

Joint Convention
 Questions Posted To Finland in 2018

Q.No *	Country	Article	Ref. in National Report
	China	Planned Activities	K, P92, P97

Question/ It is mentioned that the Finnish public has a good level of trust towards the safety of nuclear waste disposal in the country. However, the latest results of polls evaluating public opinion show an indication of a slight decrease in trust towards disposal safety. What are the main reasons for the decrease in trust towards disposal safety? What are the detailed measures to be conducted on the changing of communication environment and the use of modern communication tools?

Answer In Finland, a decision on the disposal of spent nuclear fuel was made at the turn of the millennium. At that time STUK and in particular, nuclear waste company Posiva were very active in their communications. It was important because the decision in principle is a political decision and people have to have a proper understanding of the matter voted politician's decide upon. After the decision in principle was ratified by the parliament, the disposal project has been mainly technical development and the communication has not been very active. Now when Finland is approaching the start-up of the disposal, STUK sees that Finns must be given an opportunity to understand what disposal is about and provide them with the opportunity to properly understand the risks involved in the project.

Doing this we have to understand the new audiences we are discussing with and what are the tools we have to use. We also have to understand that because of the development of public communications climate the audiences are for example more fragmented they used to be.

Q.No *	Country	Article	Ref. in National Report
	France	Planned Activities	Section K - pages 91-97

Question/ No information is provided in Section K about:

Comment - measures taken by Finland to voluntarily make public the reports on their international peer review missions
 - the actions taken by Finland to enhance openness and transparency in the implementation of the obligations under the Convention.
 According to the Information Circular INFCIRC/604/Rev.3 Draft 3, the Section K should include:
 - "the measures taken by the Contracting Party to voluntarily make public the reports on their international peer review missions"
 - "information on the actions taken by Finland to enhance openness and transparency in the implementation of the obligations under the Convention".

Answer This will be taken into account in the next report. Previous IRRS to Finland was done in 2012 and follow-up 2015. Reports from both missions are available for public on STUK website. Also Joint Convention reports are available on STUK website and from the previous JC review meeting also the questions and answers posted to Finland are available for public.

Q.No *	Country	Article	Ref. in National Report
	France	Planned Activities	Section K - pages 91-97

Question/ In Section K of the Finish Report, part "Development of national competences for future needs", it is mentioned that "the two main ongoing R&D programs in Finland concerning

nuclear waste and spent nuclear fuel management and disposal are:

- The joint R&D-programme between TVO and Fortum (compiled by Posiva); the programme is mainly aimed at planning and implementing a spent fuel disposal project but also includes an R&D-programme for LILW management;
- The national research programme (KYT-2018) for 2015–2018, administered by MEAE; the programme aims at supporting the creation and maintenance of overall competence and the basic skills needed regarding the management and disposal of nuclear waste (mainly spent fuel).

[...] However, due to budget cuts, STUK has partly terminated and significantly reduced its radiation safety research (e.g. research into the biological effects of radiation, or biodosimetry). Since radiation safety research activities contributed to the maintenance and development of expertise in Finland, STUK has established a national radiation safety research programme in co-operation with all universities in Finland to ensure that radiation safety research will be continued in Finland.”

Could Finland explain the process in place to verify that the national radiation safety research programme in co-operation between STUK and all universities in Finland serves effectively STUK to reach its main focus in support to the regulatory decision making of STUK (consultancy work for the review of Posiva’s CL application, developing STUK’s YVL Guides...), as it was previously the case when STUK managed its own R&D programme?

Answer The first mentioned R&D programmes (Posiva, KYT) are focused on nuclear safety and especially on nuclear waste management. These are financed directly by the licensees with waste management obligation or through separate waste management fund. STUK has also possibility to execute reserch project related to regulatory oversight if seen necessary. These will be financed through invoicing from licensees as part of normal STUK oversight invoicing routine. Budget cut to radiation safety research affect more on research focusing on other fields of use of radiation. They don't directly influence STUK oversight on radioactive waste management, but there is a risk that on longer time perspective the general radioation safety expertise would decrease and that would have effect on STUK regulatory work and possibilities for effectively fulfil our mission.

Q.No	Country	Article	Ref. in National Report
*	France	Planned Activities	Section K - pages 91-97

Question/ Comment In Section K (part: Communication to improve the general public's understanding of disposal safety) of Finland N.R., it is mentioned:

“The Finnish public has a high degree of trust in the radiation and nuclear safety regulator, STUK, and good level of trust towards the safety of nuclear waste disposal in the country. However, the interest of the general public towards disposal related information seems to be decreasing. Additionally, the latest results of polls (conducted by e.g. Finnish Energy in 2016) evaluating public opinion show an indication of a slight decrease in trust towards disposal safety. The development of this trend needs to be followed in the up-coming polls. The regulatory work and decisions made by the regulator need to be clear and understandable to the public. The general public should also have the correct understanding of disposal safety and the related risks. Due to these challenges, STUK initiated a strategic communication development project in spring 2016 to address both the changing communication environment and the use of modern communication tools”.

Could Finland provide information about the above mentioned strategic communication development project initiated by STUK in 2016, in particular regarding the measures taken to maintain/restore public confidence and acceptance?

Answer The leading idea in communication is to provide people up-to-date information. In addition to communicating current events STUK for example publishes a report to the public three times a year about the phases of the disposal project from STUK's point of view. All communications material is published on STUK's website and made available in the STUK's social media channels.

Steps have still been short and in the future STUK needs to concentrate in communicating the risks associated with the disposal and to help people to understand the risks properly.

In STUK's strategy for years 2018–2022 the challenge is formulated like this: “We provide people with correct and easy-to-understand radiation safety information to enable them to understand, even when subjected to information overload and disinformation, what is hazardous and what is not and consequently act correctly without unnecessary fear.”

Q.No *	Country	Article	Ref. in National Report
	Hungary	Planned Activities	Section L, L.4

Question/ Comment According to the 6th Finnish National Report the value of VLLW is 9,7 cubic meter. Is that an average annual value containing the VLLW produced in the period of operation and decommissioning as well? If it is not, according to your calculations how much would be the amount of VLLW in the decommissioning phase?

Answer The waste amount presented in Table L4-1 does not contain wastes from decommissioning. It is only estimate on waste amounts during operation of NPP. The rough estimated for the decommissioning waste amount is 17 000 m³, but more detailed categorization is not done.

Q.No *	Country	Article	Ref. in National Report
	Korea, Republic of	Planned Activities	K. p.93

Question/ Comment Section K mentions that there is no operating facility for HASS disposal. What radiological characteristics of HASS make it inappropriate for HASS disposal to the existing LILW disposal facility?

Answer HASS can't be disposed of to the existing LILW disposal facilities due to the inventory restrictions of the facilities.

Q.No *	Country	Article	Ref. in National Report
	Switzerland	Planned Activities	K, 95

Question/ Comment Due to budget cuts by the Government, STUK has partly terminated and significantly reduced its radiation safety research (e.g. research into the biological effects of radiation, or biodosimetry). Since radiation safety research activities contributed to the maintenance and development of expertise in Finland, STUK has established a national radiation safety research programme in co-operation with all universities in Finland to ensure that radiation safety research will be continued in Finland.

Question: Does the establishment of this programme include enhanced funding of radiation safety research in total, compensating for the cuts of the Government? If yes, where does the additional money come from?

Answer The establishment and start-up of the radiation safety research programme is on-going. One aim of co-operation is to establish better possibilities to get funding from government financing mechanisms and from other (e.g. EU) research platforms. Currently STUK has also possibilities to finance some radiation research by itself.

Q.No	Country	Article	Ref. in National Report
------	---------	---------	-------------------------

*	Canada	General	Section K; page 91
---	--------	---------	--------------------

Question/ Comment Section K discusses STUK's efforts to improve the general public's understanding. What are STUK's requirements for public information by the licensees?

Answer STUK's duty is not to put requirements for public information by the licensees. STUK can influence the public communication of licensees by doing its own communication in open and transparent way and by doing so challenging the licensees communication to follow the example.

(The requirements for public information by the licensees come from legislation and consider actually the licensing process of new facilities and communication during emergencies.)

Q.No	Country	Article	Ref. in National Report
*	Hungary	General	Section A Introduction

Question/ Comment According to the report, Olkiluoto encapsulation plant and disposal facility cover spent fuel from five reactor units. Could you provide information about the possibilities on the extension of the facility taking into account the HLW generated on the Hanhikivi-1 site or are you going to plan to construct another deep geological repository for this unit?

Answer Fennovoima started an environmental impact assessment process for a spent fuel disposal facility in June 2016. The goal of this process is to support decision in principle and site selection for the disposal facility of its own. Parallel to this EIA process Fennovoima is also aiming for negotiations with other NPP operators. It is possible that the spent nuclear fuel from future NPP at Hanhikivi would be disposed of in the same disposal facility but this would require an agreement between TVO, Fortum and Fennovoima. In addition to the agreement a licensing process for Hanhikivi-1 spent fuel disposal would be required including municipality's acceptance in the decision in principle stage.

Q.No	Country	Article	Ref. in National Report
*	Japan	General	8

Question/ Comment Can you share your experience in public acceptance, in particular an activity you feel effective to obtain public trust.

Answer This is a broad question, but we have seen one important element being active involvement and participation by the regulator. Naturally in general transparency, open and active communication and explaining the need and safety aspects of waste management are important elements.

Q.No	Country	Article	Ref. in National Report
*	Luxembourg	General	n/A

Question/ Comment Are there plans to arrange for self-assessments of the national framework and the competent regulatory authority? Are there plans for international peer review of the national framework?

Answer Finland has planned to have ARTEMIS peer review combined with full-scope IRRS in 2022. This would fulfil the requirements from EU directives. Self-assessments will be conducted as preparatory work for the peer reviews.

Q.No	Country	Article	Ref. in National Report
*	Slovakia	General	L3 / p. 103

Question/ Comment What is the next decision making step for Posiva for which the results of the mentioned optimization programme are expected?

Answer Posiva has shared the disposal project in phases. Ongoing phase is the Concept and cost optimisation -phase. During this phase Posiva estimates and investigates in detail the

disposal process aiming to more effective process and still conforming the safety requirements. Posiva uses the results of this phase when deciding to proceed to the next phase which is the Construction phase (see figure L3-2, page 105).

Q.No *	Country	Article	Ref. in National Report
	Slovakia	General	General

Question/ Comment Are there any legal provisions for the treatment of foreign radioactive waste (particularly in case of incineration of RAW)? If any, more detailed information on these provisions would be welcome (e. g. limits and conditions for effluents, the methodology of declaring the activity and nuclide composition of the imported and re-exported RAW, chemical composition of RAW and of the final product, etc.).

Answer Nuclear energy act sets the following requirement: Nuclear waste generated in connection with or as a result of the use of nuclear energy elsewhere than in Finland, shall not be handled, stored or permanently disposed of in Finland.

Finland applies the Council Directive 2006/117/Euratom on the supervision and control of shipments of radioactive waste and spent fuel. For radioactive waste that is not generated in use of nuclear energy, Radiation Act states that radioactive waste or material containing radioactive waste may be imported to, exported from or carried in transit through the territory of Finland only with the prior authorization of STUK for each consignment.

We have no experience in treatment of foreign radioactive waste, and there are no specific requirements for this. Any specific license conditions for this would be given on a case by case basis, if the practice would be approved. In any case, the resulting waste would be returned.

Q.No *	Country	Article	Ref. in National Report
	Belgium	Article 5	page 60

Question/ Comment The spent fuel storages undergo periodic safety reviews on a regular base. As the spent fuel storages will stay in operation for several decades, is it a design lifetime foreseen for the spent fuel storages? Is there a special program foreseen for ageing of the spent fuel and the spent fuel storage?

Answer For a spent nuclear fuel storage facility shall have a STUK-approved monitoring programme in place for tracking the changes in the properties and storage conditions of nuclear fuel assemblies. The programme is defining the extent and frequency of the periodic inspections of nuclear fuel and its storage conditions, as well as the inspection methods and equipment to be used. In addition the spent nuclear fuel storage and handling systems and the related equipment must shall a periodic testing programme in place for ensuring the reliable operation and condition of structures, systems, and components related to safety. The monitoring programmes are submitted to STUK for approval in connection with the application for an operating licence. Any updates to the monitoring programmes shall be submitted to STUK for approval. More detailed requirements are presented in the guides YVL D.3 and YVL A.6.

Q.No *	Country	Article	Ref. in National Report
	Croatia	Article 6.1.4	F, 62

Question/ Comment Does the regulation prescribe how can host municipality formally confirm that it is in favour of siting of the nuclear facility?

Answer According to the Nuclear Energy Act, Ministry of Economic Affairs and Employment as a contact authority must obtain a statement from the municipal council of municipality

intended to be the site of the facility.

Q.No *	Country China	Article Article 7	Ref. in National Report H, P72
-----------	------------------	----------------------	-----------------------------------

Question/ Comment As stated in P72, “the final disposal of non-nuclear radioactive waste in the Olkiluoto LILW disposal facility has started in 2016”. What are the waste acceptance criteria for non-nuclear radioactive waste, especially for disused sealed radioactive sources of Olkiluoto disposal facility?

Answer The waste types of the non-nuclear waste to be disposed of are described in the FSAR. For each waste type there is description of the required handling and packaging methods and maximum allowed surface dose rates and activity inventories of the packages. There are no specific WAC for the disused sealed sources because they are set into the waste packages. The WAC for the packages are described in FSAR as presented above.

Q.No *	Country Korea, Republic of	Article Article 7	Ref. in National Report L.2, p.102
-----------	-------------------------------	----------------------	---------------------------------------

Question/ Comment It is stated. section L.2, that Posiva has not fully demonstrated the feasibility of the emplacement of disposal components according to the latest design, based on the review of construction licence, including Posiva's capability of excavation, and manufacture and installation of EB components.

What is Posiva's plan responding to the result of the review of STUK?

Answer Posiva has established a number of development project aiming to produce information to response to the STUKs requirements. The most important projects in demonstrating the feasibility are FISST (Full Scale insity systems test) and the cold test which is part of the operation license application.

Q.No *	Country Korea, Republic of	Article Article 7	Ref. in National Report G, p64
-----------	-------------------------------	----------------------	-----------------------------------

Question/ Comment At section G, it is described that protection against a large airplane crash was included in the design of the extension of Olkiluoto SNF storage facility.

Could you explain how the detailed senario, such as collision speed and the mass of the plane, is assumed?

Answer Unfortunately such detailed design criteria of a large airplane crash as the detailed scenario, the collision speed and the assumed mass of the plane are classified information and cannot be shared. In general a large airplane crash has to be analyzed as a design extension condition (DEC). As for all accident conditions, the scenario has to be formulated and analysed and proven that the possible radioactive doses for an individual remain under the radiation dose limit that is set for the accident category. Also, it has to be proven that the most important safety functions can be activated and maintained with sufficient assurance. The mechanical impact, impact on structures and components of crash-induced vibrations and aviation-fuel induced fires have to be analyzed.

Q.No *	Country Luxembourg	Article Article 7	Ref. in National Report G.7, p. 63
-----------	-----------------------	----------------------	---------------------------------------

Question/ Comment According to the national report, the Nuclear Energy Act requires taking into account provisions for decommissioning when applying for a NPP construction license. How concrete do these provisions need to be? As I understand from the report, siting is not required at this stage?

Answer The site for the nuclear facility is approved already in the Decision in principle, so in the licensing phase before the construction license will be applied. In the construction license phase licensee has to provide the detailed design of the plant including provisions made

for the decommissioning. In CLA phase they also have to provide preliminary decommissioning plan for approval. It should contain the information on decommissioning strategy to be followed and also description on decommissioning phases. The licensee has to show by documentations that there is methods available to dismantle the nuclear facility and also so that the minimization of radioactive waste is considered already in design.

Q.No *	Country United Kingdom	Article Article 7	Ref. in National Report p.63
-----------	---------------------------	----------------------	---------------------------------

Question/ Comment The design requirements in STUK regulation Y/1/2016 require the use of high quality, carefully examined and well-tested technologies that are proven by experience. The report does not explain how novel technologies can be implemented in the nuclear industry. Please describe the methods by which licensees would be able to make a case to use novel technologies in nuclear applications.

To note, this also relates to Article 14.

Answer The solutions and methods chosen during the course of the design shall be based on proven technology and operating experience, and they shall be in compliance with the applicable standards. The design shall strive for simplicity. If new solutions are proposed, they shall be validated through tests and experiments. The design of systems performing safety functions shall be justified by means of deterministic safety analyses. These analyses shall ensure that safety functions can be performed by the designed systems and that the safety targets established for the plant are met.

Q.No *	Country Korea, Republic of	Article Article 8	Ref. in National Report G.7, p.64
-----------	-------------------------------	----------------------	--------------------------------------

Question/ Comment It is said that protection against a large airplane crash has been included in the design of the extension of Olkiluoto spent fuel storage facility.

What are the main review items and the requirements for an accident evaluation of aircraft crash in licensing?

Answer A large airplane crash has to be analyzed as a design extension condition (DEC). As for all accident conditions, the scenario has to be formulated and analysed and proven that the possible radioactive doses for an individual remain under the radiation dose limit that is set for the accident category. Also, it has to be proven that the most important safety functions can be activated and maintained with sufficient assurance. The mechanical impact, impact on structures and components of crash-induced vibrations and aviation-fuel induced fires have to be analyzed.

Q.No *	Country United Kingdom	Article Article 8	Ref. in National Report p.65
-----------	---------------------------	----------------------	---------------------------------

Question/ Comment Safety assessments are reviewed by STUK with support of independent safety analyses and/or by external experts. Please describe what proportion of safety assessments are undertaken by STUK personnel vs. external/independent experts, and how those undertaken by external experts are validated and used by STUK.

To note, this also relates to Article 15.

Answer The amount of external expertise used is decided case by case but most of the work is done internally. In Posiva's construction license application review, less than 30% of the review work was done by external experts. This is more than usually and it is related to the strategic decision that STUK does not build up of its own competence in every discipline of the disposal but uses external expertise to support STUK.

Work done by the external experts is used as supporting material for STUK decision making. External experts work is always reviewed by STUK expert before used to support STUK's decision making.

Q.No *	Country United Kingdom	Article Article 8	Ref. in National Report p.66
-----------	---------------------------	----------------------	---------------------------------

Question/ Comment Page 66 of the report states that 'TVO and Posiva use external expertise regularly when needed in various design and modification activities'. The report also describes how measures (training, development) were taken to widen the pool of nuclear talent in Finland. Is the pool of nuclear talent now considered large enough to avoid any conflicts of interest between TVO, Posiva and STUK in the use of independent advice? Please describe how any conflicts of interest between licensee organisations and STUK are resolved when considering the pool of external experts?

To note, this also relates to Article 9, 15 & 16.

Answer Pool of expertise is adequate at the moment but the marginal is not big. For this reason, constant training and development is needed to keep the pool of expertise adequate. Before use of external expert in review work as part of procurement procedure of STUK expert has to describe the working history. Work done for the operator whose documentation would be reviewed is an exclusionary criteria if the work is done recently.

Q.No *	Country United Kingdom	Article Article 8	Ref. in National Report p.76
-----------	---------------------------	----------------------	---------------------------------

Question/ Comment Several references (e.g. pages 71, 81, 82 & 109) are made to periodic reviews being conducted at 15-year intervals. Please justify how the 15-year interval satisfies the requirements of the [10-year] interval in the EU Nuclear Safety Directive and the IAEA guidance on PSRs.

To note, this also relates to Article 15.

Answer The periodic safety review follows in principle the same methodology what is required for all nuclear facilities. PSR period for other nuclear facilities is 10 years, but for disposal facilities 15 years was seen better argued since the operational activity is not that high, the technology is robust and no major changes are foreseen to take place fast. Regarding EU safety directive, it is not valid for nuclear waste facilities.

Q.No *	Country United Kingdom	Article Article 9	Ref. in National Report p.59
-----------	---------------------------	----------------------	---------------------------------

Question/ Comment At Olkiluoto NPP, hermetically sealed capsules are used to store leaking fuel assemblies in spent fuel pools, whereas at Loviisa NPP capsules are not used. Please explain why capsules are not used at Loviisa and why the non-use of capsules meets the safety requirement of the Nuclear Energy Act (section 7a) of 'as high as reasonably achievable'.

Answer The licensee of Loviisa NPP has made the decision that the leaking spent fuel assemblies are stored normally in the spent fuel pools if there is no harm for nuclear and radiation safety. In Loviisa NPP, there hasn't been any significant leakage of spent fuel and the water conditions of the pools have been measured continuously. The measurements have shown that the radioactivity in the pools and in the air hasn't been increasing from the leaking fuel assemblies. If needed, there is possibility to put a fuel assembly to a hermetic capsule at the spent fuel storage.

Q.No *	Country Belgium	Article Article 11	Ref. in National Report page 69
-----------	--------------------	-----------------------	------------------------------------

Question/ Regarding criticality safety, it is written that "In the post-closure criticality safety

Comment analyses the criticality of the disposal canister must be ruled out with very high certainty over the long term."

Has Finland studied nonetheless the impact of a criticality event on the safety functions of the disposal ?

Answer In connection with the construction licence application for the Olkiluoto spent nuclear fuel encapsulation plant and disposal facility, Posiva Oy (Posiva) submitted to the Radiation and Nuclear Safety Authority (STUK) for approval the safety case concerning the post-closure safety of disposal. Based on STUK's review of the safety case documentation, the design of the disposal canister takes into account the requirements for the criticality safety of spent nuclear fuel. The post-closure criticality safety of the disposed fuel has been demonstrated through conservative criticality analyses in a manner sufficient for the purposes of the construction licence. Posiva's criticality safety analyses cannot entirely rule out the criticality of a disposal canister on a long time span. In this respect, the analyses use highly conservative assumptions on the development of the disposal canister geometry in the long term. Therefore, recriticality of disposed fuel seems to be very unlikely. STUK has required that Posiva must continue the examination of the long-term development of the disposal canister geometry and examine the consequences of criticality before submitting an operating licence application.

Q.No *	Country Belgium	Article Article 11	Ref. in National Report page 73
-----------	--------------------	-----------------------	------------------------------------

Question/ Comment It is written "The total discharges from Finnish NPPs have been very low and the total annual calculated radiation doses of the most exposed individuals in the vicinity of both NPPs was less than 0,1% of the limit of the 100 micro Sievert that is established in the Nuclear Energy Decrees". It means 0,1 µSv which is insignificant. Could Finland please specify the calculated doses and the measured ones ?

Answer The calculated annual effective doses of the most exposed individual (representative person) in the vicinity of Loviisa NPP are 0.07, 0.07 and 0.05 microSv due to radioactive discharges of 2014, 2015 and 2016, respectively, and those in the vicinity of Olkiluoto NPP 0.05, 0.06 and 0.28 microSv, respectively. The last abnormal value is not less than 0.1 microSv and is due to a leak in the off-gas system and fuel leaks in the reactor of Olkiluoto 1. The measured annual doses due to external radiation (consisting essentially only of natural background radiation) in the vicinities of Loviisa and Olkiluoto NPPs have been some 2 mSv and 1 mSv, respectively, in recent years. In whole body measurements of inhabitants in the surroundings of Loviisa and Olkiluoto NPPs no radionuclides due to discharges of them have been detected.

Q.No *	Country Bulgaria	Article Article 11	Ref. in National Report H, 69
-----------	---------------------	-----------------------	----------------------------------

Question/ Comment The spent nuclear fuel transported to the encapsulation plant from the spent fuel interim storages will have been cooled in storage pools for a minimum of 20 years.

Did Povisa consider the possibility of encapsulation of spent nuclear fuel after long term dry storage?

Answer At the moment owners of Posiva are using only pool storage for spent nuclear fuel interim storage and the effects of long term dry storage have not been considered.

Q.No *	Country China	Article Article 11	Ref. in National Report H, P71
-----------	------------------	-----------------------	-----------------------------------

Question/ Comment As stated in page 71, "At the new NPP unit Olkiluoto 3 an in-drum drying facility is planned to be used for the conditioning of liquid wastes." What are the special packaging requirements of the in-drum drying products? What kind of further treatment and

conditioning is required before the final disposal of the drying products?

Answer The special designed drums will be used in OL3 in-drum drying system. The total activity in OL3 in-drum dried waste is not defined to be more than existing, already disposed, bituminized waste drums from OL1 and OL2. For this reason, it is possible to use existing Olkiluoto facilities for temporary storing OL3 dried drums. The disposal instead will be in place at the future expansion of low and intermediate level repository, not until the beginning of the early 2030s. Before the implementation of disposal, the suitability and possible further requirements will be assessed.

Q.No	Country	Article	Ref. in National Report
*	Japan	Article 11	71

Question/ Does the Finnish regulation require any design consideration to facilitate decommissioning and/or to minimize radioactive waste generation for research reactor? Comment If not, we guess the reason would be the small amount of waste. Is that right?

Answer In general Finnish legislation requires minimization of the production of radioactive wastes and this principle has to be followed during the whole lifecycle of nuclear facilities including research reactor.

Q.No	Country	Article	Ref. in National Report
*	Switzerland	Article 11	69

Question/ The report explains that "the residual heat of the spent fuel is also considered in the design of disposal canister and surrounding bentonite buffer in the disposal facility. The temperature of the canister-bentonite clay interface has been analysed and an appropriate safety margin has been used in the disposal facility dimensioning calculations. The maximum temperature of the disposal canister surface should be reached within 10 to 15 years after the disposal." What will be the maximum temperature of the canister-bentonite clay interface reached according to the calculations? Comment

Answer The design requirement of the maximum temperature is defined to be 100 degrees of Celsius. According to the analyses the maximum temperature will be 95 degrees of Celsius.

Q.No	Country	Article	Ref. in National Report
*	Belgium	Article 12	page 76

Question/ It is written "A periodic safety review of the LILW disposal facilities is made at 15 year interval". Comment

Could Finland please elaborate on the reasoning which lead to this frequency?

Answer The periodic safety review follows in principle the same methodology what is required for all nuclear facilities. PSR period for other nuclear facilities is 10 years, but for disposal facilities 15 years was seen better argued since the operational activity is not that high, the technology is robust and no major changes are foreseen to take place fast.

Q.No	Country	Article	Ref. in National Report
*	Belgium	Article 12	page 78

Question/ Article b) of siting requirements is about "the evaluation of the facility on individuals, society and the environment" which is also a requirement of the Environmental Impact Assessment (EIA). It seems there is an overlapping between siting studies and EIA studies. Comment

Could Finland please comment on that.

Answer EIA is part of the licensing process of a nuclear facility in Finnish licensing system. The finalised EIA report has to be an appendix in the decision in principle application. The

EIA process covers wide range of site studies (e.g. zoning, land scape, fauna, flora, climate, traffic, noise, bedrock, ground water, ...). The ones related to radiation and nuclear safety are covered in the EIA only on general level and the more detailed studies are reported in the decision in principle stage. Both siting and EIA studies are done or coordinated by the license applicant so the studies are not duplicated, just the reporting on EIA and siting studies have some overlapping.

Q.No *	Country Germany	Article Article 12	Ref. in National Report p. 75, Section H
-----------	--------------------	-----------------------	---

Question/ The Site of Sotkamo is mentioned twice in the National Report:

Comment In connection with a nickel and zinc mine in Sotkamo, Finland reports on a planned environmental remediation of nearby lakes contaminated with uranium bearing waste gypsum. Uranium is said to be a by-product of the metal production process, which is not recovered but precipitated in the gypsum ponds.
The Site of Sotkamo is also indicated in Fig. 1 (p. 16) as “planned uranium extraction”, but the extraction project is not described further in the report.
Could Finland please give some more information about these issues and their possible relationship?

Answer Terrafame Ltd operates a multimetal mine in Sotkamo. They use a biological sulfuric acid extraction process which dissolves uranium from the ore. Uranium content of the ore is low. Gypsum pond leakage that contaminated small nearby lakes happened on the site in 2012 and 2013 when it was operated by a previous company. For information about environmental remediation, see #18061.

Terrafame Ltd applied for a licence in November 2017 to begin uranium production by recovering from its process solution the uranium that is already leached from the ore by the leaching process. If the licence is granted and uranium recovery is started, the gypsum ponds on the site would no longer receive uranium. The estimated production would be at most 250 tU/a.

Q.No *	Country Luxembourg	Article Article 12	Ref. in National Report H, p. 77
-----------	-----------------------	-----------------------	-------------------------------------

Question/ The national report states that accidentally Am-241 sources are melt in a steel industry, on average once a year. Does Am-241 only go into the slags or what is the experience on tracing Am-241 in the end products as well? What is the maximum activity or activity concentration that is allowed to be dumped by the manufacturer?

Answer Due to the high melting temperature of Am-241 (1176 C), it ends up only in the slag. We have no experience of Americium in the end product. Based on Regulatory Guide ST 1.5 Exemption of radiation use from safety licensing, STUK’s approval must be sought for the reuse, recycling and disposal of radioactive materials originating from practices subject to the safety license or notification obligation. If the activity concentration is less than the clearance level of Am-241, 0,1 Bq/g, the slag is not subject to regulatory requirements. In practice, the concentration is higher. In this case, STUK approves the placement of the slag in a special industrial landfill on a case by case basis without a predefined concentration limit. The general limit for clearance, 10 µSv/year for the representative person is applied and the applicant has to demonstrate this.

Q.No *	Country United Kingdom	Article Article 12	Ref. in National Report p.77
-----------	---------------------------	-----------------------	---------------------------------

Question/ Environmental remediation of gypsum lakes which have leaked <1000kg of natural uranium is being planned. Please describe the remediation measures expected to be

employed and how STUK is intending to regulate this area.

Answer The Gypsum pond which leaked in 2012 and 2013 is not being remediated. The section of the gypsum pond which was leaking has not been used since the accidents. The five other sections are in active use, and gypsum waste is being added until the capacity is full. Once full, the whole gypsum pond will be closed and covered, including the damaged section. The detailed plans for the closure of the gypsum pond will need approval from STUK.

The environmental authorities made a decision earlier that small contaminated lakes should be remediated. This decision was based on sulphate, heavy metals and lack of oxygen, not just uranium. The remediation work has been delayed (with the acceptance of the environmental authorities), and it now seems likely that the most contaminated lake will cease to exist due to the expansion of the mining operation. If the operator plans to start the remediation work in any case before the expansion, they need to inform STUK and get approval for their plans for the disposal of water treatment sludges. The initial plan from the operator was to pump contaminated water out of the lakes for treatment and replace it with clean water. It was still undecided what was to be done with the heavy metal bearing small deposits at the bottom of the lakes – whether to remove them or cover them.

STUK is monitoring the uranium concentration in the waters inside and outside the mining area, to make sure we have independent knowledge of the status of uranium mobility in and around the mine site. The gypsum waste and other water treatment wastes are also sometimes sampled during the inspections.

Q.No *	Country United States of America	Article Article 12	Ref. in National Report Section Summary pg. 7
-----------	-------------------------------------	-----------------------	--

Question/ Comment The report notes that the national radioactive waste management plan and licensing system needs to be evaluated and improved to ensure a national system with capabilities for all possible waste streams based on three recent challenges. Please provide a status on the activities of the expert group formed to address these challenges, as well as the recommendations made by the Finnish Safety Investigation Authority about the sealed source incident. Please also provide an update at the 2018 Review Meeting with respect to activities of the expert group.

Answer The expert group established has been addressing obstacles in legislation and license conditions that are limiting some possibilities for effective radioactive waste management in existing waste management facilities. The aim is to establish framework that enhances the possibilities for radioactive waste management from non-nuclear field. The main waste management streams are well established, but there are needs to enhance co-operation and clear some administrative burdens. Finland will provide further information of this subject and recommendations by Finnish Safety Investigation Authority in the review meeting national presentation.

Q.No *	Country Canada	Article Article 13	Ref. in National Report page 79
-----------	-------------------	-----------------------	------------------------------------

Question/ Comment What are the main concerns, if any, about the possibility of VTT storing and disposing of their decommissioning waste from the research reactor in Olkiluoto?
Has there been any public reaction or public consultations about this approach?
Is there a timeline for such agreements to be signed?

Answer There are no concerns related to the technical capabilities of Olkiluoto NPP to take care of the decommissioning wastes of research reactor, but the current licence of Olkiluoto

NPP does not allow them to take the wastes into Olkiluoto. The public hearing about this approach was conducted during EIA process. There were not any major concerns raised up by local people. Authorities have not set any time limits for the agreements.

Q.No *	Country	Article	Ref. in National Report
	Germany	Article 13	p. 78, Section H and Annex L.4

Question/ Comment It is reported that in June 2016 Fennovoima submitted an Environmental Impact Assessment Programme for a spent fuel disposal facility dedicated to its NPP project Hanhikivi.

Is it correct to understand this as the beginning of a new siting process for a second spent fuel repository in Finland? Which sites have been proposed and compared so far in this context, and how has the siting procedure been performed to support the current choice, which is co-disposal at Eurajoki or new-built near the NPP- site at Pyhäjoki?

Answer Fennovoima started an environmental impact assessment process for a spent fuel disposal facility in June 2016. The goal of this process is to support decision in principle and site selection for the disposal facility of its own. The EIA program present two possible sites, Sydänneva in Pyhäjoki and Eurajoki municipality. More detailed area for the investigations in Eurajoki will be decided later. It is also mentioned in the EIA report that new sites might be added later. Based on the time schedule of the project given in the EIA program, preliminary site studies will be done during next 10-15 years

Q.No *	Country	Article	Ref. in National Report
	Russian Federation	Article 13	H p. 78

Question/ Comment The Russian Federation recognizes the great success achieved by Finland in the area of final SNF disposal. As far as we know, no international peer reviews involving experts from international organizations (for example, the IAEA or NEA/OECD) were performed for this project. Could you, please, elaborate if it is true and whether some international peer reviews are scheduled to support the SNF repository licensing efforts?

Answer There hasn't been IAEA or NEA peer reviews focusing on the SNF disposal in last two decades. STUK organised a peer review (EU27) in 2009 for evaluation STUK regulatory system for disposal regulation. There is currently no plans to have peer review focusing on SFN licensing. Both Posiva and STUK are using wide range of international experts to support development and regulatory evaluation. STUK has published the safety evaluation of external experts done to support the construction license application review.

Q.No *	Country	Article	Ref. in National Report
	Sweden	Article 14	Section B and L.3

Question/ Comment According to the construction licence decision from the Government, technical modifications and improvements to the design and concepts can be authorized by STUK, if they are within the terms of the construction licence (L.3). In Figure 5, page 25, the disposal tunnel and canisters are depicted with both vertical and horizontal disposal options. Is the horizontal emplacement option still open or a possible modification that can be authorized by STUK?

Answer Both vertical and horizontal options are included in the construction license as a license condition. In safety assessment report STUK concluded that STUK has not observed a reason why the horizontal disposal solution could not fulfil the set safety requirements. If Posiva decided to change the orientation of the design, it would be approved by STUK as a plant modification according to the Section 112 of Nuclear Energy Decree.

Q.No *	Country	Article	Ref. in National Report
	China	Article 15	H, P81

Question/ Please give more information about the consideration for STUK to set an at least 15

Comment years' time interval for the licensee to conduct a periodic safety review for the disposal of nuclear waste. What are the differences between each periodic safety review stage?

Answer The periodic safety review follows in principle the same methodology what is required for all nuclear facilities. PSR period for other nuclear facilities is 10 years, but for disposal facilities 15 years was seen better argued since the operational activity is not that high, the technology is robust and no major changes are foreseen to take place fast. The procedure does not differ between the different PSRs, but of course PSR has to take into account new information and operational experience from the latest phase.

Q.No *	Country	Article	Ref. in National Report
	China	Article 15	H, P82

Question/ Comment Do the Loviisa and Olkiluoto LILW disposal facilities charge for the waste disposal? If so, what's the charging standard? What is the calculation method of the charging standard? In addition, "according to the Radiation Act and the Radiation Decree, radioactive sources created by the use of radiation are the responsibility of the State and the practical management of these wastes is carried out by STUK". What about the related fee/charge on disused sealed radioactive sources disposed of Olkiluoto LILW disposal facility?

Answer LILW disposal facilities are situated in the site area of both Olkiluoto and Loviisa NPP's and nuclear power companies own those facilities. So there is no extra charge for the nuclear waste disposal.
The charge of sealed radioactive sources consists of transportation, handling and disposal costs and it depends on the nuclide and the total activity.

Q.No *	Country	Article	Ref. in National Report
	Croatia	Article 15	H, 82

Question/ Comment In the Report it is indicated that "STUK prepared a safety assessment for the modification of the operating licence for the LILW disposal facility in Olkiluoto and used the assessment as the basis for a favorable statement issued to the MEAE". Could you explain how could STUK prepare aforementioned safety assessment and use the same assessment to issue favorable statement for the modification? How is it ensured that this procedure isn't in the conflict with regulatory control?

Answer The national long-term storage cavern attached to the LILW disposal facility at Olkiluoto is operated by STUK's Department of Environmental Radiation Surveillance, which also prepared the safety assessment for the modification of the operating license.
Non-nuclear radioactive waste is stored and disposed of under the regulatory control of STUK's Department of Nuclear Waste and Material Regulation.
The organizational structure of STUK clearly separates its duties in operating the centralized storage facility from its functions as the regulatory authority for radioactive materials and waste management.

Q.No *	Country	Article	Ref. in National Report
	Korea, Republic of	Article 15	H, p.81

Question/ Comment What is the monitoring plan suggested to ensure the post-closure safety after the post-closure safety case was performed?

Answer According to Nuclear Energy Act (YEL) (7h§, 3rd para: "The disposal of nuclear waste in a manner intended as permanent shall be planned giving priority to safety and so that ensuring long-term safety does not require the surveillance of the final disposal site.") the repository concept must be based on a passive solution not requiring active control, monitoring or surveillance. This means that no active monitoring or measures are required to maintain the safety of the repository after the closure.

Regulatory guide (YVL D.5) includes requirement for engineered barrier system (EBS) monitoring also during the operational period. The monitoring of EBS might include monitoring of relevant near field parameters, monitoring of long duration tests or in some cases monitoring of actual barrier evolution. However, the general safety requirement is that monitoring shall not impair post-closure safety. There are no explicit requirements identifying specifically the concept of performance confirmation. During the construction, Posiva has carried out an extensive monitoring programme to follow for construction effects. This programme has included several monitoring areas, such as surface environment, hydrology, hydrogeochemistry, rock mechanics and foreign materials. Particular attention is given to changes in characteristics that may have implications for post-closure safety, for instance, changes in groundwater salinity at repository depth.

Monitoring after closure is mainly used for confidence building of various stakeholders. It is doubtful that the repository would have any radiological environmental impacts during the expected monitoring period. However monitoring and collection of information of possible environmental impacts (releases) may reassure the local population. If post-closure monitoring is done it will be most probably carried out on the surface and possibly in the bedrock at shallow depth and could also include observation of site properties evolution after repository closure.

Q.No *	Country Korea, Republic of	Article Article 15	Ref. in National Report H, p.82
-----------	-------------------------------	-----------------------	------------------------------------

Question/ Comment Based on the national report, the operating license conditions of the Olkiluoto LILW disposal facility was amended to allow the disposal of LILW from the OL3 and of non-nuclear radioactive waste in November 2012 .

(1) How much did the total inventory of the Olkiluoto disposal facility increase according to amendment? and what is the updated total inventory of key nuclides?

(2) Based on the national report STUK approved the periodic safety review of the Loviisa disposal facility carried out by Fortum December 2014. What are the major changes of the periodic safety review compared to the initial safety review?

Answer (1) Before the update of the operating license the license conditions set the maximum total inventories separately for each disposal silo: 1000 TBq for KAJ-silo and 10 TBq for MAJ-silo. The current license condition sets the maximum total inventory 1100 TBq for the whole disposal facility. Section 55 of the Nuclear Energy Act authorizes STUK to set nuclide specific inventory limits for each silo. The limits are specified in FSAR and in Technical Specifications and they are approved by STUK.
(2) In its review STUK noted that based on the review of the documentation and the results from the operation inspection program the safety of the disposal facility is acceptable. The review was based on the updated regulations.

Q.No *	Country Luxembourg	Article Article 15	Ref. in National Report H, p. 79
-----------	-----------------------	-----------------------	-------------------------------------

Question/ Comment According to the National Report, each producer of nuclear waste is responsible for its disposal, which may lead to multiple disposal facilities for spent fuel. As such, the disposal facility under construction (Posiva) only accepts waste from the Olkiluoto and Loviisa NPPs, whereas the planned Fennovoima NPP seeks for own disposal solutions. Have STUK or the government considered the safety impact of having multiple disposal facilities instead of having one large, common disposal facility? After all, multiple facilities will later on, after closure, result in multiple sites that have to be controlled in some way.

Answer The fundamental principle of disposal is that it is passively safe and does not require monitoring or surveillance after closure of disposal facility. All disposal facilities are required to fulfill dose provision of 0,1 mSv/a in the post-closure phase. This limit is set so that there can be several sources for dose before dose limit 1 mSv/a would be exceeded. There should not be safety impact of having one or several disposal facilities.

Q.No *	Country China	Article Article 16	Ref. in National Report H, P84
-----------	------------------	-----------------------	-----------------------------------

Question/ Comment The consideration on the spent fuel retrievability has not been addressed in this report. Has Finland have prepared any plan and measures for retrieving the spent fuel? Please give some information about this issue.

Answer In the construction licence application for the Olkiluoto encapsulation and disposal facility, Posiva has described the principle governing the opening of the disposal facility and the retrieval of the disposal canisters at the various disposal stages and after closure of the disposal facility. Posiva has submitted to STUK as part of the preliminary safety analysis report a description concerning the opening of the disposal facility and the related work stages. Based on construction license material, STUK's conclusion was that the nuclear waste to be disposed of can be technically retrieved, and the retrieval option does not jeopardise the post-closure safety of the disposal. One of the license conditions in the construction license granted by the government to Posiva is that the reporting on the retrievability has to be updated for the operating license.

Q.No *	Country Korea, Republic of	Article Article 16	Ref. in National Report H, P.84
-----------	-------------------------------	-----------------------	------------------------------------

Question/ Comment The national report mentions that STUK reviews the plant procedures and FSAR, and performs inspections on waste management at the NPPs and the disposal facilities to ensure compliance with all requirements. Could you explain in detail the inspection of the STUK at the disposal facility, in particular, compliance with its WAC?

Answer STUK inspects the operational waste management at NPPs every second year. The inspection includes activity determination, accounting, clearance process and methods, sorting, handling, packaging, transfer, storage and operation of the disposal facility. The WAC are inspected in connection with above mentioned topics.

Q.No *	Country Sweden	Article Article 16	Ref. in National Report Sections G, K
-----------	-------------------	-----------------------	--

Question/ Comment Commendable efforts to improve spent fuel interim storage safety due to lessons learned from the Fukushima Dai-ichi accident

Answer Thank you for the positive feedback.

Q.No *	Country Belgium	Article Article 17	Ref. in National Report Section H, page 85
-----------	--------------------	-----------------------	---

Question/ Comment Is a monitoring strategy established to anticipate unplanned release of radioactive materials into the environment ? Is this covered by the technical post-closure surveillance (active control) ?

Answer According to Nuclear Energy Act (YEL) (7h§, 3rd para: “The disposal of nuclear waste in a manner intended as permanent shall be planned giving priority to safety and so that ensuring long-term safety does not require the surveillance of the final disposal site.”) the repository concept must be based on a passive solution not requiring active control, monitoring or surveillance. This means that no active monitoring or measures are required to maintain the safety of the repository after the closure. In Finland the

responsibility of the repository (also monitoring and surveillance) will be transferred to the State after the successful and approved closure of the disposal (YEL 32§). In case the State considers it necessary, a monitoring system may be used and the estimated life time cost will be charged in advance form the implementer before the approval of the closure (YEL 34§, 2nd para). This monitoring is mainly used for confidence building of various stakeholders. It is doubtful that the repository would have any radiological environmental impacts during the expected monitoring period. However monitoring and collection of information of possible environmental impacts (releases) may reassure the local population. If post-closure monitoring is done it will be most probably carried out on the surface and possibly in the bedrock at shallow depth and could also include observation of site properties evolution after repository closure.

Q.No *	Country Canada	Article Article 17	Ref. in National Report page 85
-----------	-------------------	-----------------------	------------------------------------

Question/ Comment Have there been any discussions, within the government and with the public, on how Finland would ensure that future generations would be made aware of the spent fuel disposal facility?

Are there preliminary plans, ideas, concepts or reports on how to ensure that the extensive knowledge and information about the facility is maintained and transferred to future generations, in particular over very long time horizons?

Is Finland looking into the use of markers, or other tools and techniques, at the site of the spent fuel disposal facility so that future societies would recognize and fully understand its significance?

Answer Based on the Nuclear Energy Act STUK has the right to issue prohibitions on measures concerning real estate when this is necessary in order to secure safety of closed disposal facilities. Further the Nuclear Energy Decree states that STUK shall report the disposal site of nuclear waste and the prohibition on measures, so that they can be entered in the real estate register, land register or list of titles.

STUK regulation on disposal of the safety of disposal of nuclear waste requires that the licensee of the disposal facility shall maintain a record of the disposed waste and submit the record to STUK whose task is to arrange the permanent keeping of the records. The permanent record keeping of the records will be done in co-operation with the National Archives of Finland.

No requirements are set and no decisions are made so far on the use of markers or other tools. Finland follows the international development and discussion on the issue. The need for markers or other tools will be considered in the future before the closure of the disposal facilities is started.

At the moment no active discussion on the issue is going on within the government nor with the public but the issues is raised every once in a while. It will most probably be discussed again when Posiva will start the operation of the disposal facility in 2020s.

Q.No *	Country Korea, Republic of	Article Article 17	Ref. in National Report H, p.85
-----------	-------------------------------	-----------------------	------------------------------------

Question/ Comment Section H describes concerning the passive safety on which disposal concepts are based, Please explain how the passive safety was applied and what is the plan ensuring such safety.

Answer Nuclear energy act states the following: The disposal of nuclear waste in a manner intended as permanent shall be planned giving priority to safety and so that ensuring long-term safety does not require the surveillance of the final disposal site.

According to the nuclear energy act requirement, the disposal concepts for high level and

low and intermediate level waste are designed to be passively safe after closure. This means that after the facilities have been closed according to the plans, no further active control, monitoring or surveillance are required to maintain the safety of the disposal facility.

Q.No *	Country Slovenia	Article Article 17	Ref. in National Report H, p. 85
-----------	---------------------	-----------------------	-------------------------------------

Question/ Comment The report mentions that according to Guide YVL D.5 it can be assumed that human activities affecting the radioactive waste disposal facility or the nearby host rock should be precluded for 200 years at the most by means of land use restrictions and other passive controls. Is any kind of active control also envisaged for the period after closure?

Answer According to the Section 7 of the Nuclear Energy Act the disposal of nuclear waste shall be planned giving priority to safety and so that ensuring long-term safety does not require the surveillance of the final disposal site. Currently there are no plans for active control after closure but according to the guide YVL D.5 a plan for potential post-closure monitoring measures has to be delivered to STUK as part of the closure plan.

Q.No *	Country Belgium	Article Article 19	Ref. in National Report page 38
-----------	--------------------	-----------------------	------------------------------------

Question/ Comment “The IRRS also recommended clarifying the licensing for decommissioning nuclear facilities by setting a decommissioning license, which is currently being implemented into the Nuclear Energy Act.” How it is intended to manage the transition phase between definitive shutdown and the real commencement of decommissioning? Is this phase still covered by the operation license? What kind of activities are allowed in that phase?

Answer The decommissioning license is now implemented in the nuclear energy act and decree. The definitive shutdown stage is possible under operating license and decommissioning license. Depending on the case, NPP might apply for decommissioning license and move from operation to definitive shut down stage when the decommissioning license is granted. Another possibility is that NPP will enter the definitive shut down stage during the operating license and the decommissioning license will be applied and granted during the definitive shutdown stage.

The details of the decommissioning are not yet defined because the decommissioning license was implemented to the legislation in the beginning of 2018. The plan is to give STUK regulation on the decommissioning and update the YVL D.4. in the future and these will be revisited based on the decommissioning experiences from the research reactor (FiR1) decommissioning project.

Q.No *	Country Canada	Article Article 19	Ref. in National Report Section E; page 34
-----------	-------------------	-----------------------	---

Question/ Comment Please provide clarification on whether the nuclear legislation includes the regulatory framework for decommissioning of facilities?

Answer The amendment of Nuclear Energy Act in January 2018 set a licensing step for decommissioning. Previously decommissioning was planned to be licensed as an operating license renewal. Regulatory framework and detailed requirements for decommissioning were already in place in Nuclear Energy Decree and STUK's Guide YVL D.4.

Q.No *	Country Canada	Article Article 19	Ref. in National Report page 38
-----------	-------------------	-----------------------	------------------------------------

Question/ Comment How are the municipality's views taken into consideration during the construction licence application phase? Are there some measures or approaches that could work more favourably than others?

Answer Ministry of Economic Affairs and Employment, who organises the public hearing, asks widely opinions and statements on the application. Ministry asks statement from ministries, other officials, relevant non-governmental organisations, intended municipality of the facility and its neighbouring municipalities. Also citizens are welcome to participate in the hearing and the hearing is open for all who wants to give an opinion or statement on the application. Ministry also asks the applicant to submit an explanation on the opinions and statements expressed on the application. After that ministry prepares a summary of the opinions, statements and the explanation and add the summary in the licence. Ministry considers the views when formulating the ministry's opinion on the application. STUK's positive safety assessment is mandatory for granting a licence. The statement of the municipal council of the intended municipality of the facility is important: Ministry makes sure that the municipality has maintained its positive view it gave in the earlier decision-in-principle phase when it had, according to Finnish Nuclear Energy Act, the veto-right. Furthermore the Ministry also asks public statements from municipalities after receiving the application for operation licence and decommissioning licence and the process is similar to the construction licence. Also in the case where a licence holder applies to amend the terms of the operation licence, municipalities among other stakeholders are publicly consulted on the matter. We have no experience on situation in which the municipal council of intended municipality of the facility would have changed their view. Altogether the formal requirements to hear municipalities cover the whole lifespan of the nuclear power plant and the statement of the intended location municipality is especially significant in the beginning of the process where it has the veto-right. Ministry's view is that continuing open discussion with municipalities works most favourably in different situations.

Q.No *	Country	Article	Ref. in National Report
	Sweden	Article 19	Section E and L.4

Question/ Comment In the Decision-in-Principle for the establishment of a nuclear power plant in Pyhäjoki in Northern Finland, the applicant Fennovoima was required to define its plans for future spent nuclear fuel management and disposal by the end of June 2016. Fennovoima in 2016 submitted an environmental impact assessment programme to the Government that suggests Posiva's repository site in Eurajoki and Fennovoima's Pyhäjoki site as alternative locations for the future spent fuel encapsulation plant and disposal facility. Fennovoima also signed a co-operation agreement with Posiva to support its spent fuel management activities over the next ten years. Based on this, the Government in 2016 considered the condition in the Decision-in-Principle fulfilled and resumed processing the NPP construction licence application. What are the important milestones in site selection and development of a site specific design for disposal of spent fuel in Fennovoima's programme, what are the procedures for regulatory review and assessment of the programme leading to a repository DiP and what is the overall role of STUK in the licensing process?

Answer The main phases or steps in site characterisation are defining the preliminary criteria for site screening, site characterisation work from surface and from deep drillings and evaluation of site safety aspects. STUK is following the characterisation work by Fennovoima. STUK can be asked to give preliminary regulatory opinions about site characteristics. When Fennovoima is granted license for NPP, they are also required to submit every three years RDD-plan for waste management. MEAE and STUK can have oversight of disposal project through to review of the programme and its implementation. The first formal safety evaluation by STUK is done in connection to Decision-in-Principle application review.

Q.No *	Country United Kingdom	Article Article 19	Ref. in National Report p.38
-----------	---------------------------	-----------------------	---------------------------------

Question/ Comment The report states on page 38 that ‘Parliament cannot make any changes to the Decision [in Principle]; it can only approve or reject it as such’. On page 41, the report states that ‘...in practice, no such licence would be issued without STUK’s statement...’
It is not clear from the report how STUK practically interacts with Parliament (for Decisions in Principle) and Government (for licensing) and how STUK’s independence is assured. Please describe these aspects and, in particular, if Parliament or Government could make a lawful decision that runs contrary to STUK’s regulatory position.

To note, this also relates to p.41 'bodies of the regulatory framework'.

Answer Ministry of Employment and Economy is the contact authority for nuclear facilities decision in principle and license applications. In both processes ministry shall ask a statement from STUK. In the decision in principle process government makes the decision and if the decision is positive, a ratification from the parliament will be asked as described on page 38 of the report. Construction and operating licenses are decided by the government, no parliamentary ratification is needed.
License application handling is defined in the Nuclear Energy Act. Based on section 23, Ministry of Economic Affairs and Employment shall request a statement from STUK. If necessary, STUK shall propose such license conditions in the statement that the requirements concerning safety will be fulfilled. These requirements are given on Nuclear Energy Act chapter 2A. Section 25 of Nuclear Energy Act defines that ministry shall take into account the license condition proposed in STUK's statement.

Q.No *	Country United Kingdom	Article Article 19	Ref. in National Report p.41
-----------	---------------------------	-----------------------	---------------------------------

Question/ Comment Page 41 states that ‘STUK has no responsibilities or duties which would be in conflict with regulatory control’. However, page 28 states that ‘The department of environmental radiation surveillance of STUK takes care of the waste containing nuclear material and stores it at STUK’, and page 22 states that ‘STUK will be responsible for rendering the radioactive waste harmless’ if a ‘recognized installation’ is not available. It is not clear whether this operational duty conflicts with STUK’s regulatory duty. Please provide further detail on the mechanisms in place that prevent such a conflict.

To note, this also relates to p.22 & 28.

Answer STUK as government organisation has these duties to operate state interim storage and secondary role mandated by state to take care of radioactive waste. Independence of operations and regulatory work has been assured so that tasks are pointed to different departments within STUK. Department of environmental radiation surveillance is regulated by two different departments in STUK. This practice was evaluated as part of IRRS mission.

Q.No *	Country United Kingdom	Article Article 19	Ref. in National Report p.39
-----------	---------------------------	-----------------------	---------------------------------

Question/ Comment It is not possible to determine from the report STUK’s overall inspection strategy, specifically how inspections conducted by STUK are targeted. Please describe:

What types of inspection are undertaken by STUK (and on what basis);
How the different inspection types are structured; and
How consistency between inspections/sites is maintained?

To note, this section also relates to Article 16.

Answer STUK conducts two kind of inspections: inspections which are targeted to the licensee's organisation and inspections which are related to components, structures and systems. The organizational inspections are based on semiannual programmes and the defining the inspections follows the graded approach. The strategy is to target the inspections to the safety related activities of the licensee. The technical inspections are e.g. construction, installation construction and commissioning inspections of components, structures and systems. The licensee is obligated to invite STUK to perform these technical inspections.

Q.No	Country	Article	Ref. in National Report
*	Russian Federation	Article 20	E

Question/ Comment Please, specify whether an additional review shall be performed if the public expresses its distrust to the results of performed long-term safety assessment of the deep geological disposal facility? If so, please, present a brief overview of this procedure?

Answer In case a concern is raised by the public or any other stake holder related to the radiation or nuclear safety of the facility, STUK would compare its own safety evaluation and the raised concern. Further actions would be decided based on this comparison.

This would be done case by case basis. No procedure for performing a additional review based on the public distrust has been defined.

Q.No	Country	Article	Ref. in National Report
*	Sweden	Article 20	Section E and K

Question/ Comment A follow-up IRRS mission was carried out in June 2015. The result show that significant progress has been made in most areas and many improvements have been implemented in accordance with the action plan from 2012. One previous recommendation remain open. It deals with STUK's position under the Ministry of Social Affairs and Health, "which will be discussed further in Finland" (p. 42 and 93). Please elaborate on the meaning of this recommendation and its possible implications with regard to the effective independence and mandate of STUK.

Answer The IRRS team in particular examined the role and authority of STUK in defining conditions relevant to safety in this licensing process. It found that the current practice of the licensing process in Finland is in practice (de facto) in line with IAEA requirements and guidance. But the team considers that in law (de jure) the role of the nuclear safety regulator in the process is not secured completely and unambiguously. The Ministry of Social Affairs and Health has responsibilities and interests in the medical application of radiation, including in hospitals, where licensees have duties under the Radiation Act. STUK's current position administratively under the Ministry of Social Affairs and Health continues to have the potential for STUK's decision-making to be unduly influenced by an entity that has such responsibilities and interests. The IRRS team identified two recommendations in relation to this. One of them related to ensuring STUK's legal authority to specify licence conditions and safety regulations were finalized. STUK's position in the government has been discussed but currently there is no actions taken.

Q.No	Country	Article	Ref. in National Report
*	Sweden	Article 20	Section E

Question/ Comment STUK has partly terminated and also significantly reduced its radiation safety research due to governmental budget cuts. Please elaborate on how STUK, despite compensating measures (national radiation safety research programme), maintain the scientific results and competence necessary for regulatory oversight.

Answer KYT is a national nuclear waste research programme, which one main taks is to support

STUK regulatory work. STUK has also possibility to execute research project related to regulatory oversight if seen necessary. These will be financed through invoicing from licensees as part of normal STUK oversight invoicing routine. Budget cut to radiation safety research are focusing more on research focusing on other fields of use of radiation. They don't directly influence STUK oversight on radioactive waste management, but there is a risk that on longer time perspective the general radiation safety expertise would decrease and that would have effect on STUK regulatory work and possibilities for effectively fulfil our mission.

Q.No *	Country Switzerland	Article Article 20	Ref. in National Report 44
-----------	------------------------	-----------------------	-------------------------------

Question/ Comment According to the report, “the national nuclear safety (SAFIR) and waste management research (KYT) programmes play an important role in the competence building for all essential organisations involved in nuclear energy. The funding of the programme comes from the licence holders via the State Nuclear Waste Management Fund (VYR). ...STUK has an important role in the steering of these programmes.” The decisions on which research projects are supported by the fund are, to our knowledge, made by a group of experts coming from the research institutions, the industry and STUK.

Question: Does STUK also have a fund for research on which it decides independently from other organisations? How can STUK launch a research project unwanted by the licensees?

Answer STUK has not any research program of its own in nuclear waste issues. However, to support its review and inspection work STUK can order work on special issues or have Framework Contracts with different domestic or foreign organizations or specialists. The costs will be charged from licensees. The preliminary estimate of costs will be annually announced to the licensees.

STUK does not ask licensees' opinion if it considers some issue so important that STUK must have its own independent assessment performed.

Q.No *	Country United States of America	Article Article 20	Ref. in National Report Section K pg. 97
-----------	-------------------------------------	-----------------------	---

Question/ Comment Please provide an update on the latest accomplishments of the strategic communication development project.

Answer The leading idea in communication is to provide people up-to-date information. In addition to communicating current events STUK for example publishes a report to the public three times a year about the phases of the disposal project from STUK's point of view. All communications material is published on STUK's website and made available in the STUK's social media channels.

Steps have still been short and in the future STUK needs to concentrate in communicating the risks associated with the disposal and to help people to understand the risks properly.

In STUK's strategy for years 2018–2022 the challenge is formulated like this: “We provide people with correct and easy-to-understand radiation safety information to enable them to understand, even when subjected to information overload and disinformation, what is hazardous and what is not and consequently act correctly without unnecessary fear.”

Q.No *	Country Croatia	Article Article 20.1	Ref. in National Report E, 41
-----------	--------------------	-------------------------	----------------------------------

Question/ In the Report it is stated that: “STUK does not grant construction or operating licences for nuclear facilities. However, in practice no such licence would be issued without STUK’s statement, where the fulfillment of the safety regulations is confirmed.” Does it mean that there is no regulation prescribing the obligation of obtaining positive statement from STUK in the process of obtaining the licence, just good practice? Please, could you explain in more detail?

Answer License application handling is defined in the Nuclear Energy Act. Based on section 23, Ministry of Economic Affairs and Employment shall request a statement from STUK. If necessary, STUK shall propose such license conditions in the statement that the requirements concerning safety will be fulfilled. These requirements are given on Nuclear Energy Act chapter 2A. Section 25 of Nuclear Energy Act defines that ministry shall take into account the license condition proposed in STUK's statement.

Q.No	Country	Article	Ref. in National Report
*	Canada	Article 21	page 49

Question/ Finnish producers of nuclear waste are required to provide estimates, every three years, of the future cost of managing their existing wastes, including spent fuel disposal and decommissioning of facilities. In light of this, have there been any unexpected changes or new developments to the cost estimates that were not anticipated? Are there any key considerations that other countries should take in account when updating their respective cost estimates?

Answer Changes to the cost estimates have arisen mostly from changes in decommissioning planning, which is done every six years, and from design changes in the spent nuclear fuel disposal facility. Some material changes in the basic design resulted in a significant increase on the cost estimates. The liabilities were adjusted accordingly, and the companies had to provide the additional funds as required of financing of nuclear waste management in Nuclear Energy Act.

The key consideration from the Finnish perspective is that funds should be gathered early on, and cost estimated frequently re-evaluated to verify that accumulation of funds is on the correct track. The funds in the Finnish Nuclear Waste Management Fund reached the level high enough estimated to cover all waste management costs of the 4 currently operating NPP units in approximately 30 years since first criticality.

Q.No	Country	Article	Ref. in National Report
*	United Kingdom	Article 22	p.79

Question/ The future waste management and disposal costs of nuclear installations (including the FiR 1 research reactor) are covered by assets collected in the Nuclear Waste Management Fund. It is not possible to determine from the report how STUK (and the state) underpin their confidence in the value of the NWMF to cover all future decommissioning costs. Please describe how STUK has gained confidence that the NWMF will have sufficient funding to meet all future decommissioning needs (i.e. OL1, 2 & 3, LOV1 &2 and FiR 1)?

Answer STUK’s role in the waste management cost estimates is to estimate the feasibility of the decommissioning plans and the dismantling and waste management techniques presented therein. The responsibility on the actual cost estimates is on the Ministry of Economic Affairs and Employment which uses independent assessors to verify the estimates provided by the licensees. The assessors base their estimates on international experiences and cost estimates.

The cost estimate of the FiR research reactor is uncertain at the moment due to major

uncertainties in its spent fuel management. The main uncertainty arises from repatriation of the spent fuel, and is not caused by the FiR licensee. Cost estimates are reviewed yearly until the situation clarifies.

Q.No *	Country United States of America	Article Article 22	Ref. in National Report Section F pg. 48
-----------	-------------------------------------	-----------------------	---

Question/ Comment The U.S. commends Finland on its efforts to improve the availability of competent human resources by offering additional training and development of experts in the nuclear safety field through a variety of educational programs.

Answer Thank you for the positive feedback.

Q.No *	Country United States of America	Article Article 22	Ref. in National Report Section F pg. 44
-----------	-------------------------------------	-----------------------	---

Question/ Comment With the demand for technical staff at the Radiation and Nuclear Safety Authority, as well as qualified experts in the nuclear industry, please describe any measures taken to ensure the regulatory body can recruit and retain staff as needed.

Answer STUK budget consist basically from three elements state budget, fees charged directly from licensees and from service and reserch project financed from third party. The mechanism that STUK directly charges oversight fees from licensees allows STUK to requit personnel when necessary. The state does not control our staff number and director general has the mandate to decide about STUK personnel.

Q.No *	Country Croatia	Article Article 23	Ref. in National Report E, 50
-----------	--------------------	-----------------------	----------------------------------

Question/ Comment It is not evident are there any regulatory requirements regarding Quality Assurance for the non-nuclear waste management facilities. Could you please elaborate are there any?

Answer Regulatory Guide ST 1.1 Safety in radiation practices sets the general requirements for Quality Assurance. When issuing a safety license, STUK checks that these requirements are as well as other requirements are met in e.g. the operator's manual. For the disposal of non-nuclear waste in Olkiluoto LILW, same QA requirements are applied for the non-nuclear waste as for the nuclear waste.

Q.No *	Country France	Article Article 25	Ref. in National Report Section F - page 54
-----------	-------------------	-----------------------	--

Question/ Comment In Section F (Emergency preparedness) of the Finland's Report, it is indicated that “STUK publishes VAL Guides for emergency responses. Guide VAL 1 (2012) “Protective Measures in the Early Phase of a Nuclear or Radiological Emergency” and VAL 2 (2012) “Protective Measures in an Intermediate Phase of a Nuclear or Radiological Emergency” provide detailed guidance”.

The main measures addressed in Guide VAL 1 (Protective Measures in the Early Phase of a Nuclear or Radiological Emergency) and Guide VAL 2 (Protective measures in an Intermediate phase of a nuclear or radiological emergency) could have been presented in the N.R, in particular those planned for the management of large amounts of liquid and solid waste resulting from a nuclear or radiological accident.

Answer Wastes resulting from nuclear and radiological accidents are divided on four categories. Waste in this category I cannot be processed in normal waste management as the radiation effects would not remain acceptably low. The waste must either be temporarily stored (especially in case of short-lived radionuclides) or encapsulated permanently with suitable actions (especially in case of long-lived radionuclides). For category II measures are similar but the number of possible actions may however be a lot more variable than in the case of waste in category I. With category III, recycling, management and final

disposal of different waste types is mainly based on their normal use, but with optional choices, aspects of radiation safety should be considered. In choices of waste storage and disposal, such solutions shall be looked for where needs for processing and later storing of large masses would remain minor. Category IV wastes can be disposed of with normal waste management routes.

More detailed waste management options for categories I-III will be determined case by case.

Q.No *	Country Bulgaria	Article Article 26	Ref. in National Report p. 56
-----------	---------------------	-----------------------	----------------------------------

Question/ Comment The Nuclear Energy Act (Section 7 g) states that the design of a nuclear facility must provide for the facility's decommissioning and that the related decommissioning plan should be presented.

During the design phase, the license applicant must establish the decommissioning strategy.

How the strategy considers the influence of other nuclear facilities in operation at the same site on the facilities in decommissioning?

Answer According to the Guide YVL D.4 the decommissioning strategy shall at least define the implementation stages with timetables, an outline of the dismantling and waste management solutions adopted, and the end state of the facility site. If the strategy involves a prolonged period of monitored storage prior to the dismantling of the facility, this shall be justified by considerations such as radiation protection optimization, co-implementation of the decommissioning with other nuclear facilities at the same site, or the availability of disposal facilities.

Q.No *	Country Croatia	Article Article 26	Ref. in National Report F, 56
-----------	--------------------	-----------------------	----------------------------------

Question/ Comment Taking in the consideration that the return program for SF of the US DOE is running until May 2019 and that management of radioactive waste from decommissioning of FiR 1 in existing facilities requires licensing for the suitability which is also time consuming, could you specify when is it expected to have final decision on the management of spent fuel and radioactive waste from research reactor FiR 1?

Answer Currently we don't know, when the the final decisions on spent fuel and radioactive waste management can be made. It is obvious that the dismantling of the reactor cannot be started until the waste management issues are solved.

Q.No *	Country Japan	Article Article 26	Ref. in National Report 56
-----------	------------------	-----------------------	-------------------------------

Question/ Comment The section 17 of STUK Regulation Y/1/2016 requires design consideration for decommissioning as well as YVL D.4. It should be added to paragraph 2 of the section "Regulatory requirements".

Answer To be taken into account in the next version of the report.

Q.No *	Country Korea, Republic of	Article Article 26	Ref. in National Report F, p.57
-----------	-------------------------------	-----------------------	------------------------------------

Question/ Comment VTT has a plan to install new VTT centre, brown field, after decommissioning of old hot cell laboratory.

Is there any regulatory guidelines or regulations for review and approval of "brown field"?

Answer VTT is in the process of cleaning up the old radionuclide laboratory which includes a hot-cell.

STUK has interpreted that the decommissioning of these facilities requires a change in the safety license. The coming application will be reviewed and assessed like other applications according to STUK's internal guidance. Since this is the first large scale decommissioning of such a facility in Finland, there are no specific requirements published. VTT's plans are ultimately approved as a license condition when they are deemed appropriate.

General clearance levels are used when assessing the release of a facility from regulatory control. For material released e.g. the clearance levels have to be met. STUK's approval must be sought for the reuse, recycling and disposal of radioactive materials originating from practices subject to the safety license or notification obligation. General requirements for clearance as well as the nuclide specific limits are given in the Regulatory Guide ST 1.5 Exemption of radiation use from safety licensing.

For special cases the general dose limit 10 µSv/year can also be applied; it is the applicant's responsibility to demonstrate this. For small amounts of material also the exemption limit can be applied.

Q.No *	Country	Article	Ref. in National Report
	Korea, Republic of	Article 26	F, p.57

Question/ Comment Related to decommissioning plan of VTT reviewed by STUK,
 (1) What are the contents of decommissioning safety assessment?
 (2) How can STUK review decommissioning plan? What is the guideline for reviewing the safety assessment in the documents for decommissioning?

Answer In general terms VTT's application for decommissioning is evaluated as any other license applied in Finland. Based on VTT's application, STUK will prepare a safety evaluation report and give a statement about the safety of the decommissioning project to the Ministry of Economic Affairs and Employment.
 The content of decommissioning plan is defined in guide YVL D.4 which will be also used to guide the review. Similarly as in other license reviews, principles given in Nuclear Energy Act and Decree and the safety level defined in the STUK regulations are used as basis of the review. The practical approach for conducting the review is given in STUK's internal YTV-guides and in project plan.

Q.No *	Country	Article	Ref. in National Report
	Slovakia	Article 26	Section F / p. 56

Question/ Comment The accumulation of resources for the waste disposal depends on the time during which these resources are accumulated. What are the most relevant arguments to plan the operation of the units Lo1 and Lo2 for 50 years? Are the resources accumulated during these 50 years?

Answer In generally the use of Finnish NPPs are based on the safe use of the plants. The decommissioning plans are taking into account the wastes resulting from the extended time of use of the NPPs. The existing disposal facilities (LILW) in Loviisa and Olkiluoto will be expanded before the final decommissioning of the NPPs.

Q.No *	Country	Article	Ref. in National Report
	Sweden	Article 26	Sections F, G, H and L.5

Question/ Comment VTT in June 2017 submitted an application for a licence to decommission the research reactor, FiR 1. The dismantling is scheduled to start in early 2019 and last about two years. To cover the costs, there is a deposit of approximately EUR 12 million in the

Nuclear Waste Management Fund. This is the first decommissioning project in Finland and the report identifies several challenges during the preparation and licensing phase of the project. The legislation and YVL guides need to be reviewed and updated, the competent resources for regulatory oversight must be ensured and the licensee's waste management plans must be developed further. Also, there are several alternatives for the management of both spent fuel and decommissioning wastes that has to be decided on before entering into the dismantling phase. Please elaborate on the implications of a possible prolonged licensing process with respect to the operator's responsibility for safe management of spent fuel and radioactive waste, including maintaining the necessary competence and adequate financing for the different solutions for storage and disposal of spent fuel and decommissioning waste.

Answer The challenges listed in the report are identified risks for the whole decommissioning project and plans to control them are underway. The most critical challenges are unfinished waste management plans of VTT, which may delay in the worst case the whole project for years. VTT has started negotiations on alternative waste management activities e.g spent fuel storing in Finland and also about the storing of other wastes in NPP sites and have to report about the status of these negotiation during the application handling process. If there will be long delays in the project, then VTT's possibilities to maintain resources and capabilities is a risk. At the time STUK gives its statement on safety, STUK will evaluate the safety significance of the open issues during the evaluation of the license application and if needed add requirements into its safety statement to force licensee to take care of its responsibilities.

Q.No *	Country United Kingdom	Article Article 27	Ref. in National Report p.86-87 Section I
-----------	---------------------------	-----------------------	--

Question/ Comment The Finnish report states "Concerning the transboundary movement of radioactive material, the Regulation 93/1493/Euratom on shipments of radioactive substances between Member States must be applied. The requirements are also in accordance with the European Council Directive 2006/117/EURATOM on the supervision and control of shipments of radioactive waste and spent fuel." No mention is made of Article 4(4) of Council Directive 2011/70/Euratom. Reference is made to the European Council Directive on the supervision and control of shipments of radioactive waste and spent fuel (Council Directive 2006/117/Euratom). Are any shipments also subject to an intergovernmental agreement under Article 4(4) of the European Council Directive on the safe management of spent fuel and radioactive waste (Council Directive 2011/70/Euratom)? If so, please provide details.

Answer There has not been any transportations subject to an intergovernmental agreement during the reporting period.

Q.No *	Country France	Article Article 28	Ref. in National Report Section J - page 89
-----------	-------------------	-----------------------	--

Question/ Comment In Section J (Handling of disused sealed sources), the report mentions (p. 84): "The disposal of non-nuclear radioactive waste in the Olkiluoto LILW disposal facility started at the end of 2016 after the approval of the changes in the Olkiluoto LILW disposal facility's operating licence conditions. A few high activity sealed sources will need a different disposal route, which is not yet determined." In Section K (§ Disposal of a few HASS which are not suitable for disposal in existing LILW repositories) it is indicated (p.93): "The disposal plans for HASS have not proceeded during the reporting period. The few HASS sources that do exist will be addressed as part of the Finnish national waste management plan and currently there is no operating facility that could dispose of these

sources".

In addition, in Section K (§ Disposal of non-nuclear radioactive waste) it is specified (p.96): "The revised (in 2012) licence conditions of the Olkiluoto LILW disposal facility have enabled the disposal of non-nuclear waste, including sealed sources at the Olkiluoto LILW disposal facility. They started at the end of 2016. Sealed sources containing nuclides causing the highest doses (C-14, Ra-226 and Am-241) are packed separately and are still stored in the interim storage."

Could Finland specify the expected schedule for disposal of HASS causing the highest doses (sealed sources containing C-14, Ra-226 and Am-241)?

Answer As disposal of the major part of non-nuclear radioactive waste started in the end of 2016, situation overall has been enhanced and the challenge for managing few higher activity HASS sources can be managed. In practice Finland has safe long-term storage option for these sources and there is no immediate need for disposal. This topic is addressed among other things in advisory group established by MEAE. Possibilities for disposal are for example Posiva's SNF disposal facility or extension of TVO LILW disposal facility. However this requires agreement between state and the licensee and updated safety assessment.

Q.No *	Country	Article	Ref. in National Report
	Luxembourg	Article 28	J, p. 89

Question/Comment The report states that "The annual fee for holding a licence depends on the number of sources in the licensee's possession and, therefore, there is some financial incentive to transfer disused sources back to the provider". What is the approximate annual fee for holding radioactive sources?

Answer The fee depends on the type of practice and number of radiation sources used. Some examples for industry (per year, €): Basic fee: 134, Accelerator: 341, A/B type radionuclide laboratory: 341, C type radionuclide laboratory: 136, Trade of radiation devices (radioactive or X-ray): 179, Maintenance: 201, Sealed sources: 44 or 69, High active sealed source: 341, X-ray device: 83

Q.No *	Country	Article	Ref. in National Report
	United States of America	Article 28	Section J pg. 90

Question/Comment The U.S. commends Finland for including consideration of cooperation with other agencies when missions combine or overlap, and for including a case study describing its experience.

Answer Thank you for the positive feedback.

Q.No *	Country	Article	Ref. in National Report
	Belgium	Article 32	page 22

Question/Comment From the text it follows that at least two transfers or transports of spent fuel are necessary before final disposal of the spent fuel, once from the storage pool inside the reactor building, and a second time from the water storage pool to the encapsulation and disposal facility.

Could Finland please elaborate on the modalities of which these transfers/transports will happen? Specifically, is an option of wet or dry transfer casks already selected?

Answer The transfers from reactor building to interim spent fuel storage are currently operated by the NPP licensees. It is quite routine operation both in Loviisa and Olkiluoto. The transfer/transportations from interim storages to final disposal facilities are currently under planning. The final decisions whether to transfer spent fuel wet or dry will be done later on.

Q.No	Country	Article	Ref. in National Report
------	---------	---------	-------------------------

*	Canada	Article 32	page 31-33
---	--------	------------	------------

Question/ Incineration of waste does not seem to be a chosen method for waste minimization.
 Comment Which methods do the Loviisa and Olkiluoto NPPs use to minimize waste?

Answer Incineration of waste (LILW) hasn't been used in Finland. Only waste with an activity level below the exemption limits can be disposed of in a normal way at the combustion plants.

Waste minimization is defined as main principle of waste management in Nuclear Energy Act and it shall be taken into account throughout the life cycle of the facility planning and design. Main practical tools for the minimization are volume reduction measures, campaigns for removal of very low-level waste from control, and compaction of maintenance waste. In addition In Loviisa NPP, selective ion exchange methods for the purification of liquid waste is used (especially the removal of Cs, Sr and Co). In Olkiluoto, large metallic waste components have been transported for treatment at the Studsvik facility in Sweden which reduces the volume of treated waste significantly.

Q.No	Country	Article	Ref. in National Report
*	France	Article 32	Section B - pages 24-26

Question/ In Section L5 (Decommissioning of the Finland's first nuclear reactor FiR1) of the Finish
 Comment Report, it is written:

“The fuel is subject to the return programme of the US DOE running until May 2019. The primary scenario for the management of the nuclear fuel is to send it back to its country of origin, specifically to Idaho National Laboratory in the USA, where batches of nuclear fuel from TRIGA research reactors have previously been returned from various countries. Presently the programme has however halted, as Idaho State has stopped all nuclear waste transports to Idaho National Laboratory (INL) due to breaches of the Idaho Settlement Agreement. VTT considers return to US as the primary option for the spent fuel, and is preparing licensing and contracts required for fuel's return and transport while waiting for the issue to be resolved. The secondary option would be disposal in Finland. However, this would require special additional licensing for the encapsulation and spent fuel disposal facilities currently under construction in Olkiluoto”.
 Given the uncertainties on the FiR 1 spent fuel return to the USA (as explained in Section L5), could Finland provide additional information about the provisions foreseen for the interim storage and the encapsulation (location, license...)?

Answer VTT is responsible for the FiR1 spent nuclear fuel. The primary option is repatriating FiR1 spent nuclear fuel back to USA. As a secondary plan for FiR1 spent nuclear fuel management VTT has presented interim storage and disposal of the spent nuclear fuel to Finland. VTT has preliminary discussed about the possibilities for interim storage of spent nuclear fuel from FiR1 at NPP operators. This would require a contract between VTT and the NPP operator and naturally licensing of the interim storage. VTT has also started preliminary negotiations about the disposal of the FiR1 spent nuclear fuel to Finland with Posiva, to be prepared for the possibility that repatriating of the FiR1 spent fuel to USA will not happen. Also disposal would need a separate licensing process. A ad-hoc group to improve the national plan for waste management invited by Ministry of Economic Affairs and Employment started its work in 2017. It will also address some issues related to FiR1 decommissioning. More information on the group is given on p. 96 of the national report.

Q.No	Country	Article	Ref. in National Report
*	Germany	Article 32	pp. 28, 29, Section B

Question/ Following your description given on p. 29, postponed dismantling should be the preferred

Comment decommissioning option if nuclear infrastructure is prevailing on a site like Olkiluoto, while its absence leads to the decision of immediate dismantling as it has been decided for at Loviisa.

On the other side, the decay of radioactivity is often said to lead to future problems in waste characterisation, as the nuclide content is mostly determined by using nuclide vectors and easily detectable reference nuclides that decay in the medium term (e.g. Co-60). This is one of the arguments supporting, in general, a decision for immediate dismantling. While preferring postponed dismantling at Olkiluoto, does Finland see any challenges arising from a decreasing accuracy of radionuclide vectors for waste characterisation?

Answer According to the Section 7 g of the Nuclear Energy Act dismantling the facility and other measures taken for the decommissioning of the facility may not be postponed without due cause. According to the Guide YVL D.4 if the decommissioning strategy involves a prolonged period of monitored storage prior to the dismantling of the facility, this shall be justified by considerations such as radiation protection optimization, co-implementation of the decommissioning with other nuclear facilities at the same site, or the availability of disposal facilities.

The decreasing accuracy of the waste characterization during monitored storage is taken into account by requiring characterization during the operation and immediately after closing of the facility. According to the Guide YVL D.4 at an operating nuclear facility, activity and surface contamination measurements shall be carried out and the results recorded on a regular basis to provide baseline data for planning and designing the decommissioning of the facility. At a permanently closed nuclear facility, a comprehensive activity and contamination level survey and recording programme shall be implemented to update the activity data used as the baseline in the final decommissioning plan.

Q.No	Country	Article	Ref. in National Report
*	Japan	Article 32	31

Question/ Comment In the Table 1 of Section D (Article 32) @page 31, method of interim storage for spent nuclear fuels are not dry storage but wet (pool) storage. Is there any concern which prevents to introduce dry storage in Finland?

Answer All spent nuclear fuel is stored in the wet storage pools in Finland. In principle, the Finnish legislation doesn't prevent the licensing of dry storage but the more detailed requirements are set only to the wet storages. At the moment there is no plans for using dry storages in Finland. If a licensee decides to build a dry storage, there would be a need to update to the Finnish requirements.

Q.No	Country	Article	Ref. in National Report
*	Japan	Article 32	28-29

Question/ Comment We could not find any descriptions about national strategy on NPP decommissioning and, depends on the description of this section, the planning decommissioning strategy of 2 NPP sites in Finland (Loviisa and Olkiluoto) look like quite contrastive. Is there any national strategy (or policy, decision, principle, vision etc.) in Finland to provide necessary assumption for adequate funding of NPP decommissioning?

Answer According to the Section 7 g of the Nuclear Energy Act dismantling the facility and other measures taken for the decommissioning of the facility may not be postponed without due cause. According to the Guide YVL D.4 if the decommissioning strategy involves a prolonged period of monitored storage prior to the dismantling of the facility, this shall be justified by considerations such as radiation protection optimization, co-implementation of the decommissioning with other nuclear facilities at the same site, or

the availability of disposal facilities.

In Finland, each licensee is responsible for all ongoing costs caused by radioactive waste management and decommissioning of nuclear facilities. The rationale of the funding system, which collects financial provisions from the waste generators for radioactive waste management and decommissioning, is to ensure that the funds for the future waste management are collected that the assets are available even in the case where the waste generator is unable to fulfil its obligations.

The National Nuclear Waste Management Fund is set up in the Nuclear Energy Act. The Fund is independent of the State budget.

Q.No	Country	Article	Ref. in National Report
*	Korea, Republic of	Article 32	B, p.21

Question/ Comment B describes the discharge on liquid and gaseous radioactive wastes generated from operating nuclear facilities.

(1) In general, sampling and analysis should be implemented before the gaseous radioactive effluents are discharged to environment. Please explain the sampling method, sampling time(duration), analysis frequency, and radionuclides to be analyzed, for particulates, noble gas, iodine, C-14 and H-3 in the gaseous effluents.

(2) Sampling and analysis should be implemented before the liquid radioactive effluents are discharged to environment. Please explain the sampling method, sampling time(duration) and analysis frequency for difficult-to- measure radionuclides such as C-14, Ni, Fe, Sr-89, Sr-90 in the liquid effluents.

Answer Any significant release paths of radioactive substances into the atmosphere and water shall be monitored using stationary and continuously operating radiation monitoring systems. The monitoring of radioactive releases is addressed in more detail in Guide YVL C.3.

(1) Noble gases are measured continuously from the vent stack. In addition the samples are taken from the vent stack to the laboratory for a more accurate analysis. Noble gases (Kr-85, Kr-87, Xe-133), iodine (I-131) and aerosols (all nuclides) determination is made weekly, if not more frequently from the samples. Alpha activity (total and Am-241), H-3 and C-14 are collected and measured in laboratory monthly. Also Sr-89 and Sr-90 are measured from the samples in quarterly. Only noble gases sampling time is short, other sampling times are the same periods as above mentioned.

(2) Also, a representative sample shall always be taken of any liquid releases. The sampling of any significant releases shall take place automatically from the release line; if not, samples shall be taken beforehand from the effluent system concerned separately for each release batch. Gamma activity (significant nuclides) is measured from release batch-specifically. Alpha activity (total and Am-241) and H-3 are determined from a composite sample representing the total release over a period of one month. Sr-89 and Sr-90 are analyzed on a quarterly basis from a sample representing total releases of the period.

Q.No	Country	Article	Ref. in National Report
*	Luxembourg	Article 32	B, p. 19

Question/ Comment According to the Nuclear Energy Act “the nuclear waste producer is responsible for the costs of the nuclear waste management and decommissioning and for the provisions of the future costs”. Does the principle of covering future costs also apply to radioactive waste from non-nuclear activities? If yes, how to ensure that producers then cover possible future costs?

Answer Based of the Radiation Act 50 §, the responsible party shall take the measures necessary to render harmless any radioactive waste arising from its operations. This includes the financial cost. The operator, usually through a recognised installation, sends radioactive waste to the State facility in Olkiluoto. When storing waste, STUK as the operator, is paid a standard fee which is presumed to cover all future costs as well. When STUK receives the waste, the responsibility is transferred to the State as well as any further financial obligations.

Q.No *	Country China	Article Article 32.1.2	Ref. in National Report B, P23
-----------	------------------	---------------------------	-----------------------------------

Question/ Comment It is mentioned that Fennovoima will be responsible for its own spent fuel disposal. Does it mean that it is possible to build another repository for spent fuel disposal besides the ONKALO repository? Is it possible for the ONKALO repository to receive spent fuel generated from the Hanhikivi NPP?

Answer Fennovoima started an environmental impact assessment process for a spent fuel disposal facility in June 2016. The goal of this process is to support decision in principle and site selection for the disposal facility of its own. Parallel to this EIA process Fennovoima is also aiming for negotiations with other NPP operators. It is possible that the spent nuclear fuel from future NPP at Hanhikivi would be disposed of in the same disposal facility but this would require an agreement between TVO, Fortum and Fennovoima. In addition to the agreement a licensing process for Hanhikivi-1 spent fuel disposal would be required including municipality's acceptance in the decision in principle stage.

Q.No *	Country China	Article Article 32.1.2	Ref. in National Report B, P24
-----------	------------------	---------------------------	-----------------------------------

Question/ Comment It is mentioned that in terms of the Finnish disposal concept for spent fuel, there are vertical and horizontal disposal options (i.e., KBS-3H and KBS-3V). Has Finland made comprehensive research and comparison between the two disposal options? What are their respective advantages and weaknesses? Which disposal option will be finally used by Finland for disposal of spent fuel as approved by STUK?

Answer Posiva, the implementer responsible for disposal development, has evaluated both concept variables. KBS-3V is comprehensively tested and demonstrated and KBS-3H has gone through large development and demonstration programme. Currently Posiva has planned to use KBS-3V. The advantages seen in KBS-3H are for example less excavation volume and possibly easier QC of emplacement.