



Loviisa Nuclear Power Plant

Environmental Impact Assessment Programme

Summary

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change

August 2020

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Forewords

Climate change and transitioning to a low-carbon energy system make reliable and emission-free electricity production even more important than before. A steady supply of electricity is also important. In line with our vision, we want to promote development towards a cleaner world in the future as well.

At Fortum, we believe that this new world will also need nuclear power for a long time. As a carbon dioxide emission-free, reliable source of energy that is not dependent on the weather, nuclear power contributes to meeting today's need for energy and mitigating climate change – together with renewable energy.

Loviisa nuclear power plant has been producing clean electricity for over 40 years, and we have a long track record as a responsible producer of nuclear power. The impacts of and the added value provided by our operations can be seen locally, regionally and globally. Loviisa power plant's environmental work is managed through an ISO 14001 certified environmental management system. We continuously work to reduce the impacts of our operations on the environment by applying the best practices and technologies.

Fortum has initiated an Environmental Impact Assessment Procedure (EIA procedure) at Loviisa nuclear power plant. The procedure will assess the environmental impacts of the potential lifetime extension of the power plant or, alternatively, the decommissioning of the power plant, as well as the environmental impacts of the final disposal facility for low- and intermediate-level waste.

The EIA Programme you are reading includes Fortum's plan on the assessment of environmental impacts as well as on the organisation of communication and participation. An environmental impact assessment will be performed based on the EIA Programme and the opinions and statements submitted about the programme. The results of the assessment will be presented in the environmental impact assessment report.

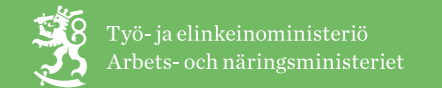
The coordinating authority in the project's EIA procedure is the Finnish Ministry of Economic Affairs and Employment, and the coordinating authority in the international hearing is the Ministry of the Environment.

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Base maps: National Land Survey of Finland 2019

Translations: AAC Global Oy

Layout and design: Creative Peak

The original language of the environmental impact assessment is Finnish. Versions in other languages are translations of the original document which is the document Fortum is committed to.

Summary

Project owner and the project background

The project owner in the environmental impact assessment procedure (the EIA procedure) is Fortum Power and Heat Oy, a wholly owned subsidiary of Fortum Corporation. The Fortum Group is the second largest producer of electricity and the largest electricity supplier in the Nordic countries.

Loviisa nuclear power plant, owned and operated by Fortum Power and Heat Oy, consists of two power plant units, Loviisa 1 and Loviisa 2, as well as other associated buildings and storage facilities required for the management of nuclear fuel and nuclear waste. Loviisa 1 began its commercial operation in 1977 and Loviisa 2 in 1980. The power plant has been generating electricity reliably for over 40 years. The electricity generated by Loviisa power plant is used as an uninterrupted, year-round source of energy. Annually, Loviisa power plant produces a total of approximately 8 terawatt hours (TWh) for the national grid. It accounts for approximately 10% of the electricity consumption in Finland. Nuclear energy plays a significant role in Fortum's low-emission electricity production. For its part, Loviisa nuclear power plant supports the climate targets of Finland and the EU, as well as a secure electricity supply.

The current operating licence issued by the Finnish government to Loviisa 1 is valid until the end of 2027, and the operating licence issued to Loviisa 2 is valid until the end of 2030. Fortum is in the process of assessing the extension of the commercial operation of Loviisa nuclear power plant by a maximum of approximately 20 years beyond the current operating licence period. At a later date, Fortum will decide concerning the extension of the operation or decommissioning of the nuclear power plant.

Loviisa power plant is one of the best nuclear power plants in the world in terms of safety and usability. Fortum has invested in the ageing management of Loviisa power plant and has carried out improvement measures throughout the operation of the power plant. Systematic maintenance and modernisations of the power plant ensure that the equipment stays abreast of the changing requirements. In 2014–2018, Loviisa power plant implemented the most extensive modernisation programme in the plant's history, in which Fortum invested approximately EUR 500 million. Thanks to the investments made and the skilled personnel, Loviisa power plant has excellent prerequisites with regard to the technical and safety-related requirements to continue operation after the current licence period.

Project description and the options to review in the EIA procedure

Loviisa nuclear power plant is located approximately 12 km from the centre of the town of Loviisa, on the island of Hästholmen. Loviisa nuclear power plant is an electricity-generating condensing power plant, and both its plant units are pressurised water reactor plants. Electricity generation in a nuclear power plant is based on the utilisation of thermal energy generated by a controlled fission chain reaction. Loviisa power plant is used for the generation of base load electricity. The nominal thermal power of each plant unit of Loviisa power plant is 1,500 MW and the net electric power is 507 MW. The total efficiency of the plant units is approximately 34%. The annual production of Loviisa power plant is approximately 8 TWh. The availability and load factors of Loviisa power plant have been excellent throughout the power plant's operating history.

The low- and intermediate-level waste generated during the operation of Loviisa power plant is processed on the power plant premises and deposited in the final disposal facility for low- and intermediate-level waste (the L/ILW repository), located 110 metres underground on the island of Hästholmen. In due course, the spent nuclear fuel from Loviisa power plant is taken to the spent nuclear fuel encapsulation plant and final disposal facility operated by Posiva Oy at Olkiluoto in Eurajoki, Finland.

Fortum is in the process of assessing the extension of the commercial operation of Loviisa nuclear power plant by a maximum of approximately 20 years beyond the current operating licence period. Fortum will, at a later date, make the decision concerning potential extension of the operation of the nuclear power plant and the application for new operating licences. The other option is to proceed to the decommissioning phase when the power plant's current operating licences expires. In both cases, the project requires a licensing procedure in accordance with the Nuclear Energy Act and an environmental impact assessment procedure.

The options reviewed in this EIA procedure are shown in *Table 1*.

Table 1. Options to be reviewed in the EIA procedure.

Option	Description
Option 1, VE1	<p>Extending the operation of Loviisa power plant by a maximum of approximately 20 years after the current operating licence period, followed by decommissioning.</p> <ul style="list-style-type: none"> The option also includes the measures to extend the service life of the power plant, decommissioning of the power plant after the licensing period ends, the operation and ultimate dismantling of plant parts to be made independent and the waste management measures related to these phases. In addition, the option includes the possibility of receiving, processing, placing in interim storage and depositing for final disposal small amounts of radioactive waste generated elsewhere in Finland.
Option 0, VE0	<p>Decommissioning of Loviisa nuclear power plant after the current licensing period (in 2027/2030).</p> <ul style="list-style-type: none"> The option also includes the operation and ultimate dismantling of plant parts to be made independent and the waste management measures related to these phases.
Option 0+, VE0+	<p>Decommissioning of Loviisa nuclear power plant after the current licensing period (in 2027/2030).</p> <ul style="list-style-type: none"> The option also includes the operation and ultimate dismantling of plant parts to be made independent and the waste management measures related to these phases. In addition, the option includes the possibility of receiving, processing, placing in interim storage and depositing for final disposal small amounts of radioactive waste generated elsewhere in Finland.

Extending the operation (Option VE1)

Fortum is in the process of assessing the extension of the commercial operation of Loviisa nuclear power plant by a maximum of approximately 20 years beyond the current operating licence period. During the extension, the operation of the power plant would be similar to what it is currently. Extending the operation of the power plant involves certain changes that may be implemented. These may include:

- replacing some of the old buildings related to the support functions of the power plant;
- water engineering related to the intake of cooling water, and the depositing of the resulting dredging and excavation masses in a new embankment structure;
- changes to the power plant's service water and waste water connections;
- expansion of the interim storage for spent nuclear fuel or alternatively increasing the capacity of the current interim storage.

The assessment also takes into consideration the possibility of receiving, processing, placing in interim storage and depositing for final disposal at Loviisa power plant small quantities of radioactive waste generated elsewhere in Finland.

The Option VE1 also takes into consideration the preparation for decommissioning during the extended operation of the power plant. This includes the expansion of the L/ILW repository and the operation thereof until circa 2090, as well as the preparatory work for and the operation of plant parts to be made independent. In addition, the decommissioning of the power plant after the commercial operation is being explored.

Decommissioning (Options VE0 and VE0+)

If the operation of Loviisa power plant is discontinued after the current licensing period in 2027 and 2030, the preparation for the decommissioning of the power plant (Options VE0 and VE0+) should be initiated in the coming years.

The stages included in the decommissioning of Loviisa power plant include:

- the expansion of the L/ILW repository for decommissioning waste;
- making the spent fuel interim storage, liquid waste storage as well as the solidification plant, and the L/ILW repository independent;
- terminating the operation of the power plant units and licensing of the dismantling work;
- detailed planning of and preparations for the dismantling;
- dismantling of the radioactive components of the power plant units and any other dismantling work;
- handling and final disposal in the L/ILW repository of radioactive waste as well as reuse of conventional dismantling waste;
- transporting the spent fuel to the encapsulation plant and final disposal facility;
- dismantling of the plant parts to be made independent;
- closure of the final disposal halls / L/ILW repository;
- release from liability and post-closure control by the authorities.

Furthermore, the assessment of Option VE0+ also takes into consideration the possibility of receiving, processing, placing in interim storage and depositing for final disposal small quantities of radioactive waste generated elsewhere in Finland at Loviisa power plant.

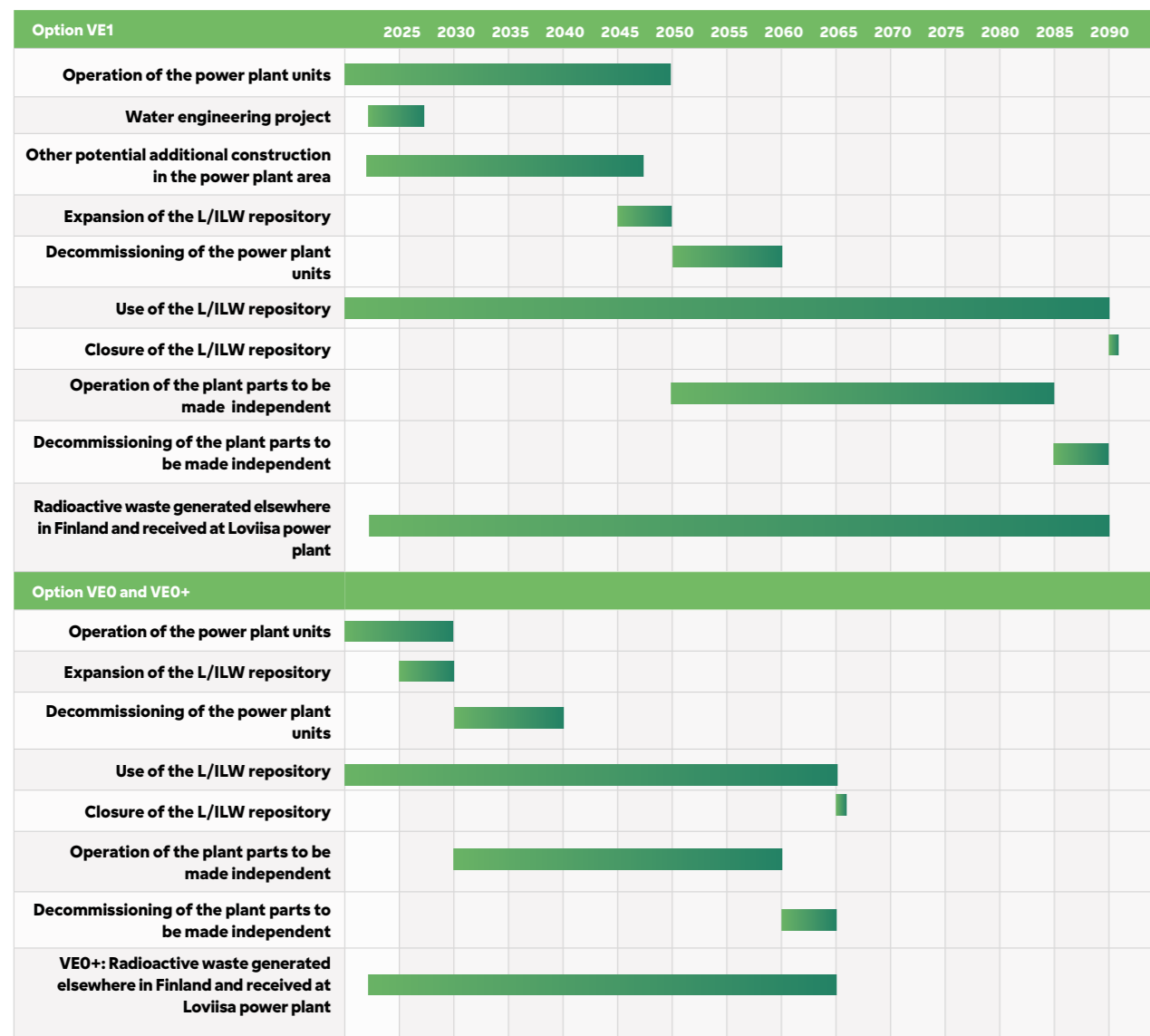


Figure 1. Tentative schedules of the project options, to be specified as the plans progress.

Project schedule

Tentative schedules of the project options to be covered in the EIA procedure are provided in Figure 1.

Assessment of the environmental impact of the project

The purpose of the EIA procedure is to assess the project's environmental impacts and foster attention to them in the project's planning phase. In addition, the procedure aims to improve access to information and the opportunities to participate in the planning of the project.

The EIA procedure is based on the Act on the Environmental Impact Assessment Procedure (252/2017) and the Government Decree on the Environmental Impact Assessment Procedure (277/2017). The procedure has two phases. In the first phase, an Environmental Impact Assessment Programme (the EIA Programme) is drawn up. It describes a plan concerning how the environmental impacts caused by the project are assessed. The second phase includes the assessment of the environmental impacts, and the results are presented in the environmental impact

assessment report (the EIA Report). The EIA procedure is carried out before licence or permit procedures, and its purpose is to influence the planning of the project and decision-making. In this EIA procedure, the coordinating authority is the Ministry of Economic Affairs and Employment.

Parallel to the EIA procedure conducted in Finland, an international hearing in accordance with the Espoo Convention should be organised in projects that may have impacts extending beyond the borders of Finland. The Ministry of the Environment is responsible for the international hearing involving Finland.

Environmental impact assessment methods

Table 2 shows a summary of the assessment methods by impact and the proposed observed areas. The observed areas concerning environmental impacts have been defined to cover the maximum reach of the impacts. In reality, the environmental impacts are likely to occur in an area smaller than the observed area. The EIA report presents the results of the environmental impact assessment and their affected areas.

Table 2. Summary of the environmental impacts to be reviewed, assessment methods and the preliminary observed area of the impacts.

Component	Methods of assessment	Observed area
Land use, land use planning and the built environment	An expert assessment of how the project relates to the current and planned land use and land use planning. In addition, built environment sites and the distance thereto are assessed.	Approximately up to 5 km from the project area.
Landscape and cultural environment	An expert assessment of the project's relation to the landscape of the vicinity (holiday housing, in particular) and the landscape overall. Cultural environment sites are identified.	Approximately 5 km from the project area.
Traffic	A calculated assessment of the changes generated by the project in traffic volumes and an expert assessment of the impact of transport on traffic safety. The assessment also applies a separate survey conducted concerning the risks and implementation methods related to the transports of spent nuclear fuel.	The traffic routes leading to the project area in Loviisa up to main road 7. In addition, the immediate vicinity of the transport routes for spent nuclear fuel.
Noise and vibration	An expert assessment of the noise emissions and vibration caused by the different phases of the project and transport, as well as their dispersion in the environment.	The project area and its vicinity within an approximately 3-km radius and the nearby areas along the transport routes.
Air quality	An expert assessment of the typical emissions into the air generated by the project.	The typical emissions into the air caused by construction, dismantling and transport activities, and the extension of the operation within an approximate radius of 1–2 kilometres.
Soil, bedrock and groundwater	An expert assessment based on the planned construction and final disposal measures.	The project area.
Surface waters	A modelling of the cooling water and an expert assessment based on it concerning the impact on the sea area. An expert assessment of the impacts of water structures, service water intake, and the management and discharge of wastewater. In addition, a survey is conducted on the pollutants and sub-bottom profiling of sediments.	Approximately 5 km from the project area.
Fish and fishing	An expert assessment to be conducted based on ichthyofauna studies and the impact assessment of surface waters.	Approximately 10 km from the project area.
Flora, fauna and conservation areas	An expert assessment of the impact on the natural environment and conservation areas. In addition, an avifauna survey is conducted in connection with the EIA procedure.	Approximately 10 km from the project area, with a special focus on the sea area.
People's living conditions, comfort and health	An expert assessment (including the regional economy, noise, emissions, traffic and landscape) to be conducted based on the calculated and qualitative assessments carried out in the sections concerning other impacts. In addition, a resident survey and small group interviews are conducted.	The power plant's vicinity and transport routes. The resident survey is conducted within a 20-kilometre radius.
Regional economy	A survey of the regional economy, based on an analysis of the current situation and resource flow modelling.	Finland.

Component	Methods of assessment	Observed area
Emissions of and radiation from radioactive substances	An expert assessment of the release of radioactive emissions generated by the project into the air and sea. Radiation in the vicinity of Loviisa power plant is monitored in accordance with the monitoring programme in effect, and the assessment is based on data obtained from the monitoring. The radiation doses caused by emissions are assessed by means of calculations.	Radiation monitoring of the environment within an approximate radius of 10 km, radiation dose calculation within 100 km.
Use of natural resources	An expert assessment of, for example, the use of blasted rock, and a description of the impact of the nuclear fuel production chain.	The production chain of nuclear fuel at a general level. Other use (e.g. mineral aggregate) locally or regionally.
Waste and by-products	An expert assessment of the waste streams in different phases and the processing, utilisation options and final disposal thereof. Reports prepared earlier (including Posiva 2008) are used to describe the impact of the transport and final disposal of spent nuclear fuel.	Spent nuclear fuel from Loviisa power plant to Eurajoki, including the transport routes. Others locally or regionally.
Long-term safety of the L/ILW repository	Includes the key results of the safety case and an expert assessment of the impact on long-term safety of the extension of the power plant's service life and the radioactive waste originating from elsewhere in Finland than Loviisa power plant.	The vicinity of the power plant.
Energy markets and security of supply	An expert assessment of the development of and changes in the energy market in the project options.	Finland.
Climate change	Calculated assessment of carbon dioxide emissions (CO _{2e}) and their impact on Finland's total emissions.	At the national level in Finland.
Emergencies and accidents	A modelling of a fictional severe reactor accident which releases 100 TBq of nuclide Cs-137 into the atmosphere. As a result, the modelling provides the fallout and radiation doses caused by the emission. An expert assessment of the impacts.	1,000 km.
Combined impacts	An expert assessment of the combined impacts with regard to the other actors in the region and the associated projects.	The vicinity of the project area and the municipalities involved in the associated projects.
Transboundary impacts	An assessment to be prepared based on separate surveys and modelling of the impact of the project potentially extending beyond the borders of Finland.	1,000 km.

Participation and interaction

The EIA procedure is interactive and enables different parties to discuss and express their opinion on the project and its impacts. One of the key objectives of the EIA procedure is to promote communication about the project and improve the opportunities to participate in its planning. Participation allows for the different stakeholders to express their views.

The environmental impact assessment procedure can be participated in by everyone whose conditions and interests, such as accommodation, work, transport, leisure activities or other living conditions, may be affected by the project to be implemented. In accordance with the EIA legislation, citizens can submit their opinions of the EIA programme and report to the coordinating authority during the period these are available for viewing.

Two public events are organised during the EIA procedure: the first in the programme phase; the second in the report phase. The purpose of the events, open for all, is to provide information produced during the project and the EIA procedure. The events enable citizens to have an opportunity to express their views on the project and the impacts to be assessed and to receive more information. The dates and locations of the public events are

communicated through the coordinating authority's announcement concerning the EIA programme and report.

A resident survey is conducted in the EIA report phase to study the attitudes of the area's residents. The resident survey material also serves as data for the impact assessment. In addition, small group events are held in the EIA report phase to disseminate information on the project and hear various stakeholders. The stakeholders may include the area's residents, landowners, fishermen and entrepreneurs. The composition of the groups and the interview themes are tailored in accordance with the need for information and the stakeholder group.

The EIA programme and report will be published on the Ministry of Economic Affairs and Employment website. The documents are available for viewing in accordance with the announcement made by the coordinating authority. The EIA programme and report are also available on Fortum's website. The website also contains up-to-date information on the project, the environmental impact assessment procedure and licensing. In addition, Fortum provides information on the progress of the project, and news conferences and public events, for example.



