Työ- ja elinkeinoministeriö
Arbets- och näringsministeriet

Coordinating authority's reasoned conclusion

11.4.2025

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The Ministry of Economic Affairs and Employment's reasoned conclusion about the environmental impact assessment report on extending the service life of the Olkiluoto 1 and Olkiluoto 2 plant units and uprating their thermal power

1. Project information and the environmental impact assessment procedure

The environmental impact assessment report deals with continuing the operation of the Olkiluoto 1 and Olkiluoto 2 plant units located at the Olkiluoto power plant area in Eurajoki at the current power level until 2048 (VE1a) or 2058 (VE1b), and continuing their operation at an uprated power level until 2048 (VE2a) or 2058 (VE2b). In addition, it examines continuing the operation of the plant units at the current power level until the end of the currently valid operating licence, that is, until 2038 (VE0).

Teollisuuden Voima Oyj (hereinafter, 'TVO') is in charge of the project. Ramboll Finland Oy is TVO's consultant in the assessment of environmental impacts.

Under section 10 of the Act on the Environmental Impact Assessment Procedure (252/2017; hereinafter, 'the EIA Act'), the Ministry of Economic Affairs and Employment (hereinafter, 'the Ministry') will act as the competent (coordinating) authority, when a project concerns any nuclear facility referred to in the Nuclear Energy Act (990/1987) or another facility which handles or stores nuclear waste or in which nuclear waste is deposited for final disposal.

1.1. Description of the project and the different alternatives

The currently valid operating licences of the Olkiluoto 1 and 2 plant units will expire at the end of 2038. The report examines various alternatives for the operation of the nuclear power plant after 2038.

Under alternative 1 (VE1), the company would continue operating the plant units at the current power level until 2048 (VE1a) or 2058 (VE1b).

Under alternative 2 (VE2), the company would continue operating the plant units at an uprated power level until 2048 (VE2a) or 2058 (VE2b). The starting point for the power uprating assessed in the EIA procedure is a 10% increase in the thermal power of both reactors to 2,750 MW, which is equivalent to increasing the nominal electrical output of the plant units from the current 890 MW to 970 MW. At the OL1 and OL2 plant units, this would result in a total increase in electricity production of approximately 1,200,000 MWh per annum.

The plant units were commissioned in 1978 (OL1) and 1980 (OL2), and their original planned service life was 40 years. The service life of the plant units was previously extended to 60 years. The continued operation until 2048 or 2058 examined here is equivalent to extending their service life to 70 or 80 years.

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Non-implementation of the above alternatives (alternative 0, VE0) would mean that TVO would continue operating the plant units at the current power level until the end of the currently valid operating licence, that is, until 2038, after which the plant units would enter the decommissioning phase. If the operation of the plant units is continued, the decommissioning phase will take place subsequent to the date on which the new operating licence will expire. According to TVO, the decommissioning of the plant units will be the subject of a separate environmental impact assessment procedure in accordance with existing legislation, once decommissioning becomes relevant.

1.2. Environmental impact assessment procedure

TVO submitted the environmental impact assessment report (hereinafter also 'the EIA report') to the Ministry of Economic Affairs and Employment on 5 December 2024. The submission of the report continued the assessment procedure whose programme phase was carried out earlier in 2024. The programme phase was launched on 5 January 2024 after TVO submitted the environmental impact assessment programme to the Ministry of Economic Affairs and Employment. On 25 April 2024, the Ministry issued its statement regarding the programme. The project is subject to the environmental impact assessment procedure, because it is a project referred to in subparagraph 7b of Appendix 1 (List of Projects) to the EIA Act.

1.3. Project's connections to other projects

In addition to the OL1 and OL2 plant units, the Olkiluoto site area houses the OL3 plant unit, which was granted an operating licence by the Government in 2019. The commercial operation of the plant unit started in April 2023. The planned service life of the OL3 plant unit is 60 years. Its operating licence pursuant to the Nuclear Energy Act is in force until the end of 2038.

Furthermore, the power plant area also houses the interim storage facility for spent nuclear fuel (KPA) and the storage facilities for very low-level waste (HMAJ), low-level waste (MAJ) and intermediate-level waste (KAJ) as well as the operating waste repository (VLJ repository) for the final disposal of low-level and intermediate-level waste. The VLJ repository's operating licence pursuant to the Nuclear Energy Act is valid until the end of 2051.

According to the assessment report, in its power plant area, TVO has also been planning to commission a separate near-surface final disposal facility for very low-level waste. The near-surface final disposal facility was granted an environmental permit in October 2023. The assessment report highlights that, in addition to the environmental permit, the construction and operation of the premises of the near-surface final disposal facility require a building permit from the municipality and an operating licence from the Radiation and Nuclear Safety Authority (hereinafter 'STUK') granted under the Nuclear Energy Act.

Posiva Oy's encapsulation plant and disposal facility for spent nuclear fuel, currently under construction, is located in the Olkiluoto power plant area, and it has its own separate site area. Posiva is responsible for the research related to and the technical implementation of the final disposal of the spent nuclear fuel generated in connection with the operation of the nuclear power plants of TVO and Fortum Power and Heat Oy. In November 2015, the Government granted Posiva a construction licence under the Nuclear Energy Act to construct an encapsulation plant and disposal facility at Olkiluoto.

1.4. Other procedures and land use planning

The operation and decommissioning of the nuclear facility require a licence pursuant to the Nuclear Energy Act. These licences are granted by the Government. The project also requires the licences specified in section 21 of the Nuclear Energy Act, which are granted by STUK.

The currently valid operating licences of the OL1 and OL2 plant units will expire at the end of 2038. If TVO wishes to continue operating the nuclear power plant units, new operating licences need to be sought for the plant units. Otherwise, a nuclear facility decommissioning licence will need to be sought.

The currently valid operating licences of the VLJ repository will expire at the end of 2051. If TVO wishes to continue operating the VLJ repository after this, a new operating licence will need to be sought for it.

The operating licences of the OL1 and OL2 plant units also include licences to operate the nuclear waste interim storage facilities (KAJ, MAJ, KPA). TVO states that if the service lives of the plant units were to be extended, the operation of the interim storage facilities would also be designed to be extended as part of the operating licences of the OL1 and OL2 plant units. If the operation of the above plant units were to end in 2038, the project owner plans either to seek a separate operating licence for the interim storage facilities or to apply for its inclusion as part of the operating licence of the OL3 plant unit. Transfers of spent nuclear fuel within the power plant area must have STUK's approval.

An application for an operating licence was lodged with STUK in 2024 for the near-surface disposal of very low-level nuclear waste planned for the site of the Olkiluoto nuclear power plant.

The radiation practices referred to in the Radiation Act (859/2018) undertaken at the Olkiluoto nuclear power plant require a safety licence pursuant to the Radiation Act, which is granted by STUK. A safety licence is in force for an indefinite period, and it will be updated where necessary.

Other licences and permits examined in the assessment report include the permits set out in the Building Act (751/2923; previously, the Land Use and Building Act, 132/1999), the environmental permit set out in the Environmental Protection Act (527/2014), the water resources management permit set out in the Water Act (578/2011) and the permits set out in the Act on the Safe Handling of Dangerous Chemicals and Explosives (390/2005). The above Acts also involve provisions on various notification obligations.

Furthermore, the assessment report discusses the project's articulation with plans and programmes related to the use of natural resources and to environmental protection. These programmes include various climate policy targets, Finland's national climate and energy strategy, and water resources management plans and the marine strategy.

2. Public participation and a summary of the statements and opinions submitted on the assessment report

The Ministry of Economic Affairs and Employment held a consultation on the assessment report in accordance with the EIA Act (252/2017) and the EIA Decree (277/2017). The EIA report was published on the Ministry's website on 5 December 2024.

A consultation process was held on the EIA report from 17 December 2024 to 14 February 2025. A public notice concerning the report was published on the Ministry's website on 17 December 2024. In addition, information about this notice was also published in the municipality where the project is located and in its neighbouring municipalities, as required under section 108 of the Local Government Act (410/2015). A notice about the EIA report consultation was published in the following newspapers: Helsingin Sanomat, Hufvudstadsbladet and Satakunnan kansa.

The Ministry of Economic Affairs and Employment invited statements on the assessment report from the following parties: the Ministry of the Environment, the Ministry of the Interior, the Ministry for Foreign Affairs, the Ministry of Defence, the Ministry of Agriculture and Forestry, the Ministry of Transport and Communications, the Ministry of Social Affairs and Health, the Ministry of Finance, the Radiation and Nuclear Safety Authority, the Advisory Committee on Nuclear Safety, the Regional State Administrative Agency of Southern Finland, the Regional State Administrative Agency of Southwest Finland, the Centre for Economic Development, Transport and the Environment in Satakunta, the Centre for Economic Development, Transport and the Environment for Southwest Finland, the Finnish Environment Institute, the Regional Council of Satakunta, the Helsinki-Uusimaa Regional Council, the Finnish Heritage Agency, the Finnish Safety and Chemicals Agency Tukes, the Satakunta Rescue Services, Southwestern Finland Police Department, the municipality of Eurajoki, the municipality of Eura, the municipality of Nakkila, the city of Pori, the city of Rauma, the Confederation of Unions for Professional and Managerial Staff in Finland (AKAVA), the Confederation of Finnish Industries (EK), Finnish Energy, Geological Survey of Finland, Greenpeace, Fingrid Oyj, Fortum Oyj, the Central Union of Agricultural Producers and Forest Owners, Natur och Miljö rf, Posiva Oy, VTT Technical Research Centre of Finland Ltd, the Finnish

Confederation of Professionals (STTK), the Finnish Association for Nature Conservation, the Central Organisation of Finnish Trade Unions (SAK), the Federation of Finnish Enterprises and WWF. In addition to these, other parties and citizens also had an opportunity to express their opinion about the project.

In a request for action it sent on 9 December 2024, the Ministry of Economic Affairs and Employment asked the Finnish Environment Institute to organise an international consultation, pursuant to the Espoo Convention, relating to the EIA procedure of the Olkiluoto 1 and 2 plant units, and to forward the feedback received to the coordinating authority.

In the programme phase, Austria, Bulgaria, Denmark, Estonia, Germany, Latvia and Sweden expressed their desire to participate in the assessment procedure. In addition, upon request, the material from the report phase was submitted to Lithuania for information. The Finnish Environment Institute invited statements from the above countries on 17 December 2024.

The notice and the EIA report, together with the statements and opinions received during the time reserved for their submission, were published on the Ministry of Economic Affairs and Employment website at https://tem.fi/olkiluoto-ol1-ja-ol2-yva-selostus. An English-language EIA report and translations of the summary were available on the project's English website.

2.1 Public hearing

On 6 February 2025, at Eurajoki Municipal Hall, the Ministry held an EIA procedure report-phase public hearing concerning continuing the operation of the Olkiluoto OL1 and OL2 plant units and uprating their thermal power. The event was streamed online to enable remote participation. Three participants followed the event on site and as many as 26 people online. TVO was in charge of the practical arrangements.

The event consisted of expert presentations, and a discussion during which the public had an opportunity to ask questions and express opinions. The event presented the EIA procedure, the ongoing project and its environmental impacts. During the open discussion, issues were examined including the permit process and road traffic to Olkiluoto island. The event memorandum is filed in the Ministry's document management (VN/19926/2024-TEM-39).

2.2. Summary of the statements and opinions

In the course of the national consultation process, the Ministry of Economic Affairs and Employment received a total of 22 statements. No opinions were submitted. Several of the statements were in favour of continuing the operation of the nuclear facility and uprating its power level, based on the zero greenhouse gas emissions generated, and the stability of the energy production achieved, by nuclear energy. Remarks were mainly expressed about the impact of cooling water on surface water.

In the course of the international consultation process, Austria, Estonia, Germany, Latvia and Sweden expressed a view. Denmark also held a consultation process pursuant to the Espoo Convention, but no statements were given. Furthermore, the Ministry received one statement from a European organisation. In the main, these statements took a neutral stance, or they were against the use of nuclear energy, based, for example, on the risk of accidents.

2.2.1. Authorities and municipalities

The Ministry of the Environment declares that it has no remarks to make on the environmental impact assessment report.

The Ministry of Agriculture and Forestry, the Ministry of the Interior, the Ministry for Foreign Affairs and **the Ministry of Finance** declare that they have no comments to make on the environmental impact assessment report.

The Ministry of Social Affairs and Health declares that the report is comprehensive and carefully drawn up. The report covers the environmental and health impacts, under normal conditions and in unlikely accidents, resulting from extending the service life of the nuclear power plants, and from related nuclear waste management and uprating the thermal power of the reactors. The Ministry of

Social Affairs and Health has nothing to comment on the content of the EIA report. The Ministry of Social Affairs and Health considers that the Radiation and Nuclear Safety Authority plays an important role in assessing the safety of any operating licence application that TVO may submit to the Government in future.

The **Radiation and Nuclear Safety Authority** is of the view that the EIA report presented by TVO meets the EIA report criteria laid down for radiation safety and nuclear safety in section 19 of the EIA Act. Therefore, for radiation safety and nuclear safety, the EIA report presents the following: the necessary information about the project; a description of the current state of the environment; a description about the environmental impacts of the project and its reasonable alternatives, that are likely to be significant: a description about how these impacts will be mitigated and monitored and about the comparison of the alternatives; information on the implementation of the environmental impact assessment procedure; and a non-technical summary. In connection with reviewing the operating licence application, should one be submitted, STUK will assess in detail whether the safety-related requirements are fulfilled.

In the power uprating scenario, too, no significant change is expected in releases of radioactive materials into the air or water. Currently, the annual radiation exposure from normal operation to the residents in the immediate vicinity is less than one per cent of the dose limit imposed by the Government, 0.1 millisieverts, and the exposure is also expected to remain at the same level in the power uprating scenario.

In their operation, nuclear power plants are required to comply with the radiation protection optimisation principle (ALARA), and with regard to limiting releases, they are required to use the best available techniques (the BAT principles). Power uprating will cause an increase in the radiation dose rate level at the facility, for example in the vicinity of steam pipes and the primary circuit lines, which needs to be taken into account in the radiation protection of workers. The BAT principle will apply when equipment needs to be replaced due to the service life extension. The EIA report presents procedures employed at the Olkiluoto facilities for implementing the ALARA and BAT principles. In the long term, TVO has succeeded to reduce workers' radiation doses and radioactive releases. The procedures and policies presented are also suitable for the project at hand.

According to the EIA report, the observation and radiation monitoring of radioactive substances present in the environment are expected to continue very similarly to the current situation. STUK considers that, at this point, the assessment is adequate. The content and implementation of the radiation monitoring programme will be reviewed at regular intervals. In that work, account will be taken of the results obtained and the development of techniques.

In the event of a service life extension, the total amount of spent nuclear fuel and other radioactive waste will increase. TVO estimates that the capacity of the power plant waste repository, combined with the near-surface disposal of very low-level waste, will be enough for the final disposal of the amount of additional waste that continued operation will bring about. For spent nuclear fuel, the adequacy of storage capacity will depend on the commencement of final disposal of spent nuclear fuel by Posiva. According to TVO, in the event that the commencement of final disposal is substantially delayed, the storage capacity of the spent nuclear fuel interim storage facility must be increased.

To evaluate the impacts of a severe reactor accident, the EIA report examines an accident that releases 100 terabecquerels of the caesium-137 nuclide, and other radionuclides in the same proportion as they are assumed to be released in an accident compared to caesium-137. The magnitude of the assumed release is based on section 22b of the Nuclear Energy Decree, according to which, in order to limit long-term effects, the limit for an atmospheric release of caesium-137 is 100 terabecquerels. The likelihood of exceeding this limit must be extremely low. As this regulation concerns the possibility of a release, demonstrating that the requirement set out in the regulation is fulfilled requires probabilistic risk assessment. STUK will check the fulfilment of the requirement set out in the regulation in connection with reviewing the operating licence application, should one be submitted, and in the context of STUK's continuous oversight.

Radiation doses and the fallout from a severe reactor accident are examined up to a distance of 1,000 km. In addition, the modelled Olkiluoto accident is compared to the Fukushima accident. The impacts of a severe reactor accident are identified as extending beyond the borders of Finland. Furthermore, there is an examination of smaller operational occurrences and accidents. Using illustrative examples,

the EIA report describes the scope of the impacted areas and the impacts that releases will have on humans and the environment. STUK considers that, at this point, the assessment is adequate.

Nuclear power plant ageing management must be ensured throughout the facility's entire service life. The suitability of the OL1 and OL2 facilities for 60-year operation is demonstrated through analyses prepared for systems and equipment under normal conditions and in operational occurrences and accidents. Extending the service life of the facilities until 2048 or 2058 requires that these analyses be updated and that the suitability of the structures, systems and components needed for safe operation be demonstrated for 70-year or 80-year operation. This may also involve a need to replace and renew structures, systems or components at the plant units. TVO states that it will carry out the necessary measures under a separate management programme by 2038. Currently, TVO has not identified ageing mechanisms that would limit the technical service life of the facilities. Where necessary, equipment and components can be replaced if ageing progresses faster than anticipated.

In section 3.2.1 of the EIA report, TVO presents the procedures for the ageing management of the OL1 and OL2 plant units. These procedures rely on the principle of continuous improvement. The investments made along the years have made it possible to carry out the necessary modernisation of important systems and equipment and to uprate the power levels of both facilities. In the operation of the facilities, ageing management is reflected as preventive maintenance, which is undertaken to prepare for preventing deteriorated operability of equipment and components in advance, and as condition monitoring, including periodic inspections and testing of equipment and components, with the aim of detecting any impaired operability before it causes a risk to safety. STUK monitors TVO's maintenance activities as part of continuous oversight.

The measures determined as necessary in operating licence-phase analyses will be defined later. STUK considers that, for the purposes of this EIA phase, the ageing management assessment presented is adequate. In accordance with the Nuclear Energy Act, STUK will perform its detailed ageing management assessment in connection with the examination of the operating licence application.

In its statement, **the Advisory Committee on Nuclear Safety** (ACNS) declares that the EIA report prominently and adequately highlights the key relevance of nuclear safety in the operation of the nuclear power plant. From the perspective of normal operation and accidents, the report describes risks involved in the handling of nuclear fuel and other situations causing releases of radioactive substances. According to the ACNS, the report also explains, by means of examples, incidents related to fires, explosions and oil and chemical spills, and how to prepare for them. Furthermore, external hazards and climate change preparation are also taken into account. The ACNS welcomes the fact that nuclear safety is a cross-cutting theme in the environmental impact assessment procedures of the current in-use nuclear facilities. The ACNS finds that the assessment report presented is an excellent summary of practices related to safety issues at a nuclear facility.

According to the **Centre for Economic Development, Transport and the Environment for Southwest Finland** (ELY Centre), the assessment report is a carefully and comprehensively prepared package and the conclusions of impact assessments are justified. In its statement, the ELY Centre raises a number of observations and clarifications.

The report takes appropriate account of the zoning status of the project area. The ELY Centre submits that the fact that the material for the pending Satakunta provincial plan 2050 was open to public inspection could have merited a mention. Furthermore, it would have been appropriate to explain the maritime spatial plan in respect of the environment of the project. However, the ELY Centre notes that land use planning is in line with the planned project and there will be no needs to amend the plan.

As for the report's description of cultural environment values, the ELY Centre notes that the update and supplement inventory sites in Satakunta's built cultural environment should be taken into account in future. The text also contains some imprecision. As a whole, however, the assessment of impacts on the cultural environment appears appropriate.

The ELY Centre considers that the operational thermal load of the facility is its most significant impact on the nearby sea area. In the VE1a and VE1b alternatives presented, impacts will continue for a longer period of time, and, in alternatives VE2a and VE2b, the impacts of power uprating will increase slightly compared to the current situation. During the open water season, impacts will on average be stronger in cool summers whereas, in wintertime, this will be the case in mild winters.

The ELY Centre finds that the description presented of the current state of the sea area is comprehensive. The impact of the different alternatives on the water quality and biological factors of the sea area is assessed well, albeit at a rather general level. However, the impact of temperature increase locally on the state of the sediment in the sea area and on the regulation of internal loading receives less attention.

Based on modellings, in all the alternatives, climate change together with external loading will in the long term contribute to the eutrophication of the sea area, locally in particular. The conclusion put forth highlights that continuing the operation of the plant units or uprating their power level alone will not undermine the ecological or chemical state, or the achievement of a good status, of water bodies. The ELY Centre notes that this is likely to be true at the water body level, yet locally the state of the facility's nearby area may deteriorate, possibly significantly so.

The report extensively deals with changes that have already occurred to aquatic habitats and bird populations, and it assesses future impacts in relation to the various alternatives. Those alternatives extending the service life of the plant units and uprating their thermal power are problematic, particularly with regard to the state of the nearby waters. The ELY Centre finds that it is difficult to estimate how significant the different cumulative and combined impacts with climate change will be.

In its statement, the ELY Centre also draws attention to the possible challenges deriving from invasive species to, for example, cooling water intake. According to the ELY Centre, it is precisely the impacts deriving from invasive species, and the potential actions to prevent them, which it would be good to specify in further planning.

As regards the environmental permit, the ELY Centre points out that, with regard to power uprating, an application to amend the environmental permit must be made with the competent environmental permit authority before making any changes to activities.

It is the understanding of the **Regional Council of Satakunta** that the environmental impact assessment report is clear and, in the main, sufficiently detailed. Impacts from cooling water have been identified as the most significant adverse impact, and the sensitivity of the impacted areas at sea as high. Cooling water impacts have been assessed illustratively.

The Regional Council of Satakunta wishes to continue to draw attention to risks related to invasive species, and ecosystem impacts potentially caused by invasive species. The assessment report recognises that the spread of invasive species is difficult to predict and, on that basis, the situation is estimated to remain as it stands today. However, in the current situation, first sightings of new invasive species were made in the area, inter alia, in 2018, 2022 and 2023. It can be considered likely that new invasive species will also be detected in the area in the future. Climate change may also increase risks related to invasive species and facilitate the spread of invasive species to a wider area, whereupon it may be possible that impacts will extend, for example, to the Natura area of the Rauma archipelago (FI0200073). Impacts related to invasive species cannot be predicted, which is why special attention should be paid to monitoring the situation and preventing, mitigating and remediating any possible harm.

The Regional Council of Satakunta welcomes the fact that climate change impacts are taken into account in the environmental impact assessment in accordance with the precautionary principle and that, inter alia, a very high greenhouse gas emissions climate scenario was selected for the modellings. However, climate change impacts are addressed to a limited extent with regard to time after the end of the plant units' service life until their dismantling, and climate change impacts over this time should therefore be considered more broadly in the next phases of the project.

The assessment report takes into account the currently valid Satakunta provincial plans and the draft Satakunta provincial plan 2050 that was open to public inspection at the end of 2024, and the related zoning regulations, and it notes, for example, that the general planning provision concerning the state of water bodies requires special attention in this project.

The assessment report does not identify any energy projects with which the project could exercise a combined impact. In future, the development of the project status needs to be monitored, and where necessary action should be taken if the conditions for implementing this project are affected.

The **Finnish Safety and Chemicals Agency** (Tukes) has no comments to make on this matter.

In accordance with its job description, the **Satakunta Rescue Services** draws special attention to the impacts of the possible accidents described in the assessment report.

The examination of a serious accident leading to a radioactive release uses an INES level 6 event that ends in meltdown damage to the reactor pressure vessel but does not result in a release that would achieve the threshold value. For this reason, coefficients are employed in the examination to upscale the release.

In spite of this scaling, in the examination the protection measures resulting from the release remain limited. With regard to direct radiation impact, seeking protection indoors is justified in the precautionary action zone, but in the emergency planning zone the dose criteria for seeking protection indoors or for evacuation are not exceeded. According to the analysis, measurement, decontamination and limiting measures will eventually be taken in the emergency planning zone.

In its own plans, the rescue authority is prepared for protection measures that are more extensive than the scenario set out in the assessment report, and the authority considers its preparedness justified. Preparedness has been undertaken in broad cooperation, in relation to which the Radiation and Nuclear Safety Authority and the power utility merit a mention here. Rescue resources to protect the environment in large-scale radiation accidents are low, putting emphasis on cooperation between actors. The rescue authority welcomes the development of capabilities both nationally and internationally.

The **municipality of Eurajoki** is of the view that the EIA report has been prepared thoroughly and carefully, in compliance with high Finnish safety culture and the objectives of the Nuclear Energy Act, minimising environmental impacts. In the assessment report, the various issues resulting from service life extension are taken into account thoroughly and extensively for the entire process, all the way up to the final disposal of spent fuel. The municipality of Eurajoki has nothing to comment on the content of the EIA report.

The **municipality of Eura** and the **municipality of Säkylä** declare that they have nothing to comment on the assessment report.

2.2.2. Statements by private individuals, organisations and companies

The **Geological Survey of Finland (GTK)** declares that, as a whole, the environmental impact assessment report concerning extending the service life of the Olkiluoto 1 and Olkiluoto 2 plant units and uprating their thermal power is comprehensive, and the impacts of service life extension and power level rating are taken into account well. As a whole, the alternatives and the impacts resulting from them are described appropriately.

However, GTK points out that the assessment report does not address the carbon dioxide and methane emissions released as result of the decay process, although the decay of organic matter is discussed otherwise. When organic matter decays, greenhouse gas emissions are created under aerobic and anaerobic conditions, and these emissions may impact the local carbon cycles and water quality, particularly in anaerobic benthic layers. GTK recommends that this perspective be included in the assessment in order to show the broader picture of the impacts more comprehensively.

Fortum Oyj considers that the possible extension of the service life of the two Olkiluoto plant units and the uprating of their power level are extremely important for the clean transition. Fortum believes that a balanced combination of all clean energy generation methods will yield the best results in terms of the electricity system and customers. A diverse electricity generation mix with a high degree of security of supply has been among Finland’s assets.

Increased weather-dependent power generation, energy storages and demand-side response are key elements of a sustainable energy future, but this alone will not be enough to guarantee the reliability of the electricity system. Nuclear power generates weather-independent clean electricity round the year. Fortum is of the view that we will need the existing nuclear power plant units that generate stable and emission-free electricity, far into the future.

Posiva Oy submits that it has no comments to make on the environmental impact assessment report concerning extending the service life of the Olkiluoto 1 and Olkiluoto 2 plant units and uprating their thermal power. The report sufficiently describes the different future situations regarding service life

extensions of varying durations in order for Posiva to assess the need for the accumulation and final disposal of spent nuclear fuel. Where necessary, in accordance with the Nuclear Energy Act, Posiva will licence additional capacity for the disposal facility for the purposes of its owners' spent nuclear fuel. During the preparation of the EIA report, Posiva was also consulted with regard to spent nuclear fuel.

VTT Technical Research Centre of Finland Ltd is of the view that the assessment report shows that, in extending the operation of the plant units, the various alternatives have only marginally negative impacts, yet the positive impacts for the climate, regional economies and energy markets are great. Furthermore, VTT declares that from the perspective of national and international climate goals and the predictability of electricity production, it is good that the continued operation of the OL1 and OL2 plant units and also the uprating of their power level are being examined, as nuclear power is a carbon-neutral and stable method of energy production. According to VTT, the environmental impact assessment report has been drawn up with care, and it is comprehensive, and VTT has no remarks to make on its content.

The **Finnish Association for Nature Conservation** declares that extending the operation of the plant units until 2048 or 2058 is equivalent to extending their service life to 70 or 80 years, which means that their service life would be as much as doubled in comparison to the original planned service life. Such a major extension of service life is also likely to prolong the duration and total accumulation of the environmental impacts, whether positive or negative, arising from the operation of the plant units. In its statement, the Finnish Association for Nature Conservation particularly highlights changes in the surface temperature of sea water, and impacts of the prolonging thermal loading on the marine ecosystem and fish populations.

In connection with a service life extension and power uprating, the total amounts of uranium fuel needed and nuclear waste generated will also increase, as will their entire procurement and/or production chain and related environmental impacts, both at the Olkiluoto area in Finland and in the countries of origin of the raw materials and their refinement, as compared to the original estimates. The longer the OL1 and OL2 plant units are kept in operation, and the greater the power at which they are operated, the longer the environmental impacts from the operation of these plant units will continue.

The Finnish Association for Nature Conservation regards the objective of restricting the use of non-renewable natural resources and curbing overconsumption as extremely important, pointing out that in the longer term it is justified to strive to abandon the use of nuclear energy as an electricity generation method, both in Finland and globally.

The Finnish Association for Nature Conservation notes that, if the impact of every plant unit using uranium fuel on global uranium resources and on the adverse environmental impacts arising from their quarrying and further processing were to be treated as insignificant, the conclusion, it would appear, is that the entire uranium fuel chain has no globally significant environmental impacts whatsoever. This cannot be true, and the relationship of environmental impacts from the production and further processing of uranium with nuclear power plant units, including in Finland, should not be played down.

Therefore, in terms of either the effects of cooling water on the warming, eutrophication and fish populations in the sea area off Olkiluoto or the environmental impacts of the uranium fuel chain or any other environmental impacts, it cannot reasonably be said that it would be insignificant if the service life of the OL1 and OL2 plant units is extended from 2038 to 2048 or 2058. What is clear is that, in the course of the possible 10-year or 20-year extension of operation, all the negative environmental impacts will have time to multiply, whereupon environmental restoration will be significantly delayed.

The Finnish Association for Nature Conservation proposes that, when considering to extend the service life of the OL1 and OL2 plant units and uprate their thermal power, the environmental impact assessment should carefully consider perspectives of sustainable natural resource use and reduction of overconsumption in relation to the long-term life-cycle impacts that arise from the operation of the nuclear power plant units and from the procurement of fuel.

The **Central Organisation of Finnish Trade Unions (SAK)** finds that extending the service life of the OL1 and OL2 plant units to 2048 or 2058 instead of 2038, and uprating their thermal power by 10 per cent to 2,750 megawatts, is justified if the project satisfies the other conditions imposed on it. Extending the service life of the OL1 and OL2 plant units and uprating their thermal power will result

in environmental harm, but considerably less than what would be the case with the construction of a completely new facility. However, in the further project planning, the means presented in connection with the impact assessment to prevent and mitigate possible adverse impacts should be taken into account. SAK mentions, in particular, the thermal load of cooling water; eutrophication; oxygen depletion near the cooling water discharge point; and concentrations of harmful substance in water discharged into the sea. According to SAK's evaluation, the assessment report is logical and covers the relevant issues.

The **Federation of Finnish Enterprises** states that the environmental impact assessment report has been drawn up with care and comprehensively, and it has no remarks to make on the content of the assessment report. The Federation of Finnish Enterprises is in favour of extending the operating licences in the form applied for. The plant units generate emission-free electricity mainly predictably and reliably, and abandoning emission-free production would not be in line with the 2035 carbon neutrality goal.

2.2.3. Statements by other countries and authorities

Austria announces that it wishes to continue the negotiations in accordance with Article 5 of the Espoo Convention and Article 7 of the EIA Directive. Annexed to the response submitted by the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology was an expert statement from the environment agency, containing 23 questions regarding the assessment procedure. The Ministry of Economic Affairs and Employment prepared responses to these questions in cooperation with TVO and STUK.

The **Latvian** Energy and Environment Agency submits that it received responses from the Latvian Ministry of Foreign Affairs, the Ministry of the Interior, the Ministry of Health, the State Centre for Defence Logistics and Procurement, the Nature Conservation Agency and the State Environmental Service.

In its statement, the Latvian Ministry of Health notes that the project will not have a direct impact on the health of the country's citizens.

In its statement, the Latvian Nature Conservation Agency notes that the report has been prepared with high quality and the project's significant environmental impacts have been analysed sufficiently accurately. The report contains a description of the methods for preventing transboundary impacts and of the measures to be taken to reduce harmful impacts. The project can be implemented only under strict supervision and monitoring.

In its statement, the State Environmental Service of the Republic of Latvia puts forth comments regarding, for example, the impacts of the release from the accident scenario examined in the report, the need for protective measures in a severe reactor accident, and the growth in the amount of and the final disposal of radioactive waste.

The Latvian Ministry of Foreign Affairs, the Ministry of the Interior and the State Centre for Defence Logistics and Procurement have no comments to make on the EIA report.

The **Swedish** Environmental Protection Agency held a consultation process pursuant to the Espoo Convention, as a result of which statements were submitted by the Swedish Radiation Safety Authority, the Swedish Board of Agriculture (Jordbruksverket) and the Miljövänner för kärnkraft organisation.

The Swedish Radiation Safety Authority declares that the postulated accident included in the assessment report would result in a limited radiological impact in Sweden. A more serious, although extremely unlikely, accident that goes beyond a design basis accident would possibly lead to greater radiological consequences in Sweden. Such an event is not presented in the assessment report. However, the Swedish Radiation Safety Authority finds the chosen approach acceptable.

The Swedish Board of Agriculture would have liked to see the assessment procedure employ INES level 7 accident modelling instead of the INES level 6 modelling used presently.

Germany announces that it wishes to continue the negotiations in accordance with Article 5 of the Espoo Convention. The statement by the Saxon State Ministry of Environment and Agriculture

contains 25 questions regarding the assessment procedure. The Ministry of Economic Affairs and Employment prepared responses to these questions in cooperation with TVO and STUK.

The **Danish** Ministry of Green Tripartite held a consultation process pursuant to the Espoo Convention. No statements were submitted.

Estonia announces that it wishes to continue the negotiations in accordance with the Espoo Convention. The Estonian Ministry of Climate hopes for responses to the questions put forth in the statement of the Estonian Rescue Board. The Ministry of Economic Affairs and Employment prepared responses to these questions in cooperation with TVO and STUK.

The Estonian Ministry of Climate declares that statements on the assessment report were also provided by the Estonian Ministry of the Interior, the Environmental Board and the Health Board. These entities have no remarks to make on the EIA report.

2.2.4. International statements by private individuals, organisations and companies

In its statement, the Swedish **Miljövänner för kärnkraft** organisation expresses its support for uprating the power level of the plant units and extending their service life until 2058, with due consideration of appropriate oversight by the Radiation and Nuclear Safety Authority and the environmental aspects set out in the Espoo Convention.

3. Adequacy and quality of the assessment report

As the coordinating authority for the EIA procedure, the Ministry of Economic Affairs and Employment has reviewed the adequacy and quality of the assessment report, and in this regard considers the following facts:

Teollisuuden Voima Oyj's environmental impact assessment report concerning the Olkiluoto 1 and Olkiluoto 2 nuclear power plants satisfies the content requirements laid down in section 19 of the EIA Act (252/2017) and section 4 of the EIA Decree (277/2017), and it was processed as required under environmental impact assessment legislation. The assessment report has been drawn up with consideration to the project's assessment programme and the statement that the coordinating authority issued on it. The project owner has had at its disposal adequate expertise for assessing environmental impacts and carrying out separate reviews.

The assessment report is comprehensive and well prepared. In the course of the assessment of environmental impacts, no issues have arisen which could not be mitigated to an acceptable level and which would prevent the implementation of any of the alternatives. The project's environmental impacts and a comparison of the alternatives will be examined further in the following chapter.

On the basis of the Ministry of Economic Affairs and Employment's review and the statements and opinions received, it can be noted that the assessment has been carried out at a sufficient level in order to draw up a reasoned conclusion.

3.1. Impacts on surface water, fish populations and fishing

The impacts of cooling water are the most significant environmental impacts generated during normal operation of the nuclear power plant. For the OL1 and OL2 plant units, cooling water is taken from the Olkiluoto water south of the plant units and discharged west of the power plant area into Iso Kaalonperä bay. Impacts from extending the operation of the plant units up to 2058 and uprating their power level on the water quality of surface water, and possible indirect impacts on aquatic life, were assessed as expert work. This assessment was based on descriptions of operations and of changes in these operations, on information about the current state of the aquatic environment and, with regard to the impacts of the cooling water of the Olkiluoto OL1, OL2 and OL3 plant units, on flow calculation-based cooling water modelling. The modelling took into account the thermal loading of the cooling water of the Olkiluoto OL1, OL2 and OL3 plant units, as well as the effect of climate change.

In its statement, the Centre for Economic Development, Transport and the Environment for Southwest Finland states that the operational thermal load of the facility is its most significant impact on the

nearby sea area. In their statements, the Regional Council of Satakunta, the Finnish Association for Nature Conservation and the Central Organisation of Finnish Trade Unions (SAK) also mention the thermal load impacts of cooling water on water bodies.

Furthermore, in its statement, the Centre for Economic Development, Transport and the Environment for Southwest Finland (ELY Centre) states that service life extension-related thermal load impacts will continue for a longer period of time, and power uprating-related thermal load impacts will increase slightly, compared to the current situation. The ELY Centre notes that, during the open water season, impacts will on average be stronger in cool summers whereas, in wintertime, this will be the case in mild winters. The ELY Centre considers that the description presented of the current state of the sea area is comprehensive. It finds that the impact of the different alternatives on the water quality and biological factors of the sea area is assessed well, albeit at a rather general level. However, the impact of temperature increase locally on the state of the sediment in the sea area and on the regulation of internal loading receives less attention. In its statement, the ELY Centre draws attention to the possible challenges deriving from invasive species to, for example, cooling water intake. It finds that, in further planning, it would be good to specify the impacts from invasive species and the potential actions to prevent them. In its statement, the Regional Council of Satakunta also states that, in terms of invasive species, special attention should be paid to monitoring the situation and preventing, mitigating and remedying any possible harm.

The impact of continuing the operation of the power plant and uprating its power level on surface water is assessed as being marginally negative. If their operation is continued, the activity of the OL1 and OL2 plant units will not change compared to the current situation. The thermal load discharged into water bodies is some 98,000 terajoules annually, with the volume per plant unit of cooling water approximately 38 cubic metres per second and the temperature of the cooling water discharged into water bodies some 10 °C higher than the natural sea water temperature. If the operation of the plant units is continued, this will not have an impact on the temperature of the sea area, or the stratification conditions, compared to the current operations. However, in the continued operation scenario, the above impacts will be longer-term.

In the power uprating scenario, the temperature of the OL1 and OL2 plant units' cooling water discharged into the sea will rise 1 °C compared to the current operations or continued operation. Therefore, the temperature of the plant units' cooling water discharged into the sea will be approximately 11 °C higher than the natural sea water temperature, and the thermal load to the sea area from the cooling water is expected to average some 109,000 terajoules per annum. The cooling water volume, some 38 cubic metres per second per plant unit, will not change. The increase in the discharge water temperature, and changes in the density of discharge water, will cause indirect impacts on currents in the sea area. Near the cooling water discharge point, uprating of the power level may, occasionally, marginally amplify the temperature stratification of the sea, thereby reducing the exchange of water between the surface and the bottom layers. In addition, thermal loading may facilitate the adaptation of invasive species to a new habitat, thereby promoting the spread of such species.

The impact of continuing the operation of the power plant and uprating its power level on fish populations and fishing is expected to be marginally negative, but the additional years of operation would prolong these impacts. Warm sea water favours fish that are adapted to it, such as Cyprinoidei. A warming of the water body may contribute to the spread and expansion of invasive species, such as the round goby, in the sea area. In the power uprating scenario, the thermal loading of cooling water would be greater than at present.

Cooling water carries with it biomass (screenings) to the power plant from the inlet water channels. On the basis of the monitoring performed during 2023–2024, the amount of fish carried to the OL1 and OL2 plant units totalled 15.4 tonnes of fish per year on average. 95% of the fish weighed less than or exactly 3 grams. The assessment notes that the carrying of fish to the seawater plants of the plant units may have a minor reducing effect on the recreational fishing catch in the cooling water intake area. Continued operation would prolong the fish mass-reducing impacts further into the future. Climate change may intensify the impacts of the thermal load transmitted to the affected area. Power uprating will not increase the need for cooling water intake, which is why the carrying of fish to the plant units will have an effect similar to that in the case of continued operation.

The Ministry of Economic Affairs and Employment considers that the assessment of impacts on surface water, fish populations and fishing and the examination of mitigation measures are at an adequate level.

3.2. Impacts on climate change mitigation

In their statements, several respondents note that nuclear energy is a carbon-neutral method of energy production.

Indicatively, the significance of climate impacts from continuing operation at the current power level is assessed as fairly positive and, in the case of continued operation at an uprated power level, as highly positive. The direct operational greenhouse gas emissions are low in comparison to the impacts of fossil fuel energy production. Finland has set a goal to be carbon neutral in 2035, which will require increased emission-free energy production.

The Ministry of Economic Affairs and Employment considers that, with regard to climate impacts, the assessment is at an adequate level.

3.3. Impacts of a severe reactor accident

The Ministry of Economic Affairs and Employment notes that, in Finland (the Nuclear Energy Decree [161/1988], section 22b), the limit for a large release is set at 100 TBq for a caesium-137 release, and this value has generally been employed as the source term for Finnish environmental impact assessments. The accident modelling set out in the report assumes that other radionuclides will also be released in the same proportion as they can be assumed to be released compared to the caesium-137 nuclide. The area examined in the modelling provided in the report extends 1,000 kilometres from the power plant. The impacts of accidents occurring at the facility examined are compared to the Fukushima reactor accident.

In its statement, STUK notes the above large-release limit imposed in Finland. The likelihood of exceeding this limit must be extremely low. As this regulation concerns the possibility of a release, demonstrating that the requirement set out in the regulation is fulfilled requires probabilistic risk assessment. STUK will check the fulfilment of the requirement set out in the regulation in connection with reviewing the operating licence application, should one be submitted, and in the context of STUK's continuous oversight.

In addition, in its statement, STUK notes that the assessment report identifies the impacts of a severe reactor accident as extending beyond the borders of Finland. Furthermore, the assessment also examines smaller operational occurrences and accidents. STUK finds that the assessment report, using illustrative examples, adequately describes the scope of the impacted areas and the impacts that releases will have on humans and the environment.

Based on the activity released in the discharge (Nuclear Energy Decree [161/1988], section 22b), the imaginary serious reactor accident examined in the assessment report is equivalent to an International Nuclear Event Scale (INES) level 6 accident. The assessment also examines the protective measures required by a serious reactor accident. In addition to a reactor accident, the report also examines other incidents, including fires or transportation-related risk situations, and conventional environmental and safety risks.

Furthermore, the report evaluates possible phenomena that climate change may bring about at the plant site, as well as discussing how to prepare for these phenomena. In the design of the plant units, steps have been taken to prepare for, for example, wind loads, flooding, lightning, the impacts of snow and ice, and high and low air and sea water temperatures. As a result of plant modifications, earthquake resistance has also been assessed and improved through various plant modifications.

The assessment report describes measures for maintaining a high level of nuclear safety and radiation safety at the plant units.

The Ministry of Economic Affairs and Employment considers that the project owner has implemented the matters required at the programme phase. The examination is comprehensive and extensively describes the environmental impacts arising from an unlikely serious accident. STUK will assess the

safety of the nuclear power plant later in connection with the operating licence applications, should they be submitted.

3.4. Releases of radioactive materials, radiation protection and waste management

Continuing the operation of the plant units, or continuing their operation at an uprated power level, are not expected to bring about any significant change in the releases of radioactive materials into the air and water bodies. The annual radiation dose from normal operation to the residents in the immediate vicinity is less than one per cent of the annual dose limit imposed by the Government, 0.1 millisieverts (Nuclear Energy Decree, section 22b). The assessment suggests that the exposure will also remain low in the power uprating scenario, but the additional years of operation would prolong the impact. Therefore, the significance of the impacts is estimated to be marginally negative.

In its statement, STUK notes that, in their operation, nuclear power plants are required to comply with the radiation protection optimisation principle (ALARA), and, with regard to limiting releases, they are required to use the best available techniques (the BAT principles). Power uprating will cause an increase in the radiation dose rate level at the facility, for example in the vicinity of steam pipes and the primary circuit lines, which needs to be taken into account in the radiation protection of workers.

The assessment report presents procedures employed at the Olkiluoto facilities for implementing the ALARA and BAT principles. STUK considers that, in the long term, the project owner has succeed to reduce workers' radiation doses and radioactive releases. STUK finds that the procedures and policies presented are also suitable for the project at hand.

According to the assessment report, the observation and radiation monitoring of radioactive substances present in the environment are expected to continue very similarly to the current situation. STUK considers that, at this point, the assessment is adequate. At regular intervals, STUK will review the content and implementation of the radiation monitoring programme. In that work, account will be taken of the results obtained and the development of techniques.

As a result of extending the service life of the plant units, the total amounts of the very low, low and intermediate-level waste and spent nuclear fuel generated at the site area will increase. The total amount will increase if the service life of the plant units continues and the amount of annually generated waste remains unchanged. There are functioning waste management methods in place for the very low, low and intermediate-level nuclear waste generated at the power plant area. TVO estimates that the capacity of the power plant waste repository, combined with the capacity of the near-surface disposal facility for very low-level waste, will be enough for the final disposal of the increasing amount of waste generated from the service life extension.

The increasing total amount of spent nuclear fuel may necessitate to expand storage capacity, which could be achieved for example by building more new pools in the storage facility. The uprating of thermal power would require the making of fuel technology changes, which would be likely to cause a need to increase residual heat removal in the storage facility, which could, where necessary, be implemented by increasing the flow rate of cooling water. In this scenario, the temperature of the water returned into the sea would not increase from what it is currently. The impact of the above changes on the environment is found to be low.

Posiva, in charge of encapsulation and final disposal activities for the spent nuclear fuel that has been and will be generated at the power plant area, applied for an operating licence with the Government at the end of 2021. The environmental impacts of spent nuclear fuel encapsulation and final disposal activities were already assessed earlier, and determined to be low at least up to 12,000 uranium tonnes of spent nuclear fuel. Where necessary, Posiva will licence the capacity of the final disposal facility to meet the needs of the nuclear power plants of its owners. Due to Posiva's conservative design bases, the above fuel technology changes will not have any impact on Posiva's plans.

The radiation exposure arising from waste management measures to processing personnel as a result of extending the service life of the power plant units will continue longer, but nevertheless will not significantly increase personnel's radiation doses compared to current operations. The impacts arising in normal operations from waste management measures are extremely low, and the statutory limits are not exceeded. Adverse impacts can be mitigated, for example, by minimising the amount of nuclear waste generated, performing appropriate radiation protection measures and employing functioning and safe processing and final disposal methods.

STUK will assess the safety of the nuclear power plant later in connection with the operating licence applications, should they be submitted.

3.5. Other observations highlighted in the statements

Energy markets

In their statements, several respondents note that nuclear energy is a stable method of energy production.

Finland's electricity production and consumption are broadly in line with each other; the need for imported electricity has declined. Yet, in peak consumption situations, Finland is dependent on imported electricity. Finland aims to reach carbon neutrality by 2035 and, after that, carbon negativity. In industry, heating and transportation, electricity will be replacing the use fossil fuels and raw materials that cause carbon dioxide emissions. In the future, electricity consumption is estimated to increase clearly in Finland and the other Nordic countries alike.

For both scenarios, that is service life extension and power uprating, the significance of impacts was assessed to be highly positive, because with electricity use growing in the future, extending the service life of the plant units will support the operational security of the energy system while reducing the need to import electricity.

Regional economies

At the local level (the sub-regional unit of Rauma), in both the service life extension and the power uprating alternative, the significance of impacts is assessed to be highly positive at the local level (the sub-regional unit of Rauma), because during the plant units' additional years of operation, there will be significant direct regional economic effects as well as multiplier effects. At the regional level (Satakunta), the effects on regional economies are assessed as marginally positive in the continued operation and the power uprating alternative alike. At the national level (entire Finland), in both project alternatives, the effects on regional economies are also assessed as marginally positive.

4. The coordinating authority's reasoned conclusion

TVO initiated the environmental impact assessment procedure on 5 January 2024 by submitting the assessment programme to the Ministry. On 25 April 2024, the coordinating authority issued a statement on the assessment programme. The assessment report was submitted to the Ministry on 5 December 2024. In April 2025, the coordinating authority issued a reasoned conclusion.

The coordinating authority's reasoned conclusion is based on the assessment report content requirements specified in section 19 of the Act on the Environmental Impact Assessment Procedure (252/2017) and section 4 of the Government Decree on the Environmental Impact Assessment Procedure (277/2017), on the project description and surveys set out in the assessment report, on their results and an analysis of the results, and on the content of the statements and opinions submitted about the report.

The coordinating authority's reasoned conclusion must be included in the project licence decision in accordance with section 26 of the EIA Act. The licence decision is to indicate how the assessment report and the reasoned conclusion have been taken into consideration.

On the basis of the report, the statements received, the results of the international consultation process, and its own review, the coordinating authority has assessed that the project alternatives presented do not involve any probable significant adverse environmental impacts. Under all the project alternative scenarios, the environmental impacts of the plant units would continue almost as they are currently. In the power uprating scenario, the overall balance of environmental impacts would be slightly greater.

The thermal load to the nearby sea area carried by the discharging of cooling water is the most significant environmental impact of the nuclear power plant during normal operation. In addition to impacts to surface water, other environmental impacts include impacts on fish populations, fishing,

radioactive releases, radiation protection, waste management, climate, the energy market, regional economies, and the impacts of unlikely accidents.

4.1. Environmental impacts from continuing operation until the expiry of the currently valid operating licences (VE0)

Non-implementation of the service life extension and the power uprating alternatives would mean that TVO would continue operating the plant units at the current power level of 2,500 megawatts until the end of the currently valid operating licence, that is until 2038, after which the plant units would enter the decommissioning phase. The decommissioning of the plant units will be the subject of a separate environmental impact assessment procedure in accordance existing legislation, when decommissioning becomes relevant. Estimates suggest that environmental impacts would persist as they are currently.

In 2023, the plant units produced a total of 14.29 TWh of electricity, corresponding to some 18% of Finland's electricity consumption. Nuclear electricity production generates very little greenhouse gas emissions, thereby curbing climate change. The economic and employment advantages of nuclear power generation, particularly in the sub-regional unit of Rauma, are very considerable.

Since the early 1990s, the capacity factors for the OL1 and OL2 plant units have been around 90%. During their years of operation, the plant units have been modernised in many ways through annual servicing and safety improvements. At the plant units, investments have been made that have allowed them to remain in good operating condition today. As a result, it was possible previously to extend the service life of the plant units from 40 years to 60 years.

The power plant units use cooling water to cool the turbine condensers. The amount of cooling water used by the OL1 and OL2 plant units is approximately 38 cubic metres per second, per plant unit. At present, during the process, cooling water is heated to some 10 °C above the natural temperature of sea water. Apart from the temperature increase, the quality of cooling water does not change when flowing through the nuclear power plant. The average thermal load from the OL1 and OL2 plant units into the sea is approximately 98,000 terajoules per year. Impacts would remain the same if operation is continued until 2048 or 2058 without uprating the power level. These impacts are assessed under alternative VE1. In the VE2 alternative, which includes power uprating, some of the impacts are slightly greater.

The basic principle of nuclear safety and radiation safety is to prevent radioactive substances from being released into the environment. To prevent releases, the safety of plant units is ensured at multiple levels through different structural barriers and safety systems. Nuclear safety and radiation safety are developed by analysing risks and taking steps to prepare for them. The nuclear safety of the OL1 and OL2 plant units is ensured by means of safety functions. Safety functions are designed to prevent the occurrence of operational occurrences and accidents, stop them from progressing or mitigate the consequences of accidents. The safety functions have been defined in order to ensure the integrity of the radioactive substance release barriers. These functions are supported by support actions that start automatically or are started by an operator.

The most important safety functions of a nuclear power plant are reactivity management, residual heat removal and the prevention of the spread of radioactivity. The purpose of reactivity management is to stop, when necessary, a chain reaction generated by the reactor. Residual heat removal aims at cooling the fuel and thus ensuring the integrity of fuel and the primary circuit, while the prevention of the spread of radioactivity aims at isolating the containment and ensuring its integrity and thus managing radioactive releases during an accident. The assessment report assesses impacts of a highly unlikely serious reactor accident.

Operational radioactive releases from the OL1 and OL2 plant units are monitored by release measurements, and the dispersion of releases into the environment is monitored in accordance with the STUK-approved environmental radiation monitoring programme. Environmental radiation monitoring is based on continuous dose rate measurements, air and fallout samples, sea water samples, and samples taken from the food chain.

The Nuclear Energy Decree (161/1988) and the Government Decree on Ionizing Radiation (1034/2018) lay down the radiation dose limits for the normal operation, operational occurrences and

accidents of nuclear facilities. The limit for the annual dose to an individual resulting from the normal operation of a nuclear power plant is 0.1 mSv, which is less than 2% of the average annual dose caused to a Finn by radiation, 5.9 mSv. In recent years, the radiation dose to an individual in the vicinity of the OL1 and OL2 plant units has been some 0.2% (approximately 0.0002 mSv) of the dose constraint provided in the Nuclear Energy Decree and less than one ten-thousandth of the normal annual radiation dose caused to a Finn by other sources.

The principles for implementing nuclear waste management, and the amounts of nuclear waste generated in activities carried out under the currently valid operating licence, are presented in the assessment report.

4.2. Environmental impacts of continuing the operation of the plant units (VE1)

The operation of the OL1 and OL2 plant units of the Olkiluoto nuclear power plant would be continued at the current thermal power of 2,500 megawatts up to the end of 2058. In the main, impacts on the environment would remain similar to what they are during the current operation of the facility.

The thermal load to the nearby sea area carried by the discharging of cooling water is the most significant environmental impact of the nuclear power plant during normal operation. The implementation of this project alternative would, the assessment suggests, have a marginally negative impact on surface water. Furthermore, impacts to fish populations and fishing would also be marginally negative. Under this project alternative, the current environmental impacts would continue longer both for surface water and for fish populations and fishing. The coordinating authority considers that this assessment has been carried out appropriately. The coordinating authority requires that attention be paid to monitoring the state of surface water and the occurrence of invasive species.

A serious reactor accident is a highly unlikely occurrence whose impacts, in the event of such an accident, would be exceptionally wide-ranging and long-term. The report examines an accident that releases into the atmosphere 100 TBq of the Cs-137 nuclide and other radionuclides in the same proportion as they are assumed to be released compared to the Cs-137 nuclide. The coordinating authority considers that this examination has been carried out appropriately. The coordinating authority requires that the ageing management of the plant units be ensured throughout the entire service life of the facility. A detailed ageing management analysis needs to be carried out in connection with the operating licence application, should one be submitted.

Continued operation will increase the total amount of spent nuclear fuel and other nuclear waste. However, implementation of this project alternative will not have any significant impacts on nuclear waste management. The possible need to increase storage capacity for spent nuclear fuel has been addressed as part of the environmental impact assessment. This project alternative is not expected to bring about any significant change to releases of radioactive substances. The coordinating authority notes that activities are required to comply with the radiation protection optimisation principle (ALARA), and with regard to limiting releases, it is a requirement to use the best available techniques (the BAT principles).

The project alternative is assessed to have fairly positive impacts on the climate, a highly positive impact on the energy market, a highly positive impact on regional economies locally, and a marginally positive impact on regional economies at the regional level and nationally.

4.3. Environmental impacts of continuing the operation of the plant units and uprating their power level (VE2)

The operation of the OL1 and OL2 plant units of the Olkiluoto nuclear power plant would be continued at an uprated power level up to 2058. The thermal power of both units would be increased by up to 10%, to 2,750 megawatts. An increase in the temperature of cooling water would be the most significant environmental impact during the normal operation of this project alternative. Otherwise, impacts on the environment would mainly remain similar to what they are during the current operation of the facility.

The implementation of this project alternative is expected to have a marginally negative impact on surface water. An increase in the temperature of the OL1 and OL2 plant units' cooling water discharged into the sea by up to 1 °C compared to the current operations would be the most significant environmental impact of this project alternative. As a result of the power uprating, the temperature of

the plant units' cooling water discharged into the sea would on average be up to 11 °C higher than the natural temperature of sea water. Under this project alternative, there would be no impacts deviating from the current status to fish populations and fishing, but the duration of the impacts would be prolonged. The coordinating authority considers this assessment appropriate. The coordinating authority requires that attention be paid to monitoring the state of surface water and the occurrence of invasive species.

A serious reactor accident is a highly unlikely occurrence whose impacts, in the event of such an accident, would be exceptionally wide-ranging and long-term. The report examines an accident that releases into the atmosphere 100 TBq of the Cs-137 nuclide and other radionuclides in the same proportion as they are assumed to be released compared to the Cs-137 nuclide. The coordinating authority considers that this examination has been carried out appropriately. The coordinating authority requires that the power uprating be performed safely and that the ageing management of the plant units be ensured throughout the entire service life of the facility. A detailed analysis about the safety of power uprating and about ageing management needs to be carried out in connection with the operating licence application, should one be submitted.

Continuing operation at an uprated power level will increase the total amount of spent nuclear fuel and other nuclear waste. Implementation of this project alternative will not have any significant impacts on nuclear waste management. The possible need to increase residual heat removal and storage capacity for spent nuclear fuel has been addressed as part of the environmental impact assessment. The project alternative is not expected to bring about any significant change in releases of radioactive substances. The coordinating authority notes that activities are required to comply with the radiation protection optimisation principle (ALARA), and with regard to limiting releases, it is a requirement to use the best available techniques (the BAT principles).

The project alternative is assessed to have highly positive impacts on the climate, a highly positive impact on the energy market, a highly positive impact on regional economies locally, and a marginally positive impact on regional economies at the regional level and nationally.

4.4. Other impacts

The report also discusses other impacts that the project alternatives would have, and the significance of these impacts is assessed as marginal or non-existent. Under the continued operation scenario, no impacts are projected to noise and vibration; air quality; flora, fauna and conservation areas on land; use of natural resources at the power plant area; human health or construction. Under the power uprating scenario, no impacts would be projected to noise and vibration, air quality, use of natural resources at the power plant area; human health or construction.

TVO has estimated that continued operation would result in other marginal adverse impacts on the community structure, land use and zoning; the landscape and the cultural environment; transportation; soil, bedrock and groundwater; flora, fauna and conservation areas in sea areas; people's living conditions and comfort, and the use of natural resources in the procurement of nuclear fuel.

Power uprating is expected to have other marginal adverse impacts similarly to continued operation, with the exception of the marginal negative impact of the power uprating on flora, fauna and conservation areas on land.

4.5. Timeliness of the reasoned conclusion

When deciding a matter related to a licence, the licensing authority is required to ensure that the reasoned conclusion is up to date. At the request of the licensing authority, the coordinating authority is required to present its view as to whether the reasoned conclusion which it has prepared is up to date. Furthermore, before the licence proceedings are opened, the project owner may also request the coordinating authority to present its view as to whether the reasoned conclusion which it has prepared is up to date. Where necessary, the assessment procedure will be supplemented in accordance with section 27 of the EIA Act.

5. Communication about the coordinating authority's reasoned conclusion

The Ministry of Economic Affairs and Employment will issue a public notice about the reasoned conclusion. Information about the notice will also published on the electronic noticeboards of the municipalities affected by the project.

The Ministry will submit the reasoned conclusion and the statements and opinions received to the project owner. The reasoned conclusion will be submitted for information to the authorities dealing with the project, to the municipalities affected by the project and to the regional council and other relevant authorities. Furthermore, the Ministry is required to submit the reasoned conclusion and translations of its essential sections to the Finnish Environment Institute, which will submit them to any other state that has participated in the environmental impact assessment procedure.

The reasoned conclusion and the statements and opinions received are also available on the Ministry of Economic Affairs and Employment website at https://tem.fi/olkiluoto-ol1-ja-ol2-yva-selostus.

6. Service fee, grounds for determining the fee and instructions for requesting an administrative review

Service fee €47,630

The fee is determined on the basis of the Act on Criteria for Charges Payable to the State (150/1992) and the Ministry of Economic Affairs and Employment's Decree on the chargeable performances of the Ministry of Economic Affairs and Employment that are included in the environmental impact assessment procedure of nuclear facilities (874/2023). As provided in the Decree, the fee chargeable for the coordinating authority's reasoned conclusion in a demanding project (more than 30 person-days) is €16,540 plus €90/hour for working time that exceeds 30 working days, up to a maximum of €47,630.

An administrative review of this fee decision may be requested from the Ministry of Economic Affairs and Employment. A review of a decision imposing a fee may be requested within six months of the imposition of the fee as provided for in the Administrative Procedure Act (434/2003). Instructions for requesting an administrative review are enclosed with the decision.

A decision issued by the Ministry of Economic Affairs and Employment on a request for an administrative review may be appealed as provided for in the Administrative Judicial Procedure Act (808/2019).

Minister of Climate and the Environment Sari Multala

Senior Specialist Miia Saarimäki

Enclosures Instructions for requesting an administrative review

Distribution Teollisuuden Voima Oyj

For information Competent authorities
Other entities to which the request for an opinion was sent