Loviisa EIA 3

Fortum Power and Heat Oy

Supplementing the Loviisa Nuclear Power Plant
with a Third Plant Unit

Environmental Impact Assessment Programme Summary

Fortum

1 PROJECT AND ITS JUSTIFICATION

In order to improve its readiness for constructing additional production capacity, Fortum Power and Heat Oy has initiated the environmental impact assessment (EIA) procedure concerning a new nuclear power plant unit that would possibly be located at Hästholmen in Loviisa. Fortum Power and Heat Oy is examining the construction of a nuclear power plant unit with approximate electric power of 1,000 to 1,800 MW and thermal power of 2,800 to 4,600 MW at Hästholmen in Loviisa, which is the location of two existing nuclear power plant units (LO1 and LO2). Fortum has not made any decisions concerning action to be taken subsequent to the EIA procedure.

The consumption of electricity in Finland continues to grow. Finland consumed approximately 90 TWh of electricity in 2006. The 80 TWh mark was exceeded in 2001, and 50 TWh in 1985. Electricity consumption has doubled in a quarter-century. The annual consumption is estimated to exceed 100 TWh in 6 to 8 years.

This document presents a summary of the EIA programme phase of the project. Among other things, the document will be used as part of the international hearing.

In a press release issued on 28 March 2007, Teollisuuden Voima Oy (TVO) announced that it is initiating an environmental impact assessment procedure on the environmental impacts of a new nuclear power plant unit possibly to be built in connection with the Olkiluoto nuclear power plant. As part of the procedure, TVO has submitted the assessment programme to the Ministry of Trade and Industry on 31 May 2007.

1.1 Environmental impact assessment procedure

The directive (85/337/EEC) issued by the Council of European Communities (EC) has been enforced in Finland based on annex twenty (XX) of Treaty establishing the European Economic Community by virtue of the EIA Act (468/1994) and Decree (713/2006) on environmental impact assessment.

According to the EIA Act, the projects to which an environmental impact assessment procedure is applicable are provided in the EIA Decree. According to the list of projects of the EIA Decree, nuclear power plants are included in projects subject to the assessment procedure.

The first stage of the EIA procedure comprises the preparation of the assessment programme that presents information about the project, the options under assessment, a summary of the licences required for the project, a description of the environment, and the assessment methods. It also presents a plan for arranging the assessment procedure and participation, as well as planning and implementation schedules for the project.

An assessment report will be prepared on the basis of the assessment programme and the statements and opinions received on it. In nuclear power plant projects, the Ministry of Trade and Industry acts as the statutory coordinating authority of the EIA procedure responsible for organising the public display of the assessment programme and report, compiling the statements and opinions provided on them, and providing its own statement.

The objective of the EIA procedure is to promote the assessment and uniform observation of environmental impacts in planning and decision-making. Another objective of the procedure is to increase the opportunities for citizens to receive information and participate in the process.

The UN Economic Commission for Europe Convention on Environmental Impact Assessment in a Transboundary Context (the so-called Espoo Convention) is also applied to the project. Nuclear power plants are mentioned in the project list of the Convention. In Finland, the contact authority for the Convention will be the Ministry of the Environment.

1.2 Licences required for the project under the Nuclear Energy Act

The new power plant unit requires a decision-in-principle issued by the Government and ratified by the Parliament stating that the power plant unit is in line with the overall good of society. The prerequisites for a positive decision-in-principle include, e.g., an approval from the municipality intended to be the site of the facility. The investment decision for the project is not allowed prior to the decision-in-principle. The Government grants the construction licence if the prerequisites for granting a construction licence for a nuclear facility provided in the Nuclear Energy Act (990/1987) are met. The Government grants the operating licence if the prerequisites prescribed by the Nuclear Energy Act are met and the Ministry of Trade and Industry has ascertained that provision for the cost of nuclear waste management has been arranged in a manner required by law.

1.3 Location

The planned site for the nuclear power plant is located on the south coast of Finland, on the island of Hästholmen situated about 12 kilometres southeast of the city of Loviisa.

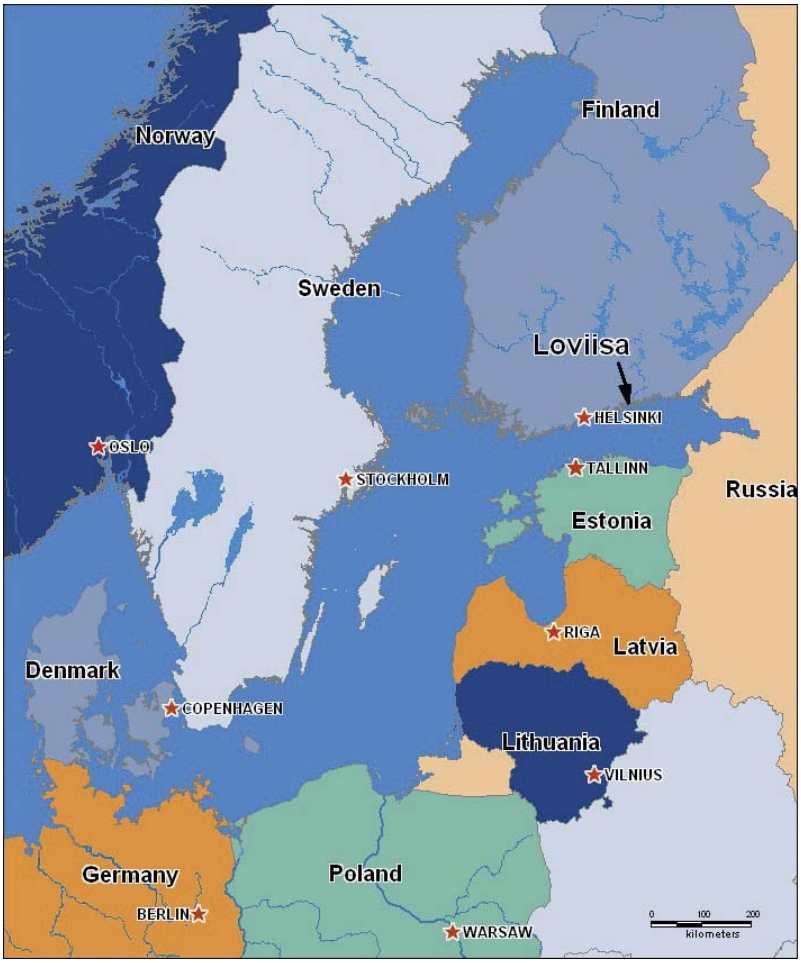


Figure 1. The location of Loviisa, Finland's neighbouring countries and the countries of the Baltic Sea region (Source: Pöyry Energy Oy).

Figure 2. The city of Loviisa and the location of the island of Hästholmen.

Base map © Affecto Finland Oy, Permit L7183/07

1.4 Project options

The environmental impact assessment will consider the construction of a new nuclear power plant unit with an approximate electric power of 1,000 to 1,800 MW at Hästholmen in Loviisa. The nuclear power plant unit may be a boiling or pressurised water reactor plant. The option under examination is the Hästholmen site and the cooling water options associated with it.

In addition, the environmental impact assessment will consider the non-implementation of the project (the zero-option). The zero-option, in which the power plant unit will not be constructed at Hästholmen, will examine the emissions that would result if the amount of electricity equal to the production volume of the power plant unit were purchased from the market.

1.5 Nuclear safety

In Finland, the provisions for the use of nuclear energy are stipulated by the Nuclear Energy Act and Decree. The nuclear energy legislation lays down the requirements concerning, among other things, the general safety principles for the use of nuclear energy, the licensing procedure for nuclear facilities, the supervision of safety, and nuclear waste management.

In Finland, the Radiation and Nuclear Safety Authority (STUK) is the authority that supervises the safety of nuclear facilities in Finland from the design of the power plants to their decommissioning and issues detailed regulations that apply to the safe use of nuclear energy and to physical protection, emergency preparedness and safeguards. STUK is also responsible for the supervision of the use of nuclear materials and the treatment and storage of nuclear waste.

A nuclear power plant must be designed in accordance with nuclear energy legislation and Regulatory Guides on Nuclear Safety (YVL Guides) published by the STUK in order to ensure the safety of its operation. The YVL Guides published contain detailed requirements concerning safety. The guides apply to the safety of nuclear installations, nuclear materials and nuclear waste, as well as to the safety systems and emergency preparedness required for the use of nuclear energy. The YVL Guides are rules the licensee or any other organisation concerned must comply with.

The latest safety requirements will be taken into account in the potential new power plant unit. The potential plant unit will be one in which preparations have been made for severe accidents and the mitigation of their consequences.

Reactor safety requires the functionality of three factors in all circumstances:

- Managing the chain reaction and the power it produces
- Cooling the fuel after the chain reaction has ended, also known as decay heat removal
- Isolation of radioactive substances from the environment

The fundamentals of safety include several barriers for radioactive substances and the defence in depth principle of safety. The principle of several barriers means that there is a series of strong and tight physical barriers between radioactive substances and the environment, preventing the substances from entering the environment in all circumstances. The tightness of any single barrier is enough to ensure that no radioactive substances can enter the environment. The defence in depth principle refers to the prevention of the occurrence of transients and accidents, as well as to the control of transients and accidents and mitigation of their consequences.

The objective of the power company and the control authorities is to ensure nuclear power plant safety so that plant operation does not cause radiation hazards that could endanger the safety of workers or of the population in the vicinity or could otherwise harm the environment or property.

1.6 Spent nuclear fuel and operating waste

Spent nuclear fuel is initially cooled down and stored for a few years in water pools at the power plant unit. After this it is taken to interim storage in water pools in the spent nuclear fuel storage facility at the Loviisa power plant. Interim storage in the spent nuclear fuel storage will continue for decades until the final disposal of the spent nuclear fuel. The implementation of the new power plant unit may require that the currently used spent nuclear fuel storage facility be expanded or a new facility be constructed.

The low and intermediate-level operating waste, as well as the decommissioning waste and dismantled components generated in connection with the decommissioning of the power plant, will be placed at a depth of over 100 metres in rock facilities excavated in the bedrock of the Loviisa power plant site. The implementation of the new power plant increases the volume of final disposal waste and will lead the currently used final repositories be expanded in a later phase.

According to plan, nuclear fuel spent in Finland will be disposed of in a final repository to be excavated in bedrock. According to the Nuclear Energy Act, nuclear waste (incl. spent nuclear fuel), may not be imported to Finland or exported from Finland. Fortum and TVO have established Posiva Oy to manage the transportation and final disposal of the spent nuclear fuel produced by the Olkiluoto and Loviisa power plants. Posiva completed an environmental impact assessment concerning the disposal facility for nuclear fuel in 1999. After positive decisions-in-principle (in 2001 and 2002), Posiva focused its further research on disposal in Olkiluoto and started preparations for building an underground rock characterization facility. Posiva intends to dispose of spent nuclear fuel at a depth of approximately 400 to 500 metres in the bedrock of Olkiluoto, a few kilometres away from the existing nuclear power plant. The disposal of spent nuclear fuel is scheduled to start in 2020. The spent nuclear fuel from a potential new plant unit will also be disposed of in Olkiluoto. The objective is to expand the Olkiluoto final repository to accommodate the spent nuclear fuel from Loviisa 3, and to apply for the necessary licenses.

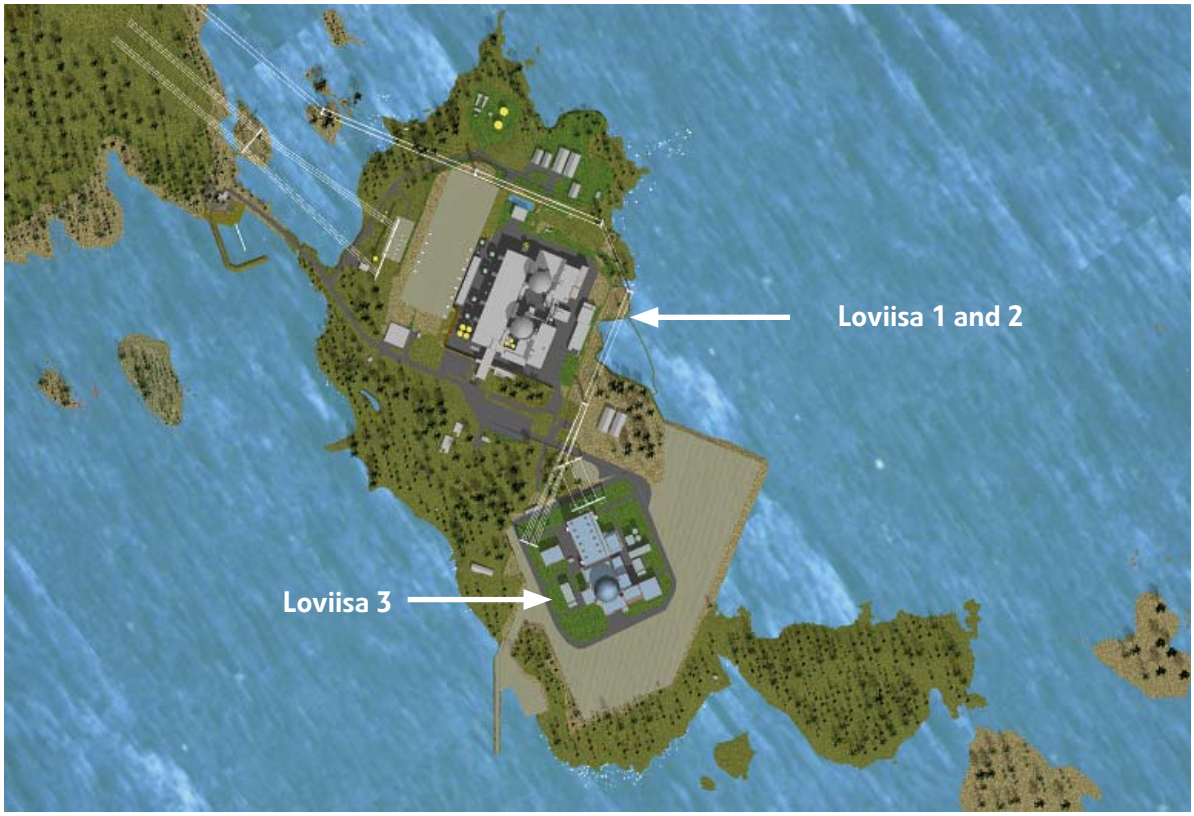


Figure 3. Location of the current power plant units (Loviisa 1 and Loviisa 2) and the planned location of the new power plant unit (Loviisa 3). The site planned for the new power plant unit is to the south of the existing plant.

1.7 Present state and monitoring of radiation

The releases of radioactive substances from the power plant to air and water are under constant monitoring. The releases are carefully measured to ensure that they remain well below the prescribed limits. Radioactivity is measured on and around the power plant from objects such as seawater, fish, algae, sea bed fauna, air, soil and plants, as well as garden and agricultural products. Monitoring is carried out in accordance with the radiation control programme for the surroundings of the power plant, and the results are reported to STUK.

Annual radiation doses to the environment are calculated on the basis of radioactive releases from the power plant. The calculating models account for the spreading of radioactive substances in the atmosphere and waters, as well as accumulation phenomena in different food chains. The calculation of radiation doses to people resident near the plant accounts for the means by which they utilise the environment surrounding the power plant for purposes such as agriculture, recreation and fishing in order to be able to determine the radiation doses caused to people through different routes of origin.

The environmental radiation caused by the Loviisa nuclear power plant is very minor in comparison with the average radiation dose received by Finns from other sources of radiation, which amounts to approximately 3,700 mikrosieverts (μSv) annually. The annual radiation doses to people resident near the plant are calculated annually

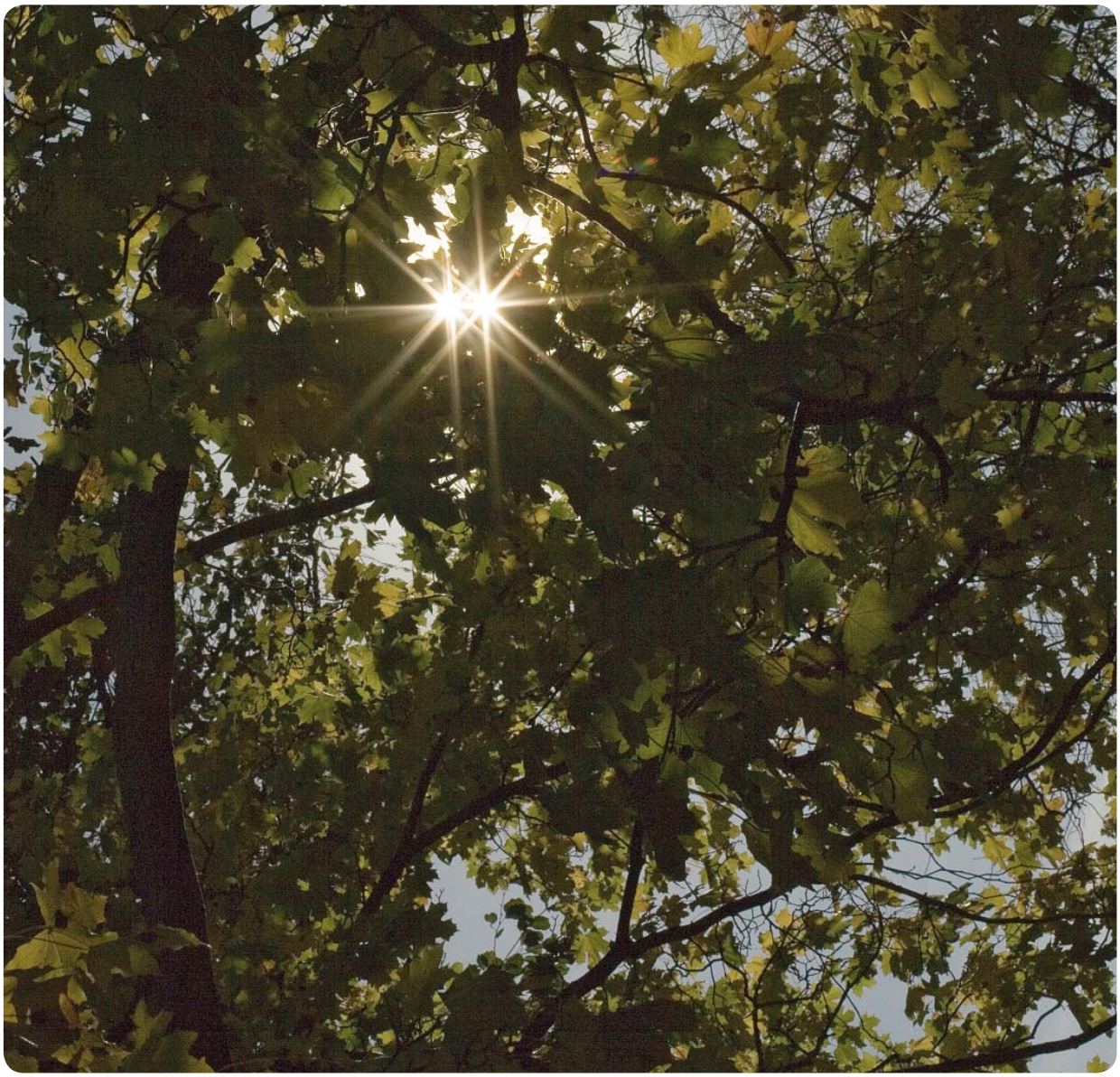
on the basis of the plant's radioactive emissions. The maximum permitted annual dose is 100 µSv. The radiation dose to the most exposed nearby residents due to emissions into the air and sea in 2006 was approximately 0.1 µSv/inhabitant.

Environmental monitoring measurements can be used to monitor the occurrence of radioactive substances originating from the nuclear power plant in the environment because they can be distinguished from natural radioactive substances and those originating from other sources of emissions.

Radioactive substances originating from the operations of the Loviisa nuclear power plant are effectively filtered; therefore any releases into the environment are low. Radioactive substances originating from the Loviisa power plant have been mainly detected in the aquatic environment, such as sediment material and organisms (for instance Saduria entomon) that particularly accumulate radioactivity, and are not used as human food. Radioactive substances originating from the power plant have been detected in seawater only in exceptional cases, and never in fish. Air and fallout samples show very low amounts of radioactive substances a few times a year, originating from airborne releases from the Loviisa power plant. Radioactive substances originating from the power plant have never been detected in soil, grazing grass, milk, garden products, crops, meat or drinking water.

If radioactive substances were to be released from the plant to an extent that would increase the radiation level in the immediate surroundings, the situation would be immediately observed by the monitoring network surrounding the plant units. The network consists of measuring stations located at distances of 2 to 5 kilometres from the plant, from which the data is automatically transmitted to the computers of the plant units. This data is also available for STUK inspections at any time.

To provide for the occurrence of accidents, the current Loviisa power plant has been allotted a protective zone extending to 5 km from the power plant in the land use planning, as well as an emergency planning zone of rescue operations primarily comprising the nearby municipalities of Loviisa, Pernaja, Pyhtää and Ruotsinpyhtää.



2 EXAMINED IMPACTS

The EIA report will present the impacts occurring during the construction and operation of the plant unit, as well as those arising from the decommissioning of the unit. In addition to the above, the impacts of production and transportation of nuclear fuel, as well as the impacts arising from the disposal of spent nuclear fuel, will be described, and the possible associated projects and their environmental impacts will be examined.

The EIA procedure will primarily assess the environmental impacts of operations taking place on the power plant site, including radiation effects. Operations extending outside the site include, for example, traffic during the construction and operation of the plant unit. The impacts of these operations will also be assessed to the required extent. The environmental impact of the construction of power transmission links to the national grid will be assessed in a separate EIA procedure.

The EIA procedure will assess:

The impacts of construction on:
- Soil, bedrock and groundwater
- Vegetation, animals and objects of protection
- Employment and industries
- Welfare of the residents
- Noise levels
- Traffic

The impacts during the operation of the new plant unit on:
- Air quality and climate
- Water systems, water fauna and fishing
- Soil, bedrock and groundwater
- Vegetation, animals and objects of protection
- Land use, structures and landscape
- People and society

In addition, the following will be assessed to the required extent:
- Impacts of waste and by-products and their treatment
- Environmental impact of traffic
- Impacts of exceptional and accident situations
- Impacts of power plant unit decommissioning
- Impacts of nuclear fuel production and transportation
- Impacts of associated projects
- Impacts of the zero-option
- Comparison between alternatives

In practice, the project's environmental impacts will be assessed by examining the present state of the environment and assessing the changes caused by the projects, as well as their significance. Planned assessments include, e.g., cooling water spreading calculations, noise modelling, an assessment concerning the regional structure and economy, an assessment of the power plant's landscape impacts, and preparation of conceptual drawings. If required, a resident survey and thematic interviews will be carried out to investigate the attitudes of nearby residents towards the project and to support the assessment of social impacts. The investigation of health impacts is part of the assessment of the project's social impacts.

The EIA report will discuss the environmental impacts of a severe accident based on the safety analyses of the existing power plant units and the requirements imposed on the new unit. The consequences of exceptional situations will be assessed based on the extensive research data on the health and environmental impacts of radiation.

2.1 Limits of the environmental impact assessment

The EIA implementation options will primarily examine the environmental impacts of operations taking place on the power plant site. Operations extending outside the site include, for example, traffic during the construction and operation of the plant, and the construction of the power transmission link. The impacts of these operations will also be assessed to the required extent. In connection with the EIA procedure, it will also be assessed whether an accident will have impacts extending beyond Finnish territory.

The impacts of the transportation and intermediate storage of nuclear fuel and waste produced at the plant will be assessed. Furthermore, the impacts of handling and disposal of waste will be assessed to the required extent. The environmental impacts of producing nuclear fuel will be presented.

At this stage, no combined effects with other planned projects known at the time have been identified. This issue will be examined in more detail in connection with the environmental impact assessment. Combined effects with present operations will be examined as part of the impact assessment.

This EIA procedure will examine the environmental impacts within areas specifically defined for each type of impact. The extent of the observed area depends on the environmental impact being examined. Environmental impacts are likely to occur in an area smaller than the observed area. The affected areas will be presented in the assessment report.

3 INFORMATION ON POSSIBLE TRANSBOUNDARY ENVIRONMENTAL IMPACTS

Safety will be the central design principle of the potential new nuclear power plant unit. If the decision is made to implement the new plant unit, the latest safety requirements will be taken into account. The plant unit will be one in which preparations have been made for severe accidents and the mitigation of their consequences. Potential hazardous situations will be analysed already in the plant design phase, and reliable technical protection will be designed for each.

Protection against external hazards will also be carried out. The design of the plant unit includes preparations for, among other things, a big passenger aeroplane crash and exceptional weather conditions. Other contemporary threats, such as the effect of climate change, will also be considered in the design.

In the extremely unlikely accident situation that could cause a major radioactive release despite the preparations for severe accidents and the mitigation of their consequences, there is an extremely low possibility of the impacts extending beyond Finnish territory in some weather conditions. At this stage, no other impacts extending beyond Finnish territory have been identified. This issue will be examined in more detail in the EIA report.

4 SCHEDULE

The environmental impact assessment report is scheduled to be ready in June 2008, and the EIA procedure concerning the project is intended to be completed in late 2008. If it is decided to implement the project, the aim is to start construction of the new nuclear power plant unit in or around 2012. Thus the plant could be commissioned around 2018.

Organisation responsible for the project: Fortum Power and Heat Oy

Postal address: P.O. Box 100, FI-00048 FORTUM, Finland
Telephone: +358 10 4511
Contact persons: Heikki Raumolin, Reko Rantamäki
E-mail: firstname.lastname@fortum.com

Coordinating authority: Ministry of Trade and Industry

Postal address: P.O. Box 32, FI-00023 Government, Finland
Telephone: +358 9 160 01
Contact person: Jaana Avolahti
E-mail: firstname.lastname@ktm.fi

International hearing: Ministry of the Environment

Postal address: P.O. Box 35, FI-00023 Government, Finland
Telephone: +358 20 490 100
Contact person: Seija Rantakallio
E-mail: firstname.lastname@ymparisto.fi

For further information about the project, you can also contact:

EIA consultant: Pöyry Energy Oy

Postal address: P.O. Box 93, FI-02151 Espoo, Finland
Telephone: +358 10 3311
Contact person: Päivi Koski
E-mail: firstname.lastname@poyry.com

Fortum Power and Heat Oy
P.O. Box 100
FI-00048 FORTUM, Finland
www.fortum.com/loviisa