3	Page 30/172 At repository for LL-LILW (SFL) it is mentioned that the details of the repository design will make possible to further define the set of requirements and eventually establish waste acceptance criteria. “The nuclear power plants should not commence final conditioning of waste until a verified concept exists.” Please detail what a verified concept means? Are there any preliminary waste acceptance criteria when the verified concept exists?	In accordance to SKB's recent plan for establishment of the final repository for LL-LILW (SFL), consecutive steps will be taken for further development of the design of the engineered barrier system, waste acceptance criteria (WAC) and site selection process. The development of the WAC will be iteratively coupled with the other developments. According to the plans presented in the RD&D-programme in 2019, SKB plans to initiate the site-selection process in the near future. Furthermore, SKB has asked the waste producers for information with regards to the long-lived waste by 2026. SKB plans to file a licence application in 2030. According to the present plans, the SFL-repository will be divided in two parts, one specifically for metallic waste from NPPs and one part for waste mainly originating from the Studsvik facilities. The latter part consists both of legacy waste and waste that is still being produced at these facilities. In practice, most of the metallic wastes from decommissioning of reactors are now stored in large steel tanks. The legacy waste, for historical reasons, are now mainly grouted with cement and stored in steel drums. The vast majority of the waste that have been produced in the later years at the Studsvik facilities is being conditioned in a way that allows re-conditioning. Only sludges are conditioned.

Article	Ref. in National Report	Question / Comment	Answer
Article 19	E 2.1.4	Page 58/172 paragraph 2, Please detail information on how “SKB coordinates the nuclear power utilities’ cost estimations” What type on information related to estimations on repository’s waste inventory and/or waste characteristics is available at the EIA stage of the repository project?	SKB has been commissioned to compile the licensees' cost calculations. The costs can be divided into common and specific costs for the licensees. SKB establishes the common costs for the facilities needed in the nuclear waste program. This includes costs for the construction, operation and decommissioning of these facilities. The licensees themselves make cost calculations for the decommissioning of their nuclear power reactors. Prior to each cost calculation, the operating times of the reactors are an important factor in the planning of the nuclear waste program. Based on the reactor owners' current planning conditions, forecasts are made for how much spent nuclear fuel and nuclear waste is to be disposed of in the waste system and when the need for intermediate storage and final disposal arises in time. Currently 60 years of operation of the reactors.

Article	Ref. in National Report	Question / Comment	Answer
Article 26	F.6.2.3, 100	It is stated that the applications for clearance of the buildings and sub-surface structures are expected during 2020, and only the laboratory wing of the facility will be kept by the licensee to be used for other purposes, such as management of nuclear waste. - What is the progress status and the plan to manage radioactive waste?	Three, out of a total of five planned, clearance reports have been delivered to SSM and are under review for a possible final decision on clearance of buildings for conventional demolition. It is expected that the two remaining reports will be issued to SSM during 2022. Currently there are only a few measurement activities left, mostly SSMs own to verify the licensees measurements. Material that has been taken out are either cleared or stored awaiting completion of Sweden's final repository for low and intermediate waste. Conventional demolition and remaining backfill work are expected to be completed by 2025. The laboratory building will be used to handle Sweden's legacy waste and has little or nothing to do with handling of waste from the former research reactors R2 and R2-0. The plans for how to handle the legacy waste is being developed. The legacy waste will according to current plans all be in final repository in about 25 years from now.

Article	Ref. in National Report	Question / Comment	Answer
Article 23	E.3.2.5	It is stated that the standards for quality control are described in SS-EN ISO 9001:2015. - What standards and system do you have for quality assurance of construction and operation of the disposal facilities, including management of spent fuels? - Is the relevant information disclosed? If so, please provide us with the web page (URL).	The Clab Facility originally followed USNRC General Design Criteria enligt 10 CFR 72 when built and has in retrospect also been evaluated against IAEA Safety Series No 116, 1994 - Design of Spent Fuel Storage Facilities. Of course there are several other national and international norms and standard´s for particular areas such as radiation protection, safety analysis, safety and safeguards that are also applied together with the Swedish regulatory requirements (SSMFS). The SFR facility does not follow any particular nuclear related general standard of construction from the nuclear field, but is rather constructed as a "standard" underground facility, with some added features for radiation protection as well as special design requirements installed that are derived from the requirements of being av final repository.

Article	Ref. in National Report	Question / Comment	Answer
Article 26	F.6.2.1, 99	It is stated that the plant-specific and scenario-specific decommissioning studies have been performed for all the Swedish nuclear power plants in order to estimate waste quantities, timetables and costs. - Are the information related to the main contents and results of the studies open to public? If so, please provide the web page address (URL). - Are the study results updated periodically? If so, how often do you update?	Every three years, the Swedish Nuclear Fuel and Waste Management Company (SKB), produces, on commission of and in collaboration with the licensees of nuclear power reactors, a programme for nuclear waste management and decommissioning, called “Programme for research, development and demonstration of methods for the management and disposal of nuclear waste (SKB TR-19-24)” and a cost estimate for the disposal of radioactive residual products from nuclear power (SKB TR-19-26). These reports are publicly available on SKB’s website: www.skb.se. The “Programme for research, development and demonstration” contains information on the decommissioning (plans) for nuclear power plants in Sweden, including estimates for the waste streams and timetables. Decommissioning studies produced from 2013 are public reports and are available on SKB's website under publications. Decommissioning study of Forsmark NPP, R-13-03 Decommissioning study of Oskarshamn NPP, R-13-04 Ringhals Site Study 2013, R-13-05 The reports are not regularly updated.

Article	Ref. in National Report	Question / Comment	Answer
Article 26	F.6.2.2, 99	It is stated that the different waste streams that will be generated in conjunction with dismantling and demolition of the Ågesta reactor have been identified. - What are the waste streams from generation to disposal of radioactive waste from decommissioning by waste type, and what is the disposal plan?	The waste produced consists of: short-lived low level waste, long-lived low level waste, short-lived intermediate level waste, long-lived intermediate level waste and waste suitable for free relase (according to clearence levels). Short-lived low level waste and short-lived intermediate level waste is planned to be disposed of in the final repository for short-lived radioactive waste (SFR). Long-lived low level waste and long-lived intermediate level is planned to be disposed of in the final repository for long-lived radioactive waste (SFL). The waste produced is transported for intermediade storage at another nuclear facility (Svafo) before final disposal. The water used during segmentation of the reactor pressure vessel will be treated through evaporation and incineration at different nuclear facilities. The resulting ashes will be stored in Svafos facilities before disposal in a final repository.

Article	Ref. in National Report	Question / Comment	Answer
Article 10	H.1.1.6	In order to establish comprehensive safety of the disposal facilities, information on the periodic safety assessment is utilized. Please elaborate on the system of periodic safety assessment on the low- and intermediate-level radwaste disposal facility. If such information is already on public domain, please share the URL for the web page.	According to 10a § Act on Nuclear Activities there is a general requirement that requires licensees to at least every ten years perform a period safety review (PSR) PSR. This practice is meant to supplement the renewal of the license. A PSR should take into consideration: • the conditions under which the activity is conducted • how systems, structures and components are affected by operation and aging • experiences from operating the facility and from the operation of similar facilities, and • developments in science and technology The PSR should also include an analysis and reports of • how the facility's construction, operation, organization and activities meet the requirements of the Nuclear activity Act, the Environmental Code and the Radiation Protection Act (1988:220) and the regulations and conditions imposed under those laws, and • conditions for these rules and conditions to be met until the next global assessment. With this analysis as a starting point the licensee is required to develop an action plan aimed to maintain and improve safety and radiation protection of the facility for the next ten years. The PSR and the action plan is reviewed by SSM. The review is conducted in order to ensure that the PSR fulfils the requirements of the nuclear activities act and that the action plan of the licensee has the potential to fulfil the requirements on maintaining and improving the safety and radiation protection of the facility. Specifically for the SFR repository, according to the issued conditions, the licensee must analyze and at least every 10 years report how applicable requirements according to the Radiation Protection Act, the Nuclear Activities Act and the Environmental Code is

Article	Ref. in National Report	Question / Comment	Answer
			complied with for the final repository regarding its long-term protective capacity and environmental consequences. Investigations into conditions, as well as measures to achieve the initial condition that is the basis for the post-closure safety assessment must be reported and justified. Within the report, the knowledge gaps and uncertainties of significance for radiation safety after closure shall be reported, as well as a program for how these knowledge gaps and uncertainties are intended be taken care of. The report must also include an overview of the waste acceptance criteria in the light of the analysis of long-term radiation safety. For shallow land burial, no such requirement regarding an up-dated safety assessment has been issued. However, SSM has required a monitoring program and that the results are analyzed prior to any further disposal of waste. The regulatory review report of SKB's safety report for SFR 2001 (which is the main part of that Periodic Safety report) can be downloaded from: https://inis.iaea.org/collection/NCLCollectionStore/_Public/42/022/42022545.pdf?r=1

Article	Ref. in National Report	Question / Comment	Answer
Article 19	E.2.1.4, E.3.3.7	It takes a considerably long period of time from the construction and operating license for the spent fuel disposal facility, its operation, and to the closure and post-closure period. Are there measures that can be taken if the construction and operational costs exceed the funding? It is stated that the funding is reviewed every three years for its adequacy. Are there standards for calculating the construction and operational costs, and a rule to disclose to the public?	The regulatory framework requires the licensee for a spent fuel disposal facilities to regularly update a plan for continued implementation and closure activities. The updated plan is to be submitted to the Radiation Safety Authority (SSM) for review of e.g. the quality of data and appropriateness of assumptions in the plan. There are in addition legal requirements on licensees for a spent fuel disposal facility, every three years, to submit an updated cost assessment report for the total costs for the (remaining) construction and operation as well as for decommissioning and closure of the facility. The updated cost assessment report is reviewed by the National Debt Office with regard to e.g. the relevance and quality of financial parameters and appropriateness of assumptions. The review aims also to verify that the cost assessments are based on sound financing principles and methodologies. The cost assessment is also subject to consultation with stakeholders as part of the National Dept Office's review. The main part of the cost assessment report is published in the public domain, subject to restrictions as regards commercially sensitive information.

Article	Ref. in National Report	Question / Comment	Answer
Article 16	H.6.3.4, 137	It describes the the swelling of bitumen-solidified ion-exchange resin. - Have bituminized waste forms been disposed of before at SFR? If so, what is the plan to treat this? - Are there materials being considered to solidify spent resin? Or are there spent resin treatment methods being considered?	Waste such as ion exchange resins and evaporate concentrates have beeen conditioned in a bitumen matrice. Some theoretical problems have been identified concerning swelling parameters that could in some cases influence the concrete barriers in some rock vaults. Mitigation measures include the waste load in individual waste packages, deposition strategies and planning for the final closure of SFR (e.g. plugs and backfill). The main part of the waste that are deposited in SFR are solidified with cement/concrete.
Article 28	J.1.1, 145	It is stated in J.1.1 that financial provision must have been made to cover the cost of management of the disused sources safely should the license holder become insolvent or go out of business. - Please elaborate on financial provisions. - How are the costs that the licensee pays for financial guarantee calculated? (For example, the financial guarantee dues are decided depending on the number of sources or activities held by the owner.)	In order to get a licence for a high-activity sealed radioactive source, an applicant is required to include in the application a documented agreement with the supplier for the return of the disused sourse, or with Cyclife Sweden AB for the management of the disused source. The applicant also has to provide a financial guarantee of the safe management of the high-activity sealed source. The documented agreement with Cyclife Sweden AB includes the estimated cost for the safe management of the source. The financial guarantee has to be equivalent to that cost.

Article	Ref. in National Report	Question / Comment	Answer
Article 10	E.2.9.1	If, following a long-term preliminary site survey and feedback collection, construction license is given for a disposal facility, a comprehensive/integrated review seems more efficient as the process is more like a preliminary permission for multi-level administrative procedure with operation expected to take place when the facility satisfies the criteria for operating license. Were there policy considerations or technical background and reasons for granting the construction license and operating license independently? Also, we would like to request description on the application for construction and operating license (procedure, documents to be submitted including main requirements for obtaining the license). If the relevant information is on the public domain, please share the URL for the web page.	Sweden's implementation of the IAEA's principles for staged authorisation according to GSR Part 1, Requirement 23 (paragraph 4.29) requires a Government licence relating to the siting and design of a nuclear facility, and a subsequent decision by SSM relating to permission to start construction. This process applies regardless of the type of facility. The overall thinking behind such an approach is that a Government licence relates to a decision in principle to "construct, possess and operate" the facility, based on consideration of siting and concept, whereas SSM's subsequent approval to begin construction concerns the licence-holder's more specific design details for the facility. It is accepted that the licensing decision for a spent fuel repository has (as noted by the Republic of Korea) covered very detailed questions, but this does not affect the overall procedure. Sweden does not claim that this is necessarily the only or the best way to implement the principles of staged approval embodied in GSR Part 1, only that this is the process according to Swedish law. Furthermore, as noted in the text to E.2.9.1, there is a parallel licensing procedure according to Swedish law, in which a nuclear facility requires a licence according to both the Environmental Code and the Act on Nuclear Activities. After a licence has been granted by the Government according to the Act on Nuclear Activities, an application to SSM for approval to start construction will not generally be made until after the Environmental Court has granted a licence and specified licence conditions in accordance with the Environmental Code. Requirements for what should be submitted in support of an application to start construction are not - as yet - specified in regulations, although proposals have been made for a change in the law to make this process more explicit. Instead, the requirements are summarised in SSM's management procedures (STYR2011-131). Here it is noted that the application to begin construction should be supported by an update to

Article	Ref. in National Report	Question / Comment	Answer
			the Preliminary Safety Analysis Report, taking account of optimisation decisions relating to detailed design, as well as responses to comments made by SSM at the previous review stage. The updated safety analysis report should verify that regulatory criteria continue to be met and must be reviewed and approved by SSM. In addition, the licensee is expected to provide an account of the organisational, staffing and administrative arrangements (including purchase of equipment and services) associated with construction activities. This includes arragements for security during construction. Only after review and acceptance of these plans will SSM grant permission to start construction.

Article	Ref. in National Report	Question / Comment	Answer
Article 26	F.6.1, 97	It is stated that the annual dose criteria for unlimited/limited site opening is determined through SSMFS 2018:3. Is there a methodology recommended to the licensee to demonstrate the compliance with the criteria?	No specific methodology is recommended by SSM. However, the regulations SSMFS 2018:3 specify the content of an application for clearance of a site or contaminated area. Among others, the application shall contain a description of the measurements, results and uncertainties. The measure¬ments shall demonstrate compliance with clearance levels. Those clearance levels are decided by SSM after an application that shall demonstrate compliance of the proposed levels with the dose criteria. The content of an application for clearance levels is also specified in the regulations SSMFS 2018:3 with further explanations in the supporting document of the regulations.

Article	Ref. in National Report	Question / Comment	Answer
Article 26	F.6.1, 97	It is stated that availability of financial resources the licensee has is confirmed with SSMFS 2018:1. Are there criteria to determine the availability and appropriateness of the financial resources at the time of decommissioning nuclear facilities?	The regulatory framework requires licensees for nuclear facilities to regularly update a plan for the decommissioning for their facility. The updated decommissioning plan is to be submitted to the Radiation Safety Authority (SSM) for review of e.g. the quality of data and appropriateness of assumptions in the plan. There are in addition legal requirements on licensees, every three years, to submit an updated cost assessment report for the total costs for the decommissioning of the facility. The updated cost assessment is reviewed by the National Debt Office with regard to e.g. the quality of financial data and appropriateness of assumptions in the cost assessment report. Thus, the legal and regulatory framework does not contain requirements on specific (i.e. measurable) quantitative criteria to be met to determine the availability and appropriateness of the financial resources for the decommissioning period. The arrangements in place are rather based on qualitative assessments of enough detailed deterministic assumptions over time, to guarantee trustworthy arrangements. There are in addition requirements on the licensees to provide guarantees to cover additional cost, should the moneys invested in the Nuclear Waste Fund be insufficient.

Article	Ref. in National Report	Question / Comment	Answer
Article 8	G.5.2, 118	It is stated that the spent fuel interim storage facility (Clab) and encapsulation plant are considered as a group (Clink). Also, Clink was built as the two facilities have something in common in terms of technology. - What is this commonality that grouped the two facilities into one?	There were several reasons for this decision. * The practical part is that we do not need to move the fuel outside of Clab, we can build the encapsulation process so that it "connects" directly to the fuel elevator that lifts fuel up and down from the underground storage pools. This was also an original design idea when Clab was built, so the fuel elevator has a preperad mode to lift fuel to a position where we could build the encapsulation process directly connected to the elevator shaft. * In the licensing process there has been a demand from the regulator to see Clink as one facility to levelize the requirement levels as well as the design provisions to secure safe handling, in both operational and emergency situations. To make this effort easier in the licensing process the facility will have a joint safety analysis report. * Technology wise there's the fuel elevator as described above, but also lifting equipment similarities, handling of fuel transports, know-how of maintenance and operational personell that are all advantageous for building the facilities together.

Article	Ref. in National Report	Question / Comment	Answer
Article 25	F.5.5	The National Report describes that in 2019 the Sea Eagle exercise was the largest nuclear exercise ever run in Sweden which lasted 36 hours. We note that this exercised the emergency response arrangements dealing with the 'acute' phase of the emergency. 1. Could Sweden explain what exercises have taken place which have considered the 'recovery' aspects of potential emergency scenarios?	Exercises which consider the recovery aspects are carried out in workshop-type format as discussion exercises. This type of seminar exercises are held after the larger NPP exercises. The seminar exercise handles the recovery of the different scenarios which have been the subject of a previous exercise where the early and intermediate phases of nuclear or radiological accidents have been the focus. The County Administrative Boards in the NPP counties are responsible for these exercises which are conducted with relevant organizations and authorities. In these seminar exercises several areas of expertise are brought together so that the exercise participants through dialogue and reflection together find the best solution to the problem, and thereby gain an increased understanding of their own and others roles in the emergency preparedness system. Focus has been on consequences of food production.

Article	Ref. in National Report	Question / Comment	Answer
Article 19	E.2.9.3, 67	E.2.9.4 explains about the clearance system. - Is clearance approved case by case? Can be clearance approved by general procedure when the authorized party comply with the clearance levels? - Are the decision makers who determine whether the clearance levels are satisfied by item (materials, building structures, sites) to be cleared? - How does the regulatory body regulate control program of the authorized parties? (if inspection is done other than review, etc.)	The license holder has the mandate to clear materials by applying the clearance levels of SSMFS 2018:3. Materials can also be cleared with higher clearance levels, if the license holder has a specific "clearance license" ("dispens som innebär friklassning") issued by SSM, for example for disposal of waste on a conventional waste disposal facility. Specific batches of materials can also be cleared by decision of SSM, on application from the license holder. The license holder has the mandate to clear materials. There are general requirements on competence and ability of personnel, but no approval is needed from SSM of the actual persons taking the clearance decisions. In practice, persons with university education in radiation physics and long experience in relevant areas are appointed by the license holder. Building structures and sites can only be cleared by decision of SSM. SSM's supervision is normally a combination of document review and inspections. Deficiencies and non-compliances that are identified during the review are often followed-up by inspections, preferably on-site.

Article	Ref. in National Report	Question / Comment	Answer
Article 11	A.5, A.6, H.3 (also Article 21)	Some new waste storage facilities will need to be constructed for NPP decommissioning. 1. Will SKB seek to created consolidated storage (i.e. where a store takes waste from more than one NPP) or will stores be created separately for each NPP? 2. If SKB is seeking a consolidated store, how will a decision on siting be made?	1.At this moment there is no plan for a central interim storage. Each operator is responsible for storing their own waste. 2.N/A

Article	Ref. in National Report	Question / Comment	Answer
Article 4	G.1.1.7, H.1.1.7 (Also Article 11)	The national report states that the burden on future generations should be avoided with respect to safety and cost and that those that benefited from nuclear power should also deal with the management and disposal for spent nuclear fuel and radioactive waste. 1. Could Sweden explain how it monitors and measures its achievement of this commitment?	Swedish legislation comprises the necessary elements to ensure that burden on future generations are avoided. Firstly, according to the Act on Nuclear Activities the license holder is responsible for taking the necessary measures for management and final disposal of all radioactive waste and spent nuclear fuel. The Swedish Radiation Safety Authority supervises the Industry´s implementation of the programme by regulatory reviews of license applications and recurrent reviews of the Industry's programme for Research, Development and Demonstration every third year. Secondly, the Financing Act requires the license holders to pay fees to the Nuclear Waste Fund and provide financial securities to ensure that sufficient financing for the whole waste management and decommissioning programme is financially covered. The National Debt Office reviews the industry's cost calculations every third year, with support from SSM. If needed the Government makes adjustments of the fees on nuclear electricity, based on the reviews of the National Debt Office.

Article	Ref. in National Report	Question / Comment	Answer
Article 7	G.4.2.2	The National Report describes plans for the decommissioning of the spent fuel repository but does not describe plans for the release of the facility from regulatory control. 1. Could Sweden explain the proposed plans and criteria for release of the facility from regulatory control, e.g. delicensing of the facility?	There are no established procedures, criteria or plans for the release of facilities from regulatory control. However, in practice such releases has been done in the following way. When the authority, after supervision, can establish that the operator has taken all the necessary measures in accordance with the Nuclear Activities Act and the Radiation Protection Act, and that people or the environment can no longer be exposed to unacceptable risks of harmful effects of ionizing radiation and that the activity is no longer subject to EU safeguards, it may be exempted from further supervision by the authority and no longer have to pay a fee. The authority notifies the operator about all this. However, the authority's position that the operator has no obligations to fulfill does not invalidate his obligation to comply with the provisions of these laws in the future if something unforeseen should occur. Decisions to completely exempt an operator from obligations under the Nuclear Activities Act can only be made by the government upon application by the operator.

Article	Ref. in National Report	Question / Comment	Answer
Article 20	E3, F.2, F.6.1-6.2, K1.4 (also Articles 22 and 26)	The report highlights the implementation of training programmes to meet the challenges of ensuring adequately trained staff on NPP sites as they move into decommissioning. During decommissioning there is an increased focus and emphasis on waste management activities which are key to achieving the best outcomes in optimised waste management and decommissioning. 1. How are operators taking forward initiatives to (a) embed a culture of waste management in the transition from operation to decommissioning and (b) to ensure that all staff have the necessary values and technical knowledge relevant to their role in the waste lifecycle?	Competence development and education actions are carried out for all areas needed for understanding and working with waste management and decommissioning, from operation of facilities to assessment of post-closure safety. This includes for example management teams, project managers, radiaton protection technicians and maintenence engineers. Change management is highly important to ensure that all staff work in the same direction.

Article	Ref. in National Report	Question / Comment	Answer
Article 17	E.2.4, F.6.1 (also Articles 19 and 26)	1. At what point in the site decommissioning process is the site released from nuclear third party liability? 2. Will Sweden be adopting the NEA steering committee recommendations to cease to apply the Paris convention to installations being decommissioned and to nuclear installations for the disposal of certain types of low-level radioactive waste where they meet the relevant exclusion criteria? 3. If so, will it be possible to release parts of the site from nuclear third party liability or will this be on a whole site basis?	1. The act on liability and compensation in the event of radiological accidents implements the Paris and the Supplementary Convention. Although not directly stated in the legislation, third party liability should probably cease when the operator has fulfilled all obligations under the Nuclear Activities Act. However, third party liability remains as long as there are additional reactors or other nuclear activities on the site. 2. There is no Swedish position on this issue (yet). However, facilities under decommissioning are still liable in the event of an accident. In individual cases, according to act on liability and compensation in the event of radiological accidents, the Government may decide on a lower amount of liability if it is considered appropriate in view of the type of facility and the probable extent of a radiological accident. Regarding disposal facilities of low-level radioactive waste, the same principle can be applied. Whether the amount of liability should be EUR 70 million, EUR 700 million or somewhere in between is a separate issue that the Government needs to consider. 3. This is not clear from the legislation. Though the act shall be applied in such a way that two or more nuclear installations shall be considered as one installation, if the installations have the same licensee and are close to each other.

Article	Ref. in National Report	Question / Comment	Answer
Article 15	E.2. and E.3.2.6 (also Articles 16, 19 and 26)	1. Is the safety case for a decommissioning facility subject to periodic safety reviews during the decommissioning process (e.g. if it goes on for longer than 10 years)?	According to Section 10a of the Act (1984:3) on Nuclear Activities, periodic safety reviews have to be conducted every 10 years until a nuclear facility has been decommissioned. SSM can grant exemptions from this requirement upon a licensee's application.

Article	Ref. in National Report	Question / Comment	Answer
Article 20	E3, F2, K1.4	Section K highlights identified challenges maintaining and developing competencies in radiation protection and nuclear safety and the need for relevant education programmes to provide long-term competence. 1. What are the success criteria for adequately addressing these challenges? The report highlights the need for smaller numbers of people with in-depth competence and extensive experience in areas important for SKB. 2. Have areas where deep subject matter expertise is needed been identified and appropriate arrangements for recruitment, training and development been put in place to ensure the sustainability and resilience of availability of such expertise? With the concurrent decommissioning of a number of NPPs there may be increased demand for technical services from the supply chain 3. How has the technical capacity and competence of the supply chain to fulfil this demand been considered?	1. SSM has initiated a survey of the national competence with a regularity of typically every two years. The survey includes the following four components: a) Collection and analysis of student data from all relevant universities. b) A questionnaire to all organisations handling radiation about their current knowledge management situation. c) Interviews with the larger companies or organisations with radiation or nuclear activities (e.g. the nuclear power plants). d) Interviews with the universities about their current educations. 2. Six specific areas has been identified as vulnerable in terms of amount of personnel and researchers with appropriate knowledge and competence as well as critical to the radiation safety in Sweden. Special attention has been given to these areas in SSM's research funding strategy. On part of the industry, SKB's HR department and managers identify critical competencies and develop plans for both recruitment and for developing the competence of existing staff. There are also programmes for transferring competence from senior to young professionals. There is also collaboration with universities in order to attract students (including PhD), and this is done jointly by SKB and Vattenfall. 3. There are specific requirements that the licences have to secure competence within the supply chain to be able to fulfil all requirements about radiation safety. There are also requirements to make a careful judgement whether in-house personnel should be used or a sub-contractor.

Article	Ref. in National Report	Question / Comment	Answer
Article 19	E.2.3.4 (also Articles 21 and 22)	The Act on Nuclear Activities, Radiation Protection Act and Environmental Code, require submission of an Environmental Impact Assessment (EIA) as the basis for licensing of activities such as waste management and decommissioning of reactors. This national legislation, established as per Article 19, is in accordance with the European framework as per 85/337/EEC amended by 97/11/EC and 2003/35/EC. 1. Directive 2003/35/EC has been amended by 2014/52/EU. Please can you confirm that the national legislation been updated and that the key issues that are being addressed in its implementation? Directive 2014/52/EU introduced explicit requirements for competence, such that the competent authority shall have, or have access as necessary to, sufficient expertise to examine the EIA report 2. How does the authority fulfil this requirement to ensure EIAs are examined adequately?	Sweden has been criticized by the Commission for shortcomings in the implementation of Directive 2014/52. A major screening of the implementation has therefore taken place and an inquiry has submitted a number of proposals in order to fully comply with the directive. The amendments are proposed to enter into force on 1 July 2022.

Article	Ref. in National Report	Question / Comment	Answer
Article 17	E.2.4, F.6.1 (also Articles 19 and 26)	In section F.6.2.3 for the Studsvik materials testing reactors, the report indicates that structures more than one metre below the ground surface will be left in place after clearance. 1. Is such 'in situ disposal' of sub-surface structures (such as buried pipelines) expected to be used on other decommissioning sites? 2. Are such disposals subject to any on-going surveillance or other regulatory control after the site is released from nuclear regulation? 3. Is clearance from nuclear regulation applied at a site level, or can parts of a site be removed from nuclear regulation where it meets clearance criteria? 4. Do site decommissioning plans include the decommissioning of any structures which go beyond the nuclear site boundary (such as discharge pipes which go from site to an off site discharge point)? 5. Which body is the competent authority for regulating this decommissioning activity?	1. The annual dose to members of the general public from the radiological end state of remaining building structure and the site is not allowed to exceed 100 µSv. This corresponds to the dose restriction for members of the general public during the operation of the nuclear facility according to the Radiation Protection Ordinance, 2018:506, Chapter 3, Section 5. Appendix 4 to SSMFS 2018:3 specifies the clearance levels for building structures for free-use and demolishing of the building structures, respectively. SSM's regulations do not contain specified clearance levels for areas. These have to be derived by the applicant on a case-by-case basis in accordance with the dose criterion 100 µSv/a for members of the general public. SSM has to approve the clearance of building structures and areas. Similar to the approach at the Studsvik site, the licensees of nuclear power reactors plan to demolish building structures up to 3 m below today's ground level. Remaining building structures will be decontaminated and subsequently cleared for free release. Voids in the remaining building structures are planned to be filled with cleared rubble from the site. 2. Even if the site is released from regulatory control, i.e. from SSM's regulatory control concerning radiation safety, without restrictions, the responsible County Administrative Board, the regulator body concerning the Environmental Code, might decide to implement institutional control due to remaining conventional hazards. If the site is released with restrictions, the institutional control may have to be coordinated between SSM and the responsible County Administrative Board, depending on the nature of the restrictions. 3. It is possible, and planned by some licensees, to release parts of the site from regulatory control, while other parts remain nuclear site, e.g. with interim storage facilities.

Article	Ref. in National Report	Question / Comment	Answer
			4. The decommissioning of a nuclear site covers all areas, structures etc. contaminated by the activity. For instance, areas outside of the site's perimeter, where contamination cannot per se be ruled out, have to be included in the control program for clearance of the site. Decontamination or remediation measures might be necessary to reach clearance levels (fulfill the dose criterion of 100 µSv/a to members of the general public). 5. The Swedish Radiation Safety Authority (SSM) is the competent authority for radiation safety during decommissioning and authorization of radiological clearance of building structures and sites. Other aspects of decommissioning are regulated and/or supervised by other competent authorities, e.g. County Administrative Board (Environmental hazards), Fire and Rescue Service (Fire safety), Swedish Work Environment Authority (Conventional work environment), and Swedish National Debt Office (disbursement from the Waste Management Fund).

Article	Ref. in National Report	Question / Comment	Answer
Article 11	D, H (also Article 16)	Waste generated during NPP decommissioning will be stored in existing or new interim storage facilities until it can be disposed of in the planned extension to SFR and in SFL. 1. How are you ensuring that adequate storage capacity will be available should the repositories be delayed significantly (and therefore there would be more waste requiring interim storage)? 2. Where a waste acceptance criteria (WAC) for a repository is not fully developed, will waste ultimately destined for that repository have to be stored in an unconditioned state until the WAC is developed? 3. What arrangements are in place to condition wastes into a passively safe state as soon as reasonably practicable before disposal and what requirements apply to the conditioning (such as in relation to minimising the presence of free liquor and voidage)?	1. The ongoing, or for the near future planned, radiological dismantling and demolition of the six oldest NPPs and the Ågesta reactor is planned to be completed before the extension of SFR (short-lived-LLW/ILW) and the SFL (long-lived-ILW) for the disposal of radioactive waste from dismantling and demolition will be available in approximately 2030 and 2045, respectively. Hence, it is planned that all radioactive waste from decommissioning will be stored on site. The newly constructed interim storage facilities are sufficiently large, to accommodate these waste volumes. 2. According to SSMFS 2021:7, radioactive waste to be disposed of in a final repository that is not in operation, i.e. without fully developed WAC, is only allowed to be conditioned insofar further characterization or re-conditioning is possible. For example, the dismantled and segmented RPV's and internals of BWR's are stored (after vacuum-drying) in steel tanks without conditioning. However, the SSM may grant exceptions to this requirement if there are special reasons for this. 3. Certain waste types, e.g. those mentioned in answer to question 2, have to be conditioned, e.g. with concrete filling, before their transport from the sites and final disposal, in order to fulfil the WAC’s for the final disposal. The WAC’s are established by the operator of the final disposal and reviewed by SSM. The licensees have to ensure the timely technical and organisational capabilities for the conditioning. Especially for the Oskarshamn and Ringhals sites, with one respectively two more units in operation until the early/mid 2040's, that should not present any major challenge.

Article	Ref. in National Report	Question / Comment	Answer
Article 11	H	With regard to problematic waste: 1. Are any special provisions in place to manage types of waste for which there is either no current management route available or for which the existing solutions are sub-optimal? 2. How does the SKB R&D programme include any work to develop management options / treatment methods for such problematic wastes? 3. Has the amount of possibly radioactively contaminated asbestos to be removed from NPPs during decommissioning been estimated? 4. If so, how will such asbestos be managed?	1. Characterization of waste is carried out to find a suitable waste stream. 2. Work is done in collaboration between operators and SKB 3.Yes 4. Asbestos should be stored in a closed container or in double plastic bags
Article 6	Section G	Has Sweden dealt with and prepared for the potentially unexpected changes in groundwater chemistry caused by construction?	Sweden is e.g. aware of increased sulfide concentrations during construction experienced at the Olkiluoto site in Finland, and is prepared to address such issues in a forthcoming safety assessment for an operating license, if need be.

Article	Ref. in National Report	Question / Comment	Answer
General	K.1.3	Does the national strategy for the immediate decommissioning of reactors cause extreme challenges to the authority, and if so, what are they?	In 2015-2016, the licensees of the six oldest NPPs and the Ågesta reactor informed the Swedish Radiation Safety Authority (SSM) that large-scale dismantling activities were scheduled to commence approximately 2020. In 2017, SSM analysed the impact of these plans based on a quantitative model. Thereby, the personnel resources needed for the authorization processes and regulatory oversight of the decommissioning activities were estimated. New staff, especially in the fields of decommissioning and waste management, was hired and trained in the subsequent years. In that way, SSM was, for instance, well prepared to efficiently and thoroughly review and authorize the dismantling and demolition of five units within two years.

Article	Ref. in National Report	Question / Comment	Answer
General	K.1.4.	What impact do the decisions to shut down four nuclear power reactors up to and including 2020 have on the knowledge management and education programmes?	The relatively recent shut-down of the four nuclear power reactors (O1, O2, R1, R2) in Sweden has somewhat decreased the attraction of new students and personnel to the nuclear sector. The student applications to the nuclear university programs have decreased during some years, which has led to challenges for the universities to maintain the programmes. The nuclear industry has also faced challenges to recruit new personnel. However, many efforts have been undertaken from the industry, the universities and the authority in order to maintain and strengthen the knowledge management, and the public and political interest for new nuclear power in Sweden and in the world has also helped to change this trend. Moreover, the very large project of constructing the final storage for spent nuclear fuel will require a significant amount of new competence and personnel during a long period of time.

Article	Ref. in National Report	Question / Comment	Answer
Article 25	F.5.8, p. 92, 96	The report states that a new radiation monitoring system for mapping fallout would be in place by the end of 2020. Please explain the relationship of the new system to the 28 locations for national gamma monitoring and the 90 stations newly installed around nuclear power plants in 2019; these systems seem to have similar capabilities, as described in Section F.5.3.	As stated on page 92 (right column) the County Administrative Boards are responsible for radiation monitoring as part of their public protective actions during and after a nuclear emergency. This monitoring of dose rates and collection of air samples for the purpose of public protective actions are performed by local rescue services from municipalities within each county at predefined locations or routes - this using handheld instruments in discrete positions. For a more efficient way of mapping fallout for the counties, a new radiation monitoring system for fallout is introduced because of the extended planning distance (EPD) around Swedish NPPs which will be increased from 50 km to 100 km in July 2022. This new system mentioned is a replacement of the handheld instruments and the system will be based on mobile gamma spectrometry and is mainly an airborne monitoring system intended to be used along predefined routes. The 28 and 90 stations are fixed stations.

Article	Ref. in National Report	Question / Comment	Answer
Article 8	Section G	SKB has submitted a report TR-19-15 in order to answer the open issues of the copper capsule. Has SSM commissioned any independent external or international review of the SKB's study?	SSM's review of the additional material on canister corrosion mechanisms that had been submitted by SKB to the Government in April 2019 (SKB Report TR-19-15) was conducted with the support of two separate independent consultant assignments (one Swedish, one international). Their reports were taken into account by SSM in reaching the conclusions of its own technical review, which were sent to Government in September 2019.

Article	Ref. in National Report	Question / Comment	Answer
Article 16	Section H	Has the monitoring of SFR revealed any unexpected events or things regarding the durability, stability or behaviour of groundwater or rock-, concrete- or steel structures?	SKB is monitoring different parameters in the SFR repository such as chemical composition of drainage water, rock installations, concrete and steel structures. It is annually reported to the authorities and so far no significantly negative concerns have been identified from those monitoring programmes. Issues concerning drainage water dripping into the rock vaults have been mitigated with membrane installations in the roof of the rock vaults. The general lowering of the groundwater inflow due to the underground construction has been expected even though the details regarding what processes are reversible and which one are not are not fully understood. The groundwater composition generally shows a slight lowering of chlorine levels suggesting an influence from the Baltic Sea. Increased fracturing has been observed in the concrete structure for 1BMA, mainly due to shrinkage of the concrete. This has an impact of the initial state of the 1BMA concrete barrier and has been thoroughly handled by SKB in the application for an extension of SFR and been reviewed by SSM.

Article	Ref. in National Report	Question / Comment	Answer
Article 17	H, p. 138	Chapter H7.3 provides about Institutional control in Sweden, however no guideline has been adopted. We can only recommend ongoing facility monitoring before the final closure of the disposal facility, so the data can be compared after closure, i.e. the data provided before closure could serve as a baseline for later monitoring. For the monitoring and institutional control the Guideline for the VLLW and LLW can be prepared before the construction of the national repository, so the final closure is much more easy.	The Swedish delegation agrees with the comment that it is important to ensure that appropriate monitoring is conducted during facility operations prior to closure, in order to provide a suitable baseline for comparisons with any monitoring that may be undertaken after closure. The final closure of a geological repository is according to Swedish law (Act on Nuclear Activities) subject to a decision by Government and the fulfilment of any related conditions on the licensee, which will be determined closer to the time of closure. As noted in the text (H.7.3) the situation for shallow land burials differs from that for geological disposal, in so far as there is a defined responsibility on the licensee in the permit for such burial to ensure that access restrictions can be maintained over the site for a period of up to 50 years after closure. Ultimate responsibility for a geological repository after closure, including the long-term maintenance of records and any other institutional controls, rests with the State.

Article	Ref. in National Report	Question / Comment	Answer
Article 19	A.4, p. 14	The report states that in 2019 a government inquiry proposed that the Act on Nuclear Activities be repealed and replaced. Please describe the reasons for this proposal.	The inquiry's proposal has not yet been implemented in its entirety. However, one important part, and reason for the proposal, has been to codify the state's ultimate responsibility for a closed final repository. The state's ultimate responsibility was previously only expressed as being in the nature of the matter because no one else but the state can have such ultimate responsibility. However, it has been considered a great advantage to codify this legal principle, not least for the host municipality for a final repository.
Article 22	A.4, p. 14	The report states that the responsibility for reviewing cost estimates was transferred from Swedish Radiation Safety Authority (SSM) to the National Debt Office in 2018. Please explain the reasons for transferring this responsibility.	Previously, financial issues regarding cost estimates etc. was handled by three different actors; SSM, National Debt Office and the Nuclear Waste Fund. According to the Government, the financial issues could be handled more efficiently and a better overall view would be created if fewer players were involved. The National Debt Office was therefore given the tasks that SSM previously had. However, SSM shall assist with information and analyses within its area of responsibility to the National Debt Office.

Article	Ref. in National Report	Question / Comment	Answer
Article 13	H.3.1.2, p. 129	Could you write in more detail, how does the general public perceive the treatment of foreign radioactive waste? What information is provided to the general public? Was such information requested by the public or NGO in the past? Is the general public provided with information on the technical parameters of radioactive waste treatment?	The general public is involved in the licensing process. For example, when the melting facilities in Studsvik was extending its capacity and applied for a new permit an EIA was developed and a public hearing was held. The method and plans for the waste treatment was presented to the participants and most parts of the licence application was also made available for the public. This includes information about the origin of the waste (foreign as well as domestic). They were also informed about the main principle that all radioactive waste shall be returned to the country of origin. There have not been any opinion against the treatment of foreign radioactive waste as long as the remaining radioactive waste is returned to the country of origin.
General	A, p. 15	The Chapter A.5.1 Generation of spent nuclear fuel and radioactive waste stipulates that the Radioactive waste originates also from medical use, industry, research and consumer products. However, there is no information about the radioactive waste of unknown origin (i.e. captured collected scrap).	It is true that there is no information on radioactive waste found at for instance scrap metal recycling facilities in A.5.1. Our thinking has been that because A.5.1 describes facilities and activities where radioactive waste is generated, orphan sources and radioactive material/waste found at for instance metal scrap recycling facilities does not quite belong in the section. It is mentioned briefly in Section J.1.2.2 Orphan sources. However, we thank you for pointing this out, it could definitely be described in more detail in Sweden's next report.

Article	Ref. in National Report	Question / Comment	Answer
Article 28	J.1.2.2, p. 146	SSM as governmental body is financing private foreign owned Cyclife Sweden AB which could decide “not to accept to manage an orphan source, the source has to be stored by the finder pending a solution.” How to avoid conflict of commercial interest?	The financing is strictly connected to the safe and secure management (treatment, storage and disposal) of every particular orphan source. When SSM is made aware of an orphan source, the Authority asks Cyclife for a quotation for the management of the source. At this stage Cyclife looks into whether they can accept to manage the orphan source or not. If not, they abstain from giving a quotation. If Cyclife accepts to manage the orphan source, SSM pays Cyclife accordingly, for the management of the orphan source. SSM does not pay Cyclife any money for orphan sources that Cyclife does not manage.

Article	Ref. in National Report	Question / Comment	Answer
General	a.2.4, p. 14	"During the years 2016 through 2018, SSM was allocated SEK 11 million to conduct a campaign relating to the treatment and storage of radiation sources from disused smoke detectors for industrial use that have been incorrectly delivered to recycling centres. In total, more than a hundred thousand sources were taken care of by SSM's contracted waste treatment company, Cyclife. SSM's funding for enabling control and safe management of orphan sources and certain legacy waste from non-nuclear activities continues from 2019 with an annual budget of SEK 3.0 million." Could you be more specific? 11 million extra to normal budget of 3 million or total 11 million during three year campaign meaning only two million plus. How many orphan sources except smoke detectors have been collected and what was the total activity?	SSM received in total SEK 11 million during 2016-2018 for the management of radiation sources from disused smoke detectors (for industrial use). In addition, SSM received SEK 3 million each of those three years for the management of orphan sources other than those from disused smoke detectors. The sources are registered but because of the variation in radionuclides and activities and physical form of sources, SSM does not compile number of sources and activities per year. So far no orphan sources equivalent to high-activity sealed sources have been found though.

Article	Ref. in National Report	Question / Comment	Answer
Article 27	I.1.3, p. 142	Has Sweden got any experience with situation, when public/green organisations were against to transboundary movement of radioactive waste for treatment on a commercial basis (import radioactive waste for incineration or melting)? How did you deal with it? Is there any implementation of a policy of transparency comprising the exchange of information and communication (particularly with the general public and civil society) in case of transboundary movement (import of radioactive waste for treatment) in Sweden?	The Swedish Radiation Safety Authority (SSM) has not experienced any situation, when public/green organisations were against to transboundary movement of radioactive waste for treatment on a commercial basis (import radioactive waste for incineration or melting). The right to access public information and official documents is a fundamental principle in Sweden. The public and mass media are entitled to transparency regarding public sector activities and to read the documents held by public authorities. These rights are regulated by the Public Access to Information and Secrecy Act (SFS 2009:400) and the Freedom of the Press Act (SFS 1949:105). The authorities can provide official documents at request, however there are some restrictions. Not all documents are considered official and if the documents are classified as secret, the content is limited before disclosure.
Article 26	F.6, p. 97	What types of methods for treatment of radioactive liquid concentrates are currently used?	Different methods are used such as evaporation to minimize the volume with following steps for final conditioning in a bitumen or concrete matrice.

Article	Ref. in National Report	Question / Comment	Answer
Article 25.2	F.5.2, p. 91	A national contingency plan, national action plan and Nordic manual (NORMAN) were mentioned as main documents to be used in response to potential nuclear emergency. Are these documents also used for harmonized approach on protective actions across national borders of Nordic states co-operation?	No, these documents are not used for harmonized approach on protective actions across borders. NORMAN is mainly focused on alerting the neighbouring countries and the forms of communication and information exchange. The Nordic Flagbook, published in 2014, is used for a harmonized approach on protective actions and is based on Finnish VAL-guides and implements ICRP 103 (2007). The Nordic Flagbook is supposed to provide a common Nordic starting point for application of public protective actions and protection of emergency workers in the early and intermediate phases of nuclear or radiological accidents. A revision of the Nordic Flagbook is now under revision in order to encompass changes on different levels such as EU BSS (2013), GSR Part 7 (2015), GSG-11 (2018), new national legislations (-2018) and the Swedish review of emergency planning zones and distances (2017).

Article	Ref. in National Report	Question / Comment	Answer
General	A - 8.2.1, p. 25	During the long-term operation of central interim storage facility for spent fuel (Clab), were there any issues identified (which were not considered in the project) Any lessons learned from operation, or issues registered (e.g. ageing issues)?	The facility has as of 2022 not yet entered long-term operation (defined as operation beyond the 40 years) but ageing management has been ongoing since several years. An Ageing management program focused on preventive maintenance as well as component exchange programmes is in place since several years and there has also been several larger projects for modernizing equipment as well as the safety analysis. In the upcoming project for constructing an encapsulation plant next to Clab as well as in a project adapting Clab to a new transport cask for spent fuel there will be further activities to modernize existing equipment to make them last for 80+ years. Apart from minor component ageing there has not been any major events/issues registered directly to ageing of the facility.