QuestionId	Question	Comment	Answer
16623	Regarding the general public acceptance of deep geological disposal facility construction, are considered organized public hearings as the most effective tool for public communication in the licensing process, or are there other (better) ways to build public trust and respond to public concerns?		In addition to public hearings, to build public trust, the open communication to public is performed. For example, the oversight project of disposal facility at STUK publishes an information bulletin every fourth month about resent oversight activities. The bulletin is published on STUK's website. It will also be the subject of a press release and will be announced on STUK's social media platforms. In general, a good media service is particularly important in Finland in order to convey information and gain trust of citizens.

QuestionId	Question	Comment	Answer
16624	Can you describe the progress made in the implementation of the Recommendation 13 of the working group YETI concerning the environmental impact assessment for the updated National Programme?		The Ministry of Economic Affairs and Employment and the Ministry of Social Affairs and Health in cooperation with the Radiation and Nuclear Safety Authority have prepared a programme on the management of spent fuel and radioactive waste in Finland. In connection with the preparation of the national programme for the management of spent fuel and radioactive waste, an environmental impact assessment of the programme was carried out in accordance with the Act on the Assessment of the Effects of Certain Plans and Programmes on the Environment (200/2005). The environmental impact assessment focused in particular on the environmental impact of the objectives and development targets of the national programme. The focus of the impact assessment was on the impact of achieving or not achieving the objectives, particularly at the societal level. For some impacts, the scope of the assessment extends to impacts on the environment of operators. The national programme and the environmental impact assessment are published 1st of March 2022 (https://tem.fi/en/national-programme).

QuestionId	Question	Comment	Answer
16625	Article contains an information about financial framework according to the provisions of Nuclear Energy Act, however there is no information about financing of deep geological repository in Olkiluoto. Does it mean, that the funds collected cover the construction cost of deep geological repository?		The financing of the construction and operation of the deep geological repository is included in the Finnish waste management fund VYR. All estimated costs of future waste management are collected to the fund, including decommissioning of facilities and all nuclear waste disposal. The fund targets of licensees decrease when they implement waste management steps.
16626	Article 10 does not contain any information about deep geological repository in Olkiluoto, as the Chapter H contains an information about radiation protection for the spent fuel repository, however there is no information related to Olkiluoto deep geological repository under construction.		As mentionned in page 82, disposal of spent fuel is discussed in the Section H. In Section H, Posiva is quite often mentionned. This company is the licensee and future operator of the spent fuel disposal facility. This term is used in the report and it is the synonym for spent fuel repository and Olkiluoto deep geological repository. These all mean the same facility which is under construction at the moment.
16627	Has Finland got any experience with situation, when public/green organisations were against to transboundary movement of radioactive waste for treatment on a commercial basis (import radioactive waste for incineration or melting)? How did you deal with it? Is there any implementation of a policy of transparency comprising the exchange of information and communication (particularly with the general public and civil society) in case of transboundary movement (import of radioactive waste for treatment) in Finland?		According to Nuclear Energy Act, transporting radioactive waste abroad is denied. Only exception is if radioactive waste has to be transported abroad for research purposes. In the past these situations have occurred very seldom. Within these situations public or green organisations have not been against these cases. Generally the information related to transportations (timeschedules and routes) are classified information in Finland. The information is shared only to persons or organizations needing the information in their work which makes it more difficult to public or green organizations to disturb the transportations. In general public involvement in using of nuclear energy is in connection with licensing nuclear facilities not specifically due to transboundary movement as it is so rare.

QuestionId	Question	Comment	Answer
16960	It is stated “ highly activated waste has not been conditioned but is stored at the NPPs and is expected to be conditioned and disposed of together with similar types of decommissioning waste.” Is the highly activated waste generated during operation and decommissioning of the NPPs expected to be disposed of in the deep geological repository with the spent fuel?		The current plan is dispose the highly activated components from operation and decommissioning to the bedrock repositories of low and intermediate level waste.
16961	The purpose of the State Nuclear Waste Management Fund (VYR Fund) is to collect, store and reliably invest the funds that are going to be needed to take care of nuclear waste in the future. Is the fund used to pay for all phases of the deep geological repository? If not who pays for the deep geological repository?		The VYR-fund is used as financial backup in case of bankrupcy. The NPP operators will pay for the waste management (including the geologigal disposal). When certain action has been performed the company will get the money (reserved for the action) back from the VYR-Fund.
16959		"“The release of waste from regulatory control (clearance) is regulated by Guide YVL D.4. Both conditional and unconditional clearances are effectively used for waste minimization by the NPPs.” It is a good practice to use clearance for waste minimization. "	No question

QuestionId	Question	Comment	Answer
17113	In the report, Figure 6, disposal tunnel and canisters with both the vertical (KBS-3V) and horizontal (KBS-3H) disposal options are depicted in the drawing. It shows both vertical and horizontal emplacement of spent nuclear fuel. Please explain the engineering criteria, the waste types, and other radiological considerations that would determine whether vertical or horizontal emplacement is selected for disposal.		In the constrcution licence phase Posiva applied licence for vertical and horisontal disposal options. However currently in the operational licence Posiva is applying licence only for the vertical option.
17114	The report states that building-up competencies of “new resources and employees in the field of radioactive waste management is a shared concern of many interested parties (government, regulators, licensees, research institutes, universities).” Please elaborate on any succession planning to replace the aging employees who will be retiring, including how this will be carried out.		Each license holder and operator is responsible for the development and the maintenance of competencies of their organisation. In addition to that, the main organisations in the nuclear energy area in Finland have developed and organized courses, research projects and other training for young experts as descripted in the JC Report. Currently the main organisations in the nuclear energy area are planning a new research programme called SAFER (abbreviation of words SAFety and wastE management Research) which will continue the work of current KYT and SAFIR programmes and will also include new doctoral education network. The doctoral education network will also be funded from the VYR Fund. Finland had international evaluation of current KYT and SAFIR programmes as well as a draft framework programme for SAFER in spring 2022, and we received practical recommendation on how to enhance thematic competences. A more detailed competence review of human resources in the nuclear waste management sector, compared to the review prepared in 2017, will be performed during 2022.

QuestionId	Question	Comment	Answer
18063	Could Finland provide any preplanning (before a nuclear emergency) considered for waste management as part of the overall emergency preparedness and in the context of larger recovery effort as defined in the IAEA TECDOC 1826 Management of large volumes of waste arising in a nuclear or radiological emergency.		Finnish nuclear energy legislation and regulations do not include requirements for management of large volumes of waste arising in a nuclear or radiological emergency.
18253	Suomen Nukliditekniikka is the only private enterpreneur authorized to collect, repack and transfer disused sources. Is their permit revised on a regular basis?		The safety license is valid until further notice. The validity of the license is checked during inspections and other forms of compliance assurance.

QuestionId	Question	Comment	Answer
18493	In Section B under heading “Management of non-nuclear radioactive waste”, the report states that certain types of sources are treated and conditioned before being transferred “to a central storage operated by STUK.” Similarly, in Section J under the heading “Handling of disused sealed sources”, the report states “TVO has leased a storage cavern to the state in the LILW disposal facility at Olkiluoto for the interim storage of non-nuclear radioactive waste.” 1.Please can you clarify whether STUK is the operator of the store. 2.Please can you describe the control of operations for the interim storage of these wastes (as this is not described in Section E). 3.If the operator is STUK, how is regulatory independence maintained?		STUK operates the storage cavern leased from TVO in Olkiluoto LILW disposal facility. Within STUK, the operation of the interim storage for non-nuclear radioactive waste is designated for the Environmental Radiation Surveillance division and the regulation of the waste management is responsibility of Nuclear Waste Regulation and Safeguards division.

QuestionId	Question	Comment	Answer
18494	In Section J under the heading “Handling of disused sealed sources” the report states “TVO has leased a storage cavern to the state in the LILW disposal facility at Olkiluoto for the interim storage of non-nuclear radioactive waste … most of this waste will be disposed of in the disposal facility.” 1.It is not clear from section J in the document where the disposal facility is, although it does say that some sources have been disposed of. Can you clarify if the disposal of the disused sealed sources is to be in the storage cavern leased from TVO or is elsewhere, either as part of the existing Olkiluoto facilities or on some other site? 2.If on some other site, what is the intended location? 3.How long are the sealed sources intended to be in storage in the leased cavern prior to disposal?		The leased storage cavern is part of the TVO's low and intermediate level disposal facility at the disposal depth. Disposal of the non-nuclear radioactive waste is done at the same LILW disposal facility to the silos in which the low and intermediate level nuclear waste from the Olkiluoto NPPs is disposed of. The storage time depends on the waste type and inventory of the waste.

QuestionId	Question	Comment	Answer
18495	In section E regarding the regulatory body, it explains that there is a section of STUK that provides co-ordinated expert services on what appears to be a commercial basis. 1.What is the exact nature of the expert services provided and to whom are they provided? 2.How does STUK avoid a potential conflict of interest between the expert service provided and the regulatory judgement made by its regulatory function?		1. STUK works together with STUK International Ltd., which is a private, State owned company, and offers the expert services to the regulators abroad and international organizations. STUK International Ltd. is mainly using STUK's experts but can also call external experts which will work in cooperation with STUK's experts. 2. STUK is a state regulatory body and operates in Finland. The expert services cover the regulatory framework, roles and responsibilities, legal issues and guidance preparation. The services are offered to the regulators abroad and international organizations, and STUK has no TSO role.

QuestionId	Question	Comment	Answer
18496	The report outlines that spent fuel will be placed into a copper/cast iron container and then placed in a location in the repository, which will subsequently be backfilled with bentonite clay and then the relevant gallery sealed and closed. 1.How long will the condition of the waste cask be monitored prior to enclosure in bentonite clay? 2.At what point is the spent fuel considered to be disposed and thus irretrievable? (for example, is it on placement of the canister in the disposition hole? or the point where the disposition hole is backfilled with bentonite clay? or the point where the gallery is backfilled? or when the store is sealed in totality?)		1. The waste cask will be stored in the encapsulation plant or the underground storage depending on the operational factors between some weeks up to a year. The purpose of the storage is not monitoring. The welding of the cask will be inspected by several NDT methods, and therefore monitoring is not required at this stage. 2. According to the decision in principle, the fuel shall always be retrievable, and from a strictly technical point of view this is obviously the case. The fuel can always be retrieved, if there are strong enough safety or economical reasons to do so. But the safety and implications and cost of retrieving the fuel will rise at every step. In the backfill and closure process there are some major steps (closing of a tunnel, closing of the section of disposal facility and finally closing of the whole disposal facility), but non of these steps will make it technically impossible to retrieve the waste. After the approved closing of the disposal facility the responsibility of the waste will be transferred to the state, but even at this point it would be technically possible to retrieve the waste, although it would be technically extremely challenging and the economical cost would be really high. From a Safeguards point of view, Posiva's and STUK's position is that the fuel elements will not be reverifiable by direct measurement, after the copper canister lid is closed, e.g. copper canisters must not be opened due to failures in safeguards surveillance. Continuation of Knowledge (CoK) must be maintained and stringent dual Containment and Surveillance (C/S) is required after that point. However, according to the

QuestionId	Question	Comment	Answer
18497	In the report under the various areas associated with the disposal of spent fuel, there is no mention of any ongoing monitoring during operation of the spent fuel repository although Section H does outline the post closure monitoring. 1.What is the intended type and range of operational monitoring of the spent fuel repository during the filling operations to allow the operator to understand if there are any issues with the waste canisters over that time period?		The FULL-SCALE IN SITU SYSTEM TEST monitoring started in August 2018 when the heaters were switched on. The commissioning of monitoring programme EBBO (Engineered Barrier Behaviour in ONKALO) was implemented stepwise since the backfilling and construction of the plug were finished in May 2019. The EBBO programme monitors the temperatures in canisters, buffers, backfill and plug; different type of pressures in buffer, backfill and sealing layer, wetting evolution with ERT method and pointwise relative humidity measurements; gases in experimental holes and backfilled tunnel; and buffer and backfill interaction (possible buffer upheave). There is no plans to do this kind of monitoring in the real disposal caverns, but the tests cavern in ONKALO will be monitored as long as the electric heaters inside the canisters and sensors in side the buffer and backfill remain operational.

QuestionId	Question	Comment	Answer
18498	In Section H, the institutional controls post closure such as land use planning restrictions and human interaction are expected to last for around 200 years after cessations of operations, with STUK acting as the archivist of any information. 1.Please can you explain the rationale for appointing STUK as the holder of the archived material? 2.Please can you clarify what is meant by “the state” as the anticipated controlling body regarding planning restrictions following release from regulatory oversight? 3.Please can you clarify if the institutional controls (including the 200 year restriction relating to land use) will also be applied to LILW repository sites?		1. The exact wording is that STUK will organise the long-term archiving of the information. In practice this is done in cooperation with the registry holders and The National Archives of Finland. 2. The ownership of the waste is transferred to the state after the waste has been disposed of in safe manner and the disposal facility is closed as planned. It is not yet decided which state organization will be responsible for the disposal sites. 3. Yes, same measures are applied to LILW disposal.

QuestionId	Question	Comment	Answer
18499	In Section K, under “challenges”, the report highlights maintaining and developing competencies in decommissioning for both regulator and licensee. 1.What plans are being put in place to address this perceived shortfall? 2.How will success in addressing this shortfall be measured?		1. As Finland is facing the first decommissioning project, the first aim is to learn from the experience in decommissioning of a FiR 1 research reactor. In other words, documenting the experiences and taking them into account e.g in legialation and regulations I21development. After the licensing phase the knowledge on the challenges in the decommissioning project has already increased. Also some development needs on legislation and requirements have been identified. Regulatory work needed for decommissioing is the same (inspections, document review) as required for the operating nuclear facilities. Licensee shall ensure that they have all competences available required for decommissioning. The competences can be acchieved by learning from other decommissioning projects and also by doing. The most important competences for decommissioing (e.g. radiation safety and radioactive waste management) they already have in their organisations. 2. The development of competences is seen later on in the legislation and regulation, which is targeted to decommissioing projects instead of operating units and which takes into acoount the lower radiation safety risks of decommissioing. It can also be seen on well targeted document reviews and inspections. Within the licensees, it can be seen in better decommissioing planning.

QuestionId	Question	Comment	Answer
18500	In Section H under heading “Protection of individuals, the society and the environment” in “Decommissioning of the research reactor”, there is a statement that all water produced during decommissioning shall be collected in tanks and will not be released until measured and found to be clean from radioactivity. My questions are as follows: 1.What is the definition of “clean” from radioactivity? (for example, are there limits that must be achieved for different nuclides?) 2.How is this achieved? (for example, is this simply via radioactive decay or is any treatment required?)		1. Release limits of FiR 1 for waters are set in the Operational Limits and Conditions of A Nuclear Facility. For FiR 1, they are H-3 100 Bq/g, Co-60 0,1 Bq/g, Cs-137 0,1 Bq/g and Eu-152 0,1 Bq/g. 2. Radioactive deacay is the first option.
18501	Pages 71 and 97 of the national report indicates that Fennovoima has started an Environmental Impact Assessment process for its own spent fuel disposal facility. 1.Could Finland comment on the risks and benefits, at the national level, for having two deep geological disposal facilities for spent fuels? 2.Please can you comment on the degree of public acceptance of a second spent fuel disposal facility?		In this point, Finland has not made a decision whether we will have one or more disposal facilities for spent fuel in Finland. Fennovoima has currently two options open, i.e. the development of more close cooperation with Posiva and its owners or have a disposal facility of their own.

QuestionId	Question	Comment	Answer
18502	From page 96 onwards, the national report describes siting, licensing and safety assessments of LILW repositories. 1.Could Finland give further detail on potential public consultations on LILW repositories 2.Please can you comment on the degree of public acceptance in relation to these repositories.		The operating LILW repositories were constructed already in late 1980's and 1990's. The public consultations were not required at that time. Nowadays the licensing of any nuclear facility starts with an environmental impact assessment (EIA) process, in which there is the first possibility for a consultation with the public. The statements can be given and the project is discussed with public in the hearings. After EIA, the licensee can apply for Decission in Principle from the Government. In this process, there is also a possibility to give statements and public hearings are arranged. The community have a veto-rigth at this stage. The community in question can deny the construction of the nuclear facility in to its area. Parliament can either approve or disapprove the application for decission in principle. The latest decission in principle was granded for Fennovoima to construct NPP to Pyhäjoki in 2014. This decission in principle included several nuclear facilities; NPP, interim storage for spent nuclear fuel and LILW repository located in the same site. As can be guessed, the discussion was focused on construction of the NPP, not so much on other facilities. In addition to these hearings in the licensing process, the license applicant is of course comminicating with the local people during the whole prosess. Also authorities are usually asked to join these events to shere information on safety issues. In general, it can be said that the people living near the

QuestionId	Question	Comment	Answer
18503	The National Report provides an overview of the regulatory requirements for siting of near-surface facilities (such as the LILW at the NPP sites). 1.Please could you explain the main factors that were taken into account when determining the siting of existing near-surface facilities. 2.Please explain how your experience in the siting of existing near-surface facilities is to be taken into account in considering any proposed new near-surface facilities.		In the late 1970's and early 1980's the power companies TVO and Imatran Voima (Fortum) initiated the site investigations in order to proceed with the plans to dispose LILW into the bedrock at NPP sites. The construction and operating licenses for LILW disposal facilities were granted to both companies. According to the current legislation the construction of a major nuclear facility requires DiP. In the case of a new nuclear power plant the disposal facility for LILW is included in the DiP application of the power plant. At this stage the site investigations are performed in the scope to show that the disposal facility can be constructed on site. Later the detailed investigations are perquisite for the construction license of the LILW disposal facility.
18878	It is stated that the license applicant must establish the decommissioning strategy during the design phase of the nuclear facility. - Does decomissioning strategy mean either immediate decommissioning (DECON) or deferred decommissioning (SAFSTOR)? - Are the items to consider when selecting the decommissioning strategy set as requirements?		The licensee can propose a immediate or deferred dismantling strategy. The deferred dismantling strategy needs to be justified (e.g. with nuclear waste management optimization, radiaction decay). The items to consider, when selecting the decommissioning strategy are not set in any requirements.

QuestionId	Question	Comment	Answer
18879	Article 26 stipulates that the records of information important to decommissioning shall be retained. - How do you retain the records of important information when decommissioning nuclear facilities? - If records are retained, what items are included related to decommissioning?		Licensees are collecting the information important for decommissioing planning and implementation in to their plant databases e.g. plant modifications are documented and used for the decommissioning planning. In addition, the licensee shall keep the records on operational events, which can also effect to decommissioning planning. Also the activity inventory data shall be kept for the decommissioing planning. Licensees has different ways of storing the data, but mainly they are stored in various databases.
18880	The Nuclear Energy Act (Section 7g) states that the design of a nuclear facility must provide for the facility's decommissioning and that the related decommissioning plan should be presented. - What is described in relation to the decommissioning facilitation of Olkiluoto-3?		Decommissioning is taken into account for example in material selection, in design solutions (e.g. lining of the rooms, pipings). The design shows also that the big components like pressure vessel can be removed by using the same systems as used during the installation.
18881	Article 26 states that the provisions of Article 25 with respect to emergency preparedness are applied at the time of decommissioning. - Does emergency preparedness applied during operation of nuclear facilities apply equally to decommissioning?		The requirements for the emergency arrangements of NPP's are given in STUK regulation STUK Y/2/2018, which is also applied for other nuclear facilities as required by the danger they pose. The more detailed requirements concerning emergency arrangements are given in Guide YVL C.5. During the operation of NPP above mentioned requirements have to be fullfilled. During the decommissioning the requirments can be relaxed by a separate decission of STUK to take into account the danger the facility can pose (graded approach). For example after the removal of spent nuclear fuel from the NPP, the emergency arrangements can be lighter than at the time when the spent fuel is still in the reactor.

QuestionId	Question	Comment	Answer
18882	It is stated that subcriticality is confirmed during handling, transportation and disposal of spent fuels, and especially the long-term safety of the disposal canisters is confirmed with conservative assumptions. - What are the test methods to confirm subcriticality? Is subcriticality periodically managed? - What are included in the "extremely conservative assumptions" written in the text?		The criticality safety has been assessed with dedicated analyses using various codes e.g. MCNP, SCALE and CASMO-4E. Special calculations have been made and calculation methods have been developed to analyse the long-term criticality safety. The used codes have been validated for the criticality calculation according to international standards and accepted principles. Calculations have been made for the disposal canister and the encapsulation plant. The assumptions made and the parameters used are chosen accordingly to conservative calculations. The extremely conservative assumptions include the choice of parameters of the conservative side and especially a conservative approach to burn-up credit and the isotopic composition of the spent fuel. It involves the choice of isotopes included in the calculations in a way that minimises the loss of reactivity through the absorption of neutrons over the whole calculation time. In addition, conservative assumption have been made on the degradation and behaviour of the structural material of the disposal canister. The conservatism here is interpreted in how the choice affects criticality safety and especially over the entire long-term calculation span.
18883	It is stated that the periodicity of safety assessment on low- and intermediate-level radioactive waste disposal facility is 15 years. What is the basis for determining the 15-year frequency?		The period of PSRs for nuclear power plants are 10 years. The period of PSRs for disposal facilities has been set as 15 years based on graded approach. The disposal facilities do not change much during their operating lifetimes, and they do not age technically in a similar manner to NPPs. The safety of disposal facilities is verified with inspection programmes and condition monitoring between the PSRs.

QuestionId	Question	Comment	Answer
18884	If, following a long-term preliminary site survey and feedback collection, construction license is given for a disposal facility, a comprehensive/integrated review seems more efficient as the process looks more like a preliminary permission for multi-level administrative procedure with operation expected to take place when the facility satisfies the criteria for operating license. Were there policy considerations or technical background and reasons for granting the construction license and operating license independently?		Independent construction and operating licences are based on legislation from 1957. The original considerations cannot be found anymore. However, several advantages of the independent construction and operating licences can be seen. For example, as the disposal facility projects are very long, different licence phases enables regular review of the project appropriate to the project status. Licencing is seen the most important means of supervision in the current legislation from 1987. In Finland, the licencing of a disposal facility, excluding a near-surface facility for very low-level wastes, starts with decision-in-principle phase, when the Government considers whether the construction of a disposal facility is in line with the overall good of the society. The decision-in-principle is granted by the Government, after which Parliament either approves it as such or rejects it. Thus, the policy considerations are emphasised in the beginning, although the overall good of the society in considered in all licence phases. Finland has decided to perform a comprehensive reform of Nuclear Energy legislation. Based on current plans, the new law could enter into force in 2028.
18885	It is stated that the encapsulation and disposal concept for spent nuclear fuel does not include any hazardous or harmful materials except nuclear waste. - Is there a plan to manage spent nuclear fuel which includes hazardous or harmful materials?		The encapsulation and disposal consept is designed to spent nuclear fuel that is in a form of entire fuel bundles as they have been in a reactor and further in interim storages. So far concept is not designed for any other form of nuclear fuel.

QuestionId	Question	Comment	Answer
18886	It is stated that the orphan sources, whose owners cannot be identified, are delivered to the State interim storage at Olkiluoto. - Who is responsible for such delivery? - Who assumes the responsibility for paying the costs of managing and disposing of the orphan sources?		The responsibility of the delivery depends on the situation. The possibilities are: 1) the source is taken in by STUK and delivered to State interim storage by STUK 2) if the finder of the source has a safety license for orphan sources, they will take care of the delivery and costs. 3) the finder contacts Suomen Nukliditekniikka and makes arrangements to transport the source there. The decision whether STUK takes care of the costs (1 & 3) is taken on a case by case basis based on Radiation Act 80 §. So far, if the finder is e.g. a small scrap metal company, STUK has taken care of the disposal costs.
18887	It states about the developing competences and the regulatory framework for decommissioning. - How are the competences for decommissioining being developed?		The competences for decommissioning are developed by learning from experiences of other countries for example in conferences and workshops. We have also asked directly advices from other countires on how to arrange for example the regulatory oversight during the decommissioning of a nuclear facility. We are trying to learn as much as possible from our first decommissioning project (FiR 1 research reactor decommissioning) and use this experience in the future in the development of regulations and YVL guides for decommissioning.
18888	It is stated that the recent updates of legislation identify VLLW disposal. - What was the reason behind the decision to identify VLLW? - Has the packaging concept for the VLLW disposal facility been decided?		The disposal facilities for very low level waste (VLLW) can be constructed close to surface. It is recognized that the disposal of VLLW into surface facilities saves space in the LILW disposal facilities constructed in the bedrock. Especially large part of the decommissioning waste will be classified as VLLW. The packaging concept of VLLW has not yet been decided. TVO, the operator of the first VLLW disposal facility, will present the packaging concept for approval in the license application.

QuestionId	Question	Comment	Answer
19757	In the report it is stated that STUK's review of the post-closure Safety Case identified the need to "further improve the post-closure safety case by clarifying the safety arguments and the related methods and by reducing the uncertainties concerning the performance of barriers". In relation to the challenge from the 6th meeting (Section K, p. 114, "Regulatory communication to improve the general public´s understanding of disposal safety", could you comment on, and possibly give some examples of, the pedagogical challenges you have encountered in communicating review results of the aforementioned type, i.e. assessing the fulfillment of the construction license application while at the same time stressing the need for improvement regarding e.g. uncertainties associated with barrier performance?		STUK wished to get clearer safety argument chains from Posiva so that it would be easier to assess the level of understanding Posiva has on barrier performance. That would require well justified estimations on the range of conditions in which the repository works as planned. Communication to the public is a continuous challenge in post-closure safety. The very long timespans are difficult to understand, and application and meaning of dose constraints for very far future are not always easy to explain. The key challenge is to present the risks of disposal in relation to other, more familiar risks to enable development of understanding.

QuestionId	Question	Comment	Answer
19758	The focus of STUK's regulatory control of the Olkiluoto spent fuel disposal project related to RD&D efforts has changed from an overall safety case development perspective to demonstration of the disposal system processes and the emplacements of the disposal canisters. Has the requirement of this shift of focus, as a natural result of the ongoing development of the disposal facility, had any implications on e.g. the availability of experts and tools for regulatory oversight? Analogously, has the fact that the development of the disposal facility into more a construction focused phase from a more research based and conceptually oriented phase resulted in any difficulties or implications in either attracting new competence or keeping existing compentence (on both the implementor and regulator sides)?		The personnel working with regulatory control of the Olkiluoto spent fuel disposal project is group of people from various expertises. As the focus in project has proceeded, new experts have been reqruited and some have changed or modified their expertize profile. Also, when specific expertise is needed concerning a technical sector in constructing, experts from NPP regulatory control are also being used quite flexibly. So far any major difficulties hasn't been observed.

QuestionId	Question	Comment	Answer
19759	Regarding the updated post-closure safety case for the Loviisa low- and intermediate-level operational waste disposal facility, it is stated that it addressed both the constructed parts and the planned parts for the decommissioning waste disposal. From a regulatory review perspective, could you elaborate on the challenges in e.g. assessing the adequacy of the conceptualization (in terms of e.g. initial state representation in the safety analysis report) for the constructed parts of the disposal facility in comparison to the parts of the extension described within the frames of a reference plan?		The PSR of the Loviisa LILW disposal facility was for the licensed, already existing facility. From the review perspective, it would have been desirable to have clearer division in the safety case for the existing facility and its designed extension. The existing facility is well known, and the assessment can be based on design. For the extension, plans are still preliminary and subject to change. Overall, STUK finds the assessment of safety both for the existing facility and its planned extensions highly useful. It enables better preparation for the planning of the extension and can raise issues in advance so that they can be timely solved.
19760	It is stated in the report that the Full scale in-situ system test (FISTT) has been initiated. Furthermore, it is stated the test involves instrumentation and monitoring of the performance of EBS components as well as monitoring of the environment in the FISST tunnel and in demonstration area. What parameters are being monitored in order to evaluate the EBS evolution? As a consequence of the different choices of buffer geometries in the two deposition holes, has any implications of the different approaches yet been identified?		The FULL-SCALE IN SITU SYSTEM TEST monitoring started in August 2018 when the heaters were switched on. The commissioning of monitoring programme EBBO (Engineered Barrier Behaviour in ONKALO) was implemented stepwise since the backfilling and construction of the plug were finished in May 2019. The EBBO programme monitors the temperatures in canisters, buffers, backfill and plug; different type of pressures in buffer, backfill and sealing layer, wetting evolution with ERT method and pointwise relative humidity measurements; gases in experimental holes and backfilled tunnel; and buffer and backfill interaction (possible buffer upheave). In addition, the Olkiluoto Monitoring Programme produces information on the host rock behavior around the installed EBBO. It seems that in the early evolution the hydrogeological properties have more influence on the buffer behavior than the selected buffer design. Detailed information is available only to the participating WMOs.

QuestionId	Question	Comment	Answer
19761	It is stated in the report that based on STUK's construction license review, Posiva has not yet fully demonstrated the feasibility of the emplacement of disposal components according to the latest design. In relation to this the manufacture and installation of engineered barrier components are mentioned as examples of this concern. Could you please expand on these aspects and possibly give some examples of identified challenges in these regards?		At this time Posiva has done the demonstrations and there are no more issues. At the time the issue was that only small scale tests had been done and it was unclear wheter addequate quality could be achieved in the large scale industrial operation. Also the emplacement machinery was yet to be demonstrated in operation. The emplacement demonstrations were done in FISST, and the findings from there were used in the empalcement machines to de used in the disposal process.
19914	Is the operating organization supposed to be responsible for or take part in further control of the SNF disposal facility following the expiration of a 200-years-long institutional control period?		No, operational organization is released from their responsibilities after the disposal has been completed and accepted by STUK. One part of the closure plan that the operating organisation has to provide for the regulator before the closure is a plan for the potential post-closure monitoring measures and a proposal for the restriction zone with prohibition on measures.

QuestionId	Question	Comment	Answer
19915	What were the key changes introduced at the stage of nuclear facility design development or what changes are going to be introduced due to the wide-scale application of the BIM-approach in design development and construction?		Main thing was the decision that all the design work is required to be done using BIM-software. IFC model delivery with Posiva specific additional information is mandatory and that is an ongoing process. IFC models are combined together as Combination model and the separate IFC models are way to deliver design information within separate design parties. BIM model are used e.g.: •User-centered design – user feedback in design control •Clash Detection •Design reviews •Quantity and cost estimation •Manufacture phase •Construction site •Facility management
19916	Are there any information BIM-models or comprehensive digital twins of nuclear facilities involving digitally simulated NF operation processes (model of NF operational stage) and NF decommissioning concept (decommissioning concept model) in place or are these envisaged to be implemented at the design development and construction stage?		The encapsulation process at the encapsulation plant is simulated in Virtual Reality model. There one may review any stage of the process in any location. Virtual Reality model is done based on the actual IFC-models and the animated process is done based on the process sheet.
19917	Are there any plans on the development of a pan-European set of requirements and rules (standardized template) for the exchange of data on nuclear facility decommissioning designs?		No, not currently.

QuestionId	Question	Comment	Answer
19918	Section L.3 “Posiva’s programme for spent fuel disposal” (pp.137-138) says that reports summarizing the findings of the Full scale in-situ system test (FISST) are being developed. Are you going to publish the experimental data (for example, assuming their further application in international benchmark models and computer codes)?		Typically Full-scale demonstration like Prototype Repository, FE Experiment, FEBEX, plugging experiments as part of the DOPAS are implemented wholly or partly by co-funded European projects and the results of these experiments are public. Usually one part of the demonstration is to model the experiments and use the data sets received from the experiments to evaluate the outcome of the demonstration. FULL-SCALE IN SITU SYSTEM TEST (FISST) – continued by ENGINEERED BARRIER BEHAVIOUR IN ONKALO® (EBBO) is financed and implemented by Posiva only. Participation of external WMOs was organized by commercial conditions by Posiva Solutions and Posiva. The data has been used for models by Posiva and by participants and their specific consultants. The experimental data will not be published.
19919	Could you please indicate the LILW waste acceptance criteria for the Loviisa disposal facility? What approaches were used to establish these criteria?		The WAC are based on both operational and long-term safety requirements, and include criteria for various waste characteristics, e.g. external dose rates of waste packages or radioactivity disposed of in the waste caverns. Criteria were established by Fortum experts to support the safe and reliable operation of the final disposal facility. As Fortum operates and has the full responsibility for both the power plant and the final disposal facility, the criteria were chosen to enable management of all L/ILW from the powerplant and to fulfil long term safety requirements. In addition, the criteria inhibit obvious mistakes, ensure control of the activity inventory and require different levels of “stop and think” procedures and/or authority involvement when new or exceptional wastes are dealt with. At the moment only waste from Loviisa NPP is accepted for disposal.

QuestionId	Question	Comment	Answer
19920	As stated in the report by Euratom, in Finland, a deep geological facility (DGF) is expected to be in operation by 2024. One of the DGF safety aspects is the integrity of the drifts walls under heating. In Olkiluoto, this issue was addressed in POSE experiments for boreholes in host rock. However, in some cases the drifts are reinforced with shotcrete. To our knowledge, an In-situ Concrete Spalling Experiment was expected to start in 2019-2020 in Olkiluoto to study the impact of heating on the concrete-reinforced drifts. What is the current status of this experiment and whether its findings are going to be available to public? If yes, when it is expected?		Latest report on the rock mechanics performance assessment of KBS-3V repository at Olkiluoto (Posiva working report 2021-25) is available on Posiva's website. In the report long term stability of the host rock has been analyzed with numerical simulations. Among others, the POSE experiment results has been used in this work.
19921	Another important aspect of the drifts and host rock integrity in general is long-term (dozens of years and more) stress development and relaxation in crystalline rock. As the heat from HLW or SF spreads, the mechanical stress, if the far field grows up, can result in the rock creep. Potentially It can even influence the ground surface above the DGF. The relaxation of this stress can take centuries. What models and assumptions are used to account for such long-term stress and possible rock creep related to it?		The HLW disposal facitlity licensee supports its application with an overall summary “Rock Mechanics of Olkiluoto” (POSIVA 2021-18) that condenses the rock mechanical characteristics of Olkiluoto bedrock. Thermo-hydromechanical characteristics of disposal facility host rock is further described in a separate publication (POSIVA 2021-16). Licensee justifies the rock mechanical performance of facility host and site bedrock in three time frames (initial state, early evolution, long-term evolution) in its Working Report 2021-25. This report also summarises the simulation approach and the scales of simulations. All these reports, and background reports, related are subject to rock mechanical safety review during the current licensing process.

QuestionId	Question	Comment	Answer
19922	Are bituminised waste currently put in disposal at the Olkiluoto disposal facility? What kind of package is used for this waste? How the fire hazard of this waste is taken into account?		Bitumized waste is disposed into Olkiluoto low and intermediate level waste repository. The waste is bitumized into 200 L drums and the drums are placed in to cement boxes for disposal. TVO has analysed that the risk for fire in disposal facility is quite low, but waste silos in disposal facility are equipped with carbon dioxide extinguishing system.
19923	Could you please clarify whether the practice of ‘minor licences’ granted by STUK rather than by the Government is actually a sample of graded approach in licensing of activities?		This practice of 'minor licences' granted by STUK is a sample of graded approach in licensing. These type of minor licenses granted by STUK are defined in The Nuclear Energy Act. Those licenses concern for example nuclear materials, nuclear waste, near surface disposal and dual purpose items.
19924	It is stated in Section B that landfills will be replaced by a near-surface disposal facility for VLLW. Could you please clarify how this will be done? Will Finland construct a new disposal facility for VLLW?		TVO has operated the industrial landfill on site of the NPP. Operational waste of which concentration of radioactivity is low has been released to the landfill applying specific clearance. TVO will close the landfill and therefore the specific clearance is not applicable in the future. The waste in question will be disposed of into the VLLW disposal facility.
19925	Are there any tax benefits or other privileges for residents who live near a RW disposal site?		There are no tax benefits or other privileges for residents who live near a RW disposal site. The community of the disposal site is allowed to carry property tax of disposal facilities as of any type of industrial facility.
19926	Could you please clarify whether the disposal of sealed sources is currently in progress?		Yes, disposal of disused sealed sources is currenlty going on in Olkiluoto LILW disposal facility.

QuestionId	Question	Comment	Answer
20838	P97: "… In the absence of the agreement with Posiva's owners, Fennovoima submitted an EIA programme for the disposal facility to the MEAE in June 2016. …" Fennovoima has a plan for developing a new repository in the future. Why was the agreement with Posiva's owners not reached? Is the negotiation with Posiva's owners still ongoing? Is the current design of Olkiluoto's repository capable for the additional spent fuels from Fennovoima?		Finnish nuclear licensing according Nuclear Act contains steps from Decision in Principle to construction license and operating license. Decision in Principle for Posiva was granted already in year 2002 before Fennovoima's intentions were known. Also the construction license was applied in 2012 and granted 2015. Fennovoima's intentions to utilize Posiva's owners solution for spent fuel was late taking into account that Posiva's owners were committed to proceeding towards final disposal without delays in mid 2020'ies as they had promised to MEAE. Posiva is doing co-operation with Fennovoima and assisting it to do site surveys for suitable final disposal location but negotiations concerning utilizing Posiva's underground facilities are not ongoing. The capacity of Olkiluoto repository is designed and licensed for its owners spent fuel coming from three existing units in Olkiluoto and two existing units in Loviisa. Fennovoima's spent fuel is therefore not included in Posiva's operation license or safety case.

QuestionId	Question	Comment	Answer
20839	P29: "Spent fuel from the FiR 1 is currently stored on site…. . Currently, VTT and FPH have a 5-year agreement on interim storaging (starting from licensing) of the FiR 1 spent fuel in Loviisa. …" P68: "…VTT shall provide the finalised FSAR with detailed decommissioning plans for approval to STUK. … " P68: "…According to the current estimate, the Government handling of the license application for decommissioning could be possible in autumn 2020." According to Figure 4 in Page 27, the decommissioning or closure of the FiR1 is planned to be finished around 2025. Up to now, has the government granted the decommissioning license of FiR1? Has the actual dismantling work been started? How to guarantee the work of decommissioning or closure will be finished around 2025?		The decommissioning license for FiR 1 was granted by the Governement in June 2021 and it is valid until 2030. Spent fuel was shipped back to USA at the end of December 2020. According current time schedule the dismantling of the reaserch reactor will start at the end of 2022 ond shoud be ready by the end of 2023. The licensee, VTT, is responsible on the dismantling project and also for time schedule of the project. The dismantling activities has to be finalized before the license expires in 2030.
20840	P87: "… Only small amounts of waste need to be conditioned for disposal." Which kind of non-nuclear waste should be conditioned for disposal? What is the criterion for conditioning non-clear waste?		It means that radioactive waste that cannot be released from regulatory control (discharged) even after aging, needs to be treated and packed for disposal.

QuestionId	Question	Comment	Answer
20841	P110：“… A few high activity sealed sources will need a different disposal route, which is not yet determined. ...” For the high activity sealed sources, how to select the suitable disposal route? Is it possible to dispose of the high activity sealed sources into the spent fuel disposal repository?		Options for the disposal of the high activity sealed sources are being sought. This is mentioned in the second national waste management program: Certain sealed sources and other radioactive waste also contain radionuclides that cannot currently be disposed of in the LILW disposal facility in Olkiluoto. In addition, other characteristics of the waste, such as its chemical form, may prevent disposal in existing facilities. These are kept in storage until a suitable disposal solution is in place. For these, the possibility of disposing of them in LILW disposal facilities in Olkiluoto or in Loviisa or disposal facility of spent fuel should be explored.
20842	P111: “During recent years Finnish companies have exported annually some 500–1000 (2019: 518 items; 2019: 1235 items) sealed sources to foreign providers. …” Please describe the practices of the exported sources be returned to Finland. What is the disposal route of the sealed sources including the exported ones?		So far, exporters usually receive the sources as disused sources and report them to STUK yearly. The sources are mostly taken to State interim storage.

QuestionId	Question	Comment	Answer
20843	P116: "… The 2012–2015 initiative (YTERA-Doctoral programme for Nuclear Engineering and Radiochemistry) ceased because of the financial difficulties. ...." "The governmental budget cuts resulted in significant decrease of STUK's own radiation safety research during the recent years. …Ensuring continued and stable funding of the radiation safety research in Finland remains a challenge …" What will the decrease of STUK's research make difference on the safety both in a short and long time scale? What will Finland do about this?		The page 48 of the report discusses that STUK has reinforced the co-operation with Finnish universities and international research platforms to establish a sound base for radiation protection research. Research funding opportunities have been exploited and STUK is in an active role in shaping research agendas of many of these platforms to ensure that national aspects of research funding are considered at European level. STUK has also set up an internal research funding mechanism. The income from expert services is partly reserved for research projects and researchers can apply funding for their projects biannually. The national programme of Management of spent nuclear fuel and radioactive waste in Finland (published in March 2022) explains research and development activities on this field. A research programme SAFER that targets on research in nuclear safety field has been started in 2022.

QuestionId	Question	Comment	Answer
20844	In the regulatory financing model mentioned, the nuclear industry licensees pay the regulatory fees directly to STUK. What measures are taken to ensure regulatory independence and credibility?		The goal of nuclear safety supervision is that the revenues of supervision cover 100% of the costs, which is achieved by invoicing the supervision work during the year at an estimated hourly rate, and correcting the invoicing with an equalization invoice after cost calculation. The fee for nuclear safety supervision is based on the State Payment Basis Act (150/1992) and Decree (211/1992) and the decision of the Ministry of Trade and Industry on the payment and payment bases of the Radiation and Nuclear Safety Authority's services subject to nuclear safety supervision (1285/1993, section 3). STUKs regulatory field is strictly defined in the nuclear energy legislation and it is STUKs responsibility to define the amount of resources used for the regulatory supervision. The net-budget model provides more independency and flexibility for STUK in the use of resources for the regulatory supervision compared to the state budget model.
20845	In page 91, it is mentioned that disused radioactive sources and low-level radioactive waste are disposed the same way. In page 110, it is mentioned that part of disused radioactive sources were disposed in 2012 and 2016. What is the specific disposal method, packaging approach and the related acceptance criteria of disused radioactive sources?		The license conditions for the Olkiluoto LILW disposal facility were changed in 2012 to allow the disposal of radioactive waste produced outside of Olkiluoto NPP in the LILW disposal facility. The disposal of this waste started in 2016. Packing and disposal of this waste follows the same packing and disposal methods as is used for the LILW from the operating NPP and the waste acceptance criteria is the same.

QuestionId	Question	Comment	Answer
20846	It is stated that wet LILW is immobilized in bitumen before transferred to the disposal facility, then it is dried in drums or solidified in concrete in Olkiluoto 3 (OL3). Please describe the process for immobilization in bitumen before delivery to disposal as well as safety requirements in above process.		Liquid wastes of OL1 and OL2 units are bitumized in to 200 L drums at the NPP. The liquid waste is dried and then mixed with bitumen in mixing tank and casted to drums. The mixture contains about half of the weigth bitumen and the half is waste. The drums are packed into sement box for the disposal. TVO is planning to replace the bitumization with sementation within few years.
20847	In page 29, it is stated that so far the highly activated metal waste has not been conditioned but is stored at the NPPs and is expected to be conditioned and disposed of together with similar types of decommissioning waste. Are there processes for conditioning and disposing this kind of waste? Please give more detailed information.		Highly activated metal waste will be packed into diposal packages and disposed of to low and intermediate level waste repository with the decommissioing waste. The metal components can be cut to smaller pieces or they can be disposed as such. So far only preliminary plans exists, how these will be handled.
20848	According to Article 7 of section G, spent fuel storage at the Finnish NPPs is based on water pool technology. What is the reason for not adopting dry storage technology, e.g. economic, safety, public acceptance or other factors in Finland?		Pool type spent fuel storages were part of the NPP-facility design at both NPP sites at the time of construction of NPPs. The operation experiences of these storages facility types have been positive so the use of same storage concept has been continued.

QuestionId	Question	Comment	Answer
20849	The main radionuclides of VLLW storaged in Loviisa NPP are Ni-63,Co-60,Ag-110m, currently planned management route is ‘other’, the note is ‘clearance’. The main radionuclides of VLLW storaged in Olkiluoto NPP are Co-60,Ni-63,Cs-137, currently planned management route is ‘near surface’ as stated in the report, What are the main VLLW materials produced from nuclear power plant? What is the annual production volume of VLLW from nuclear power plants?		Mainly the VLLW is soft maintenance waste e.g. gloves, overalls, plastics, paper ets… There is also some metal waste, which is classified as VLLW, but most of the metal waste is released from the regulatory control. Also some concrete can be classified as VLLW. From OL1 and OL2 units the volume of VLLW is about 30-60 m3/year.
20850	As stated in the report,"Sealed sources with activity levels below the clearance level may be disposed of as non-radioactive waste (Regulation STUK SY/1/2018) ", "the Council Directive 2002/96/EC of 27 January 2003 defines disused smoke detectors as waste electronic equipment subject to recycling requirements.".What is the current management of disused smoke detectors? Whether the disused smoke detectors can be implemented the clearance or not?Is it reused for the original purpose for the disused smoke detector? Is it stored centrally in the recycling process? What are the safety management requirements for centralized storage and how is it regulated?		Consumer are to dispose of the used smoke detectors in the same way as any electronic waste. They are then separated from the "normal" electronic waste and delivered to a licensed operator that removes the Am-241 -sources. The Am-241 -sources are the delivered to Suomen Nukliditekniikka who transports them to State interim storage. In theory, the Radiation Act allows for an operator to apply for an exemption from safety licence under a decision by STUK. So far there have been no applications. There are 2 "central storages"; the operator that dismantles the detectors and Suomen Nukliditekniikka. The safety management requirements are the same as other licensees, such as a management system, safety assessment and quality control. Detailed regulations for e.g. safety assessment can be found in STUK regulation S/6/2019.

QuestionId	Question	Comment	Answer
20851	The LILW disposal facilities are all at the NPP sites. What is the difference of siting criterion between NPP and LILW disposal facility?		Guide YVL A.2 sets the requirements for a site of nuclear facility. The Guide is applied to NPP's as such but for disposal facicilities it is applied as appropriate. The general safety principles are the same. For the site selection of a disposal facility, more detailed requirements are set in Regulation STUK Y/4/2018 and in YVL-guide D.5. These requirements are mainly related to bedrock properties like rock mechanics, hydrology, groundwater chemistry, geology, bedrock fracturing etc. The aim is to get enough information about the bedrock conditions from planned disposal depth for safety case and detailed plant design.

QuestionId	Question	Comment	Answer
21343	The report indicates that the discharge limits are specific to nuclides or nuclide groups. Please provide information on the following: 1) Are there total annual discharge limits, that are only distinguishable between liquid and gas in Bq, set for radioactive wastes generated from nuclear facilities, i.e. NPPs, reprocessing facilities, etc.? If there are, do the total annual discharge limits for liquid and gas, consist of nuclides specific or groups of nuclides specific limits? Also, what are, the set limits per nuclides/groups of nuclides especially for tritium, as well as the basis for those set limits? For examples, discharge limits are set based on, expected annual release calculated from actual discharge amounts of previous years, calculation assuming upper limit of 1mSv over a year for each nuclides, committed effective dose received by the public of 1mSv over 70 years, etc. The report indicates there are discharge target values, please provide how the discharge target values are set and their basis.		There are total annual discharge limits set for nuclear power plants. The waste storage facilities are included in the NPP area and therefore have no separate discharge limits. Radioactive waste (YVL guide D.4) is not handled as environmental discharges (YVL guide C.3). There are no reprocessing facilities in Finland. The discharge limits include limits for nuclides or nuclide groups, such as noble gases (into air, reported as Kr-87eqivalent), I-131 (into air, reported as nuclide or as I-131equivalent), tritium (into water) and others (into water, total gamma/beta). The discharge limit for tritium (liquid) has been set based on a theoretical tritium release estimation of the NPP. Meaning that the limit is set so that the actual releases are about 10% of the limit. The limits of the other nuclides/nuclide groups are counted so that the representative person in the environment will not receive more than a 0,1 mSv dose (1988/161 § 22b). The discharge limits are relatively high compared to the actual discharges of the Finnish NPPs (see graphs and figures in the reports). Most of the discharge limits can be seen in the annual reports eg. https://urn.fi/URN:ISBN:978-952-309-502-1, or the annual environmental report from Loviisa https://www.fortum.fi/media/22476/download and Olkiluoto https://www.tvo.fi/material/collections/20210222111048/7OJ6w6YO9/TVO_Ymparistoraportti_2020.pdf

QuestionId	Question	Comment	Answer
21344	2) Are there nuclides specific or groups of nuclides specific concentration limits set for each gas and liquid discharges into the environment? What are those discharge concentration limits and the basis for the set concentration limits, especially for tritium? For examples, discharge concentration limits are set based on, expected annual release calculated from actual discharge amounts of previous years, calculation assuming upper limit of 1mSv over a year for each nuclides, committed effective dose received by the public of 1mSv over 70 years, etc. If there are discharge target concentration values recommended by a regulatory body for nuclear facilities licensees to be achieved, which are lower than the set concentration limits, please provide the basis for the target concentration values.		See answer 1. The NPPs have set target values for their airborne and liquid discharges as required by the Regulator in YVL guide C.3 req. 322. They contain both specific nuclides and nuclide groups. Target values are set to represent the good and disturbance free operation of the plant (=new fuel failures, process leaks etc should be recognized when comparing results to the target values). The target values are to be updated at appropriate intervals, considering the effects of eg. the previous fuel failures.

QuestionId	Question	Comment	Answer
21345	3) Also, please provide the actual amounts of each gaseous and liquid radioactive wastes released or discharged annually into the environment from nuclear facilities between 2016 and 2020, especially, for annual discharge amounts of tritium and other nuclides in forms of gas and liquid, per types of nuclear facilities (NPPs with reactor types, reprocessing facilities, others) 4)For an evaluation of exposure dose from tritium, if other than the radiological concentration factor of 1 is used for the evaluation, please provide the used radiological concentration factor and the basis for its use.		3) STUK recommends visiting the European Comission RADD database for specific release information for Finland (Loviisa 1/2 VVER440 and Olkiluoto 1/2 BWR) to get the exact data required. There are no reprocessing plants in Finland and OL3 has not been in operation between 2016-2020. https://webgate.ec.europa.eu/radddataprov/nuclideDischargeOverview.dox?pageID=NuclideDischargeOverview 4) Radiological concentration factor of 1 is used for the evaluation of liquid tritium discharge exposure. Gaseous tritium discharge exposure is evaluated from tritium concentration in air based on methodology in reference: Killough, G. G., and L. R. McKay. Methodology for Calculating Radiation Dose from Radioactivity Released to the Environment, ORNL-4992. Oak Ridge, TN: Oak Ridge National Laboratory, March 1976.
21346	Is there a concept of generalized clearance threshold for gas and liquid waste from nuclear facilities ?		Release limits for gases and process waters are set in the Operational Limits and Conditions of A Nuclear Facility. General clearance limits for radioactive waste, buildings and sites are set in nuclear energy act 27 d §, STUK SY/1/2018 and YVL D.4 308, 309, 411 and 412.

QuestionId	Question	Comment	Answer
24226	In the section dealing with the management of low and intermediate level radioactive waste from nuclear facilities, it is indicated that "Options for the management of waste below clearance level are either general clearance or case-specific clearance. Such waste can be reused, recycled or disposed of in landfills." No example of reuse or recycling is provided. Could Finland indicate what, if any, practices exist regarding the reuse or recycling of waste below the clearance level?		The waste below clearance level can be handled as any other industrial waste according waste act (646/2011). For example the metals under clearance level are sent for recycling. They are melted and reused. Free released oils are also recycled and used again for example as a chain oil. Some of the waste under clearance limitsis still disposed in a landfill (e.g clothes, gloves, wood etc...).
24227	Status of the storage facilities for state owned waste and small user waste is not clearly explained in the Finnish report. In addition, inventory of these waste does not explicitly appear in the L.5 Annex. Could Finland provide information regarding inventory and management of state owned waste and small user waste ?		As mentioned in the text of annex L.5 the number of sealed sources in interim storage is estimate because the records before year 2014 contain only limited amount of information per waste package. After 2014, more detailed information has been collected. Small users radioactive waste is usually dispatched to the state owned interim storage in Olkiluoto. From the interim storage, radioactive wastes are disposed of in batches and according to the waste acceptance criteria of the LILW disposal facility. Some of the wastes in interim storage do not fulfill the waste acceptance criteria. The management strategy for these wastes is to search a appropriate disposal route during the interim storage time.

QuestionId	Question	Comment	Answer
24228	In Section F, it is indicated that "LILW generated from the operation of the research reactor FiR 1 is currently stored at the reactor facility in Otaniemi. At the end of March 2020, VTT signed a contract with FPH on storage and disposal of operational and decommissioning wastes in Loviisa NPP site" and "The nuclear waste (in total 6 m^3) produced during the operation of reaserch reactor is packed and currently stored in Otaniemi. [...] Waste minimization will be taken into account by careful planning and implementing efficient waste sorting and packaging methods and also by decontamination and clearance." There is no information on the thermal column graphite conditioning (which is mentioned in Annex L.5 in the unconditioned RW inventory currently stored) except that these intermediate level radioactive waste will be disposed of in the Loviisa geological repository. Could Finland explain the further management steps for the thermal column graphite from the FiR 1 research reactor?		According current plans, the termal column graphite will be disposed of to low and intermediate level waste repository in Loviisa.

QuestionId	Question	Comment	Answer
24229	It is indicated in Section B that "Section 23 a of the Nuclear Energy Act stipulates that before granting a nuclear facility construction license and operating license, or a license for decommissioning a nuclear facility, MEAE shall reserve the public an opportunity to express their opinions in writing in the matter relating to the license." In the Section F, no information is provided regarding public involvement within licensing process for the decommissioning of the FiR 1 research reactor. Could Finland provide information regarding public involvement within licensing process of the FiR 1 research reactor decommissioning ?		MEAE reserved the public an opportunity to express their opinions in writing according to section 23a of the Nuclear Energy act.

QuestionId	Question	Comment	Answer
24230		Finland has several geological facilities in operation for low and intermediate level radioactive waste as well as others in project. A deep geological repository is under construction for spent nuclear fuel from TVO and FPH. Several options are under consideration for the management of spent nuclear fuel from the shutdown research reactor as well as for future Nuclear Power Plants. Such a program and implementation of long term management of radioactive waste deserve to be complimented.	The compliment is very much appreciated.
24492	The report states: “The accumulation of LILW in the Loviisa and the Olkiluoto NPPs is depicted in Figure 13. The average accumulation of low and intermediate level waste at the Olkiluoto NPP (OL1 and OL2) has been about 120 m^3 and at the Loviisa NPP (LO1 and LO2) 24 m^3 per year during 2017–2019.” Question: Are these volumes unprocessed or conditioned waste?		The waste volumes in the figure 13 are volumes of unprocessed waste.

QuestionId	Question	Comment	Answer
24493	The report states: “The post-closure safety case must include a description of the disposal system: quantities of radioactive substances; waste packages; buffer materials… “ Question: How many types of waste packages for final disposal of LILW are approved by the regulator ?		Three different types of waste containers are in active use (barrel, cement box and cement round container for solidification). They are not approved separately, but as part of safety case and final safety analysis report.
26055	1. How are the in-core detection devices handled? 2. Are there plans to dispose of high-level radioactive waste in the ONKALO geological repository?	The report does not provide information on the management of RW with specific activity exceeding 10 GBq/kg (above the level of classification as moderately active RW). According to the total RW inventory, there are no high-level RW in Finland.	In Finland mainly only spent fuel is gathegorized as high level waste. There is a small amount high level waste stored at the NPP's mainly some removed/dismantled instrumentation from reactors. According current plans they are packed and disposed of to a low and intermediate level waste repositories during the decommissioning of NPP's.
26056	1. What methods of handling hazardous waste contaminated with radionuclides are provided for at the above-mentioned facility? 2. Has this plant been commissioned?	The report states that the hazardous waste generated during the construction and operation of the SNF packaging facility and disposal facility is planned to be sent to the Hazardous Waste Management Facility for further handling.	Based on the design of the SNF packing and disposal facility, the probability of occurance of hazardous waste contaminated with radionuclides is low. In case such wastes would occur and the level of radioactive contamination would be too high compared to exemption levels, these wastes would be treated at the at the nuclear facility premises as other nuclear wastes and disposed of similarly in the LILW disposal facility.

QuestionId	Question	Comment	Answer
26227	How does STUK approve significant revisions to the management system (review of the management system documentation, inspections on management system,…)?		The operator provides STUK the documentation for approval. STUK reviews the documentation and gives an approval if the requirements are met. In general, the management system is also overseen within the Construction Inspection Programme and in Periodic Inspection Programme when an operating facility is in question.
28089	What does “as a rule” mean in referring to the criteria defining LLW and ILW? Are there exceptions?		"As a rule" is a translational issue. The Finnish wording is formulated such that the limits for the activity consentrations of waste categories are not strict, as any measurement of radioactivity is prone to measurement deviations etc.
28090	The figure shows both KBS-3 concepts – horizontal and vertical. Is it foreseen that both could be used, or is it not yet decided which will be used (or is it simply a generic figure)?		In the constrcution licence phase Posiva applied licence for vertical and horisontal disposal options. However currently in the operational licence Posiva is applying licence only for the vertical option.
28091	The most important references in rulemaking are stated to be IAEA safety standards and WENRA safety reference levels and objectives. Are these sources considered equally, or is one only used if the other is insufficient, or are they used for different types of rule?		IAEA's safety standards are the basis on which WENRA's safety reference levels have been written. They add some details to the quite general IAEA standards. As such, they complement each other. Both are implemented on the Finnish system.

QuestionId	Question	Comment	Answer
28092	The funding arrangements are described for the SAFIR and KYT R&D programmes, but who decides on the technical content and priorities of the programmes, and by what process?		According to section 53 e of Nuclear Energy Act, the Ministry of Economic Affairs and Employment of Finland presents a proposal to the Fund for the financing of the research projects. The Fund makes the financing decisions based on ministry´s proposal. Before making the proposal, the ministry requests a statement from the Radiation and Nuclear Safety Authority STUK on the annual research project entity. The ministry has the SAFIR and KYT programmes in its disposal and the programmes make the evaluation of the technical content and priorities of the projects. Ministry presents its proposal to the Fund based on the evaluation but can differ from it if necessary.
29845	Waste that cannot yet be disposed of must be stored safely. Which reasons may prevent safe disposal of some waste and how can safe storage of this waste be ensured?		The Olkiluoto LILW disposal facility is licensed with certain waste acceptance criteria. If these are not met, the wastes must be stored safely. WAC includes criteria for i.a. radionuclide inventory, chemical form and physical measures. These wastes are stored at the state owned interim storage facility (see page 31-32 in the Finnish national report).

QuestionId	Question	Comment	Answer
29846	Small users of radioisotopes have some radiation sources on their premises which are no longer in use but have not yet been declared as radioactive waste. The number of such sources is relatively limited, whereas it is prohibited to unnecessarily store sources for which no use is foreseen. If it is prohibited to unnecessarily store sources for which no use is foreseen, on which legal basis are they stored at the premises of the users and how long can these radiation sources be stored without them being declared radioactive waste?		Based on Radiation Act 83 §, undertaking may not delay the performance of the measures without justification. The undertaking needs to remove any radiation sources containing radioactive substance subject to a safety licence which have become obsolete by returning them to the manufacturer or supplier or by transferring them to another undertaking with the appropriate safety licence. A source may nevertheless be stored without returning or transferring it, provided that the source's half-life and activity is such that it can be aged safely. Depending on the activity, it may be possible to age the sources. The applicable time limits are given in STUK Regulation S/5/2019. For example, if aging brings pre-identified significant advantages in terms of safety, technical solutions or economic efficiency in rendering waste harmless, the source can be stored for 1 year. There is no direct time limit for the storage of sources that have a longer half-life, such as Cs-137. The act states only that the undertaking may not delay the performance of the measures without justification. In practice, for STUK, it is a case by case decision wheter to enforce this.

QuestionId	Question	Comment	Answer
29847	The sub-criticality of the spent fuel in existing interim storage facility pools in Olkiluoto and Loviisa is ensured through the structural design of the racks and by choosing the boron containing rack material. In the Olkiluoto spent fuel storage, ion exchanged water is used in the pools, while the Loviisa spent fuel storage has boron containing cooling water in storage pools. If the cooling circuits are disabled in accidental conditions, cooling water can be fed from other sources to maintain the water level in the storage pools. Since sub-criticality is ensured through structural design of the racks and boron containing rack material, why is boron containing cooling water used additionally in Loviisa spent fuel storage? If in Loviisa sub-criticality also relies on the boron concentration in the cooling water, which provisions are in place for maintaining the required boron concentration in the cooling water in accident conditions?		Using boron containing cooling water is due to technical reasons and additional safety feature. Subcriticality is ensured by structural design of the racks. For this reason, subcriticality of spent fuel is maintained also in the case if boron consentration of cooling water was decreasing.

QuestionId	Question	Comment	Answer
29848	When the licensee's waste management obligations have ceased the ownership of the waste is transferred to the State. Question: Can you elaborate more on the measures prepared for this change of ownership? Are the required resources (e.g. funds, staff) already secured and planned for or is the future generation responsible for the planning? Can you state in which cases a licensee would fail its obligations in advance of this official transition? How would you identify the lack of suitability? What are your plans for the long-term archiving of information?		Since the ownership of the waste of closed disposal facility will be actual after 100 years from the beginning of the operation of the facility, the details of measures are not planned yet. Nuclear Energy Act Section 32 paragraph 3 states that the disposal of nuclear waste and the decommissioning of a nuclear facility have been carried out in accordance with section 33, and the party with a waste management obligation has paid a lump sum to the State for the monitoring and control of the nuclear waste. The licensee may fail its obligations for example in case of bankruptcy. Nuclear Energy Act Section 31 defines other cases in detail. During the operation of a nuclear facility the regulator performs the oversight and licensee has to provide a periodic safety report regularly. Lack of suitability would be identified through these actions. The long-term archiving will be planned in cooperation with the registry holders and The National Archives of Finland. See also the answer of question 18498.

QuestionId	Question	Comment	Answer
29849	You describe the financial liability and obligations of the licensees, including their regular provisions to the VYR fund. With delays in the realisation of original disposal plans, the costs can be expected to rise as well. Question: Can you elaborate more on prepared measures for the risk adaptation of necessary payments? How will you decide on the additional amount a licensee will have to pay?		The parties with the waste management obligation are responsible to pay all costs of spent fuel and radioactive waste management. VYR Fund is a provisional fund from which the management of spent fuel and radioactive waste is paid for only if a party with the waste management obligation is not capable to do so. Thus, the risk adaptation lays mainly on the responsible parties. VYR Fund manages the risks by regular evaluation of the cost estimates and by using an uncertainty coefficient. The uncertainty coefficient is used to increase the amount to be paid to the Fund by the responsible party, and it usually varies from 10 % to 20 % based on the estimated uncertainty.
29949	Do you in your country collect consumer goods and products containing radioactive substances? Do you have any restrictions on the available disposal options at the end of their useful lifetime? If yes, what are the basis for such decision?		Import of new comsumer goods containg radioactive substances is forbidden or requires a license. So far no collection has been made. If the goods are deemed to be radioactive waste, they need to be disposed of as such.

QuestionId	Question	Comment	Answer
30959	Page 48 of the report (also on page 115) contains information about STUK's communication channels with the public (web site and social media platforms). Page 75 of the report contains information on public involvement in the EIA process. Page 19 of the report there is information on the public consultation. Please clarify what is meant by communication on social media platforms (for example, whether it includes news only or other events). Please provide information on whether STUK or the operators also organize other activities to inform the public (on a daily basis, not during the EIA or licensing process), such as meetings with local people to explain waste management issues, discussions in universities; or online discussions are organized where the public can ask questions about waste management.		STUK uses its own social media accounts to distribute its own media bulletins. In addition, STUK publishes regularly small stories and reminders on radiation and nuclear safety events and issues in Finland and elsewhere. STUK also organises and takes part in meetings with public and local people to discuss on topical issues. These meetings have been organized especially during licensing and construction of a nuclear facility when local people have needs to discuss safety issues with experts. During the pandemic, we held one public meeting virtually on the internet.
31134	The text states that the decommissioning license for FiR1 is expected to be granted during 2020. What is the status of the decommissioning license for FiR1?		The decommissioning license for FiR 1 was granted by the Governement in June 2021.

QuestionId	Question	Comment	Answer
31135	The text on page 20 states that “STUK takes care of the rendering waste harmless on behalf of the State (Section 32 of the Government Decree on the Ionizing Radiation).” and “Non-nuclear radioactive waste that cannot be cleared, including spent sealed sources that cannot be returned to the manufacturer, must be handed over to an installation licensed to receive waste for the conditioning and transfer of radioactive waste to a central storage operated by STUK and later for disposal.” Although on pages 31/32 it is stated “The organisational structure of STUK clearly separates its duties in operating the centralised storage facility from its functions as the regulatory authority for radioactive materials and waste management.” Why isn’t the operations of the storage facility on behalf of the state assigned to a different organization (i.e. TVO, who holds the license and has leased the facility to STUK) to more clearly show independence between regulatory authority and operator for this specific responsibility?		In Finland, the State has the subsidary responsibility for rendering radioactive waste harmless according to the Radiation Act Section 80 in the case where there is no organization responsible for management of radioactive waste. Legislation can only prescribe the responsibility to a State organization. TVO, the license holder and owner-operator of the LILW facility into which the disused sources are disposed of is a private company and as such, cannot be given the responsibility through legislation. Private companies would be able to apply for a license to the activity if they want. So far, neither of the license holders of LILW disposal facilities in Finland have been willing to take the responsibility. There are no other competent authorities in the radiation and nuclear sector in Finland except STUK to which the responsibility could be given.

QuestionId	Question	Comment	Answer
31136	No mention appears to be made regarding the position on Article 27, paragraph 2, on prohibiting licensing of shipment of radioactive waste south of latitude 60 degrees S for storage or disposal. Please clarify Finland's position on this Article		Nuclear Energy Act of Finland Section 6 a: Nuclear waste generated in connection with or as a result of use of nuclear energy in Finland shall be handled, stored and permanently disposed of in Finland. In practice export of nuclear waste (radioactive waste from nuclear operations and spent fuel) for storage or disposal is forbidden.
31137		Canada commends Finland for looking at all the Good Practices identified in the 6th Review Cycle and analyzing lessons learned and opportunities for application of improvements in the Finnish program.	The comment is very much appreciated.
31185	Which analyses and procedures do you implement to assure that the bituminized RAW is thermally stable? Which fire protection systems do you use to cool down thermally unstable drums or drums with bituminized RAW under fire?		The bitumized waste is cooled down in a room in which there is a water and CO2 extinguishing systems. In the room, where bitumization is done there is a automatic CO2 extinguishing system, which can also be operated manually. During the bitumization the nitrogen extrusion is used in process e.g. in storage tank of bitumen. In addition nitrogen can be extruded into the tank, where bitumen and liquid waste, mainly resins, are mixed. In the storage there is a water extinguishing system.

QuestionId	Question	Comment	Answer
31286	The document mentions that repeated public interviews indicate a trend-like growth of the public trust in geological disposal. How is your strategy to explain the risks and benefits of the facility on geological disposal to the public who do not have the appropriate educational background? Will the final decision take into account the percentage of the population who disagree with the construction of disposal facilities?		Basic information of geological disposal is available on public websites of regulatory body and the licensee. The information is available for the public. Also any public member may contact the regulator and ask questions about geological disposal. In general, geological disposal raises quite little intrest among the public in Finland. The licensing process of a nuclear facility includes three phases. The first phase is a decision in principal, which is ratified by the parliament. The members of parliament are elected. The public opinion is involved through this process. Also, the commune in which the nuclear facility is located, has a veto right in this phase of the three step licensing process.
31287	The payment amounts depend on the amount of nuclear waste and the state of its management each year. Why don't the concentration of activity, half life, and type of waste become consideration in funding, as those parameters will affect the cost of treatments and the suitable disposal type.		The payment is based on the actual cost of the planned waste management. The payment takes into account multiple factors suchs as the activity and half life of the waste, planned treatment of the waste and the planned disposal (LILW-disposal/spent fuel disposal).

QuestionId	Question	Comment	Answer
31288	The document mentions that to ensure that financial liability is fully secured, every third year, the nuclear power companies producing nuclear waste and the operator of the research reactor are obliged to present cost estimates for the future management of their currently existing nuclear waste and to decommission of facilities and must take care that the required amount of money is set aside in the financial provision. The cost of waste management is, of course, calculated on a stable world economic condition. How to anticipate the world economic recession that might occur? Does it also consider the social cost?		Please see the answer to the question 29849 concerning risk adaptation. The estimated costs include, in addition to the direct management costs of spent fuel and radioactive waste, the costs of regular oversight and the real estate taxes.

QuestionId	Question	Comment	Answer
31289	One set of values is for unlimited amounts of material, and the values are taken from the IAEA Safety Guide RS-G-1.7. How do you apply clearance for the surface contamination since RSG 1.7 only gives a clearance rate for mass?		STUK's safety guide YVL D.4 Annex B sets limits for the general clearance of limited amounts of material. The radionuclide group specific activity concentration and surface activity contamination levels applicable to the clearance of waste (a maximum for 100 tonnes for a single nuclear facility per year). Nuclide groupActivity concentrationSurface activity contamination Alpha emitters 0.1 Bq/g 0.4 Bq/cm² Strong gamma and beta emitters 1 Bq/g4 Bq/cm² Weak gamma and beta emitters 10 Bq/g40 Bq/cm² According STUK's safety guide (YVL D.4: 415): Buildings left undismantled may be cleared following the general procedure and without restrictions if the average surface activity contamination on the walls, floors and ceilings inside the buildings is less than 0.4 Bq/cm² (4,000 Bq/m²). Furthermore, surface activity contamination on any area of one square metre shall be less than 10,000 Bq. These surface contamination levels may be applied to radionuclide compositions typically occurring at nuclear power plants.
31290	The dose constraint for NPPs is 0.1 mSv per year (Nuclear Energy Decree Section 22 b) and 0.01 mSv per year for nuclear waste facilities (Nuclear Energy The document mentions that Decree Section 22 d, YVL D.3 and YVL D.5). How do you determine the site constraint dose if there is more than one facility on the site?		The dose constraints for operation of a nuclear power plant and a nuclear waste facility are 0.1 and 0.01 mSv/y respectively. The dose constraint for NPPs covers all facilities on site. In practise the limits for the discharges are set in the operational limits and conditios for each facility so that the annual dose constraint will not be exceeded.

QuestionId	Question	Comment	Answer
31291	The document mentions that for a new license or the renewal of an existing license, include the documents required by the Nuclear Energy Decree: Preliminary or Final Safety Analysis Reports; Probabilistic Risk Analysis Reports……. Why haven't you implemented a safety case and safety assessment as a requirement? Please explain whether uncertainty management has been stated in the required documents?		The Nuclear Energy Decree allows for STUK to require documentation in addition to the documents specified for any licensing step (Section 35.2, Section 36.3) . The safety assessment and safety case are required in each licensing step and in periodic safety reviews as per STUK Regulation Y/4/2018 Section 4. The detailed requirements for a safety case are given in STUK Guide YVL D.5, Appendix A. Chapter 9.7 therein discusses uncertainty management.
31292	is the delivery of large metallic waste components at Studvik is based on the agreement, because the transboundary movement of radioactive waste is a sensitive issue? Does Finland not consider the conditional clearance option to do the recycling of the metal?		For Transboundary movement we apply the European Directive 2006/117/Euratom. The transportation of radioactive waste from Finland to Sweden cannot be done until authorities in both countries have approved the movement. If the metal waste is cleared from regulatory control, it is possible to be recycled in Finland. This is common practice in NPP's. Also conditional clearance option is possible.
31293	The document mentions that all premises where radioactive sources are employed are inspected by STUK regularly, every 2–8 years, it is depending on the type and extent of the practice. How does STUK carry out inspections regularly during a pandemic situation?		STUK has made fewer inspections in the past 2 years as normally. The pandemic is not the only reason, though. The new Radiation Act required all licensees to send a safety assessment for approval to STUK. This has caused a lot of "extra" work. Inspections have been made in co-operation with licensees; the use of masks etc. All planned ispections have been made.

QuestionId	Question	Comment	Answer
31294	The document mentions that about 2–3 sealed radioactive sources have been found annually in scrap metal on average. Orphan sources, whose owners cannot be identified, are delivered to the State interim storage at Olkiluoto. What kind of attempts has been made to trace the origin of orphan sources as well as to prevent similar events in the future?		There are a number of possibilities, but in most cases the origin remains a mystery. If the source is melted, the task is in practice impossible. In one case a Cs-source could be demonstrated to have come from a certain country, and was sent there using the waste transfer directive. If we can identify the serial number of a a sealed source, we can check our own registry or contact known source manufacturers. In two cases we have been able to identify the country where the source was originally sold but the final user was left unkwown.
31327	is the delivery of large metallic waste components at Studvik is based on the agreement, because the transboundary movement of radioactive waste is a sensitive issue? Does Finland not consider the conditional clearance option to do the recycling of the metal?		Dublicate of question 31292