FENNOVOIMA

Environmental Impact Assessment Program for a Nuclear Power Plant

SUMMARY

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The EIA program can be uploaded at
www.fennovoima.com.

1 Party responsible for the project and project background

Fennovoima Ltd (later on referred to as Fennovoima) is studying the construction of a nuclear power plant with the electric power of about 1,200 MW to Hanhikivi in Pyhäjoki. As a part of the study, Fennovoima is implementing an environmental impact assessment in order to assess the environmental impacts during the construction and operation of the plant in accordance with the Act on Environmental Impact Assessment Procedure (EIA Act, 468/1994).

In 2008, Fennovoima implemented an environmental impact assessment procedure (EIA procedure), which evaluated the impacts of the nuclear power plant with the electric power of about 1,500-2,500 MW, with one or two reactors, in three alternative locations: Pyhäjoki, Ruotsinpyhtää and Simo. In conjunction with the EIA procedure, the international hearing in accordance with the Espoo Convention was also implemented.

On 6 May 2010, the Council of State of Finland granted Fennovoima a Decision-in-Principle in accordance with the Nuclear Energy Act (990/1987) 11 §. The Finnish Parliament confirmed the Decision-in-Principle on 1 July 2010. The Hanhikivi headland in Pyhäjoki was selected as the location for the plant in the autumn of 2011.

Since the project that is the object of this environmental impact assessment was not mentioned as one of the plant alternatives in the original Decision-in-Principle application, the Ministry of Employment and the Economy requires that Fennovoima updates the project's environmental impact assessment with this EIA procedure. Simultaneously, the international hearing in accordance with the Espoo Convention will be carried out.

2 Alternatives to be assessed

As an implementation alternative, the environmental impacts during the construction and operation of a nuclear power plant with the electric power of about 1,200 MW will be assessed. The plant will be located in Northern Ostrobothnia, at the Hanhikivi headland in Pyhäjoki. The nuclear power plant will consist of one nuclear power plant unit with a pressurized water reactor. The supplier of this nuclear power plant will be a subsidiary of the Rosatom corporation.

The table below presents the preliminary technical specifications of the planned new nuclear power plant.

As a zero alternative, the assessment will estimate the situation, in which Fennovoima will not implement the nuclear power plant project. In the zero alternative, the need for electricity in Finland would be covered by increasing the import of electricity or through power plant projects of other parties.

Specification	Numerical value and unit
Reactor	Pressurized water reactor
Electric power	about 1,200 MW (1,100–1,300 MW)
Thermal power	about 3,200 MW
Thermal efficiency	about 37%
Fuel	Uranium dioxide UO_2
Thermal load to be discharged to the water system	about 2,000 MW
Annual energy production	noin 9 TWh
Cooling water requirement	noin 40–45 m^3/s

Table 1 Preliminary technical specifications of the planned new nuclear power plant.

3 Environmental impact assessment of the project

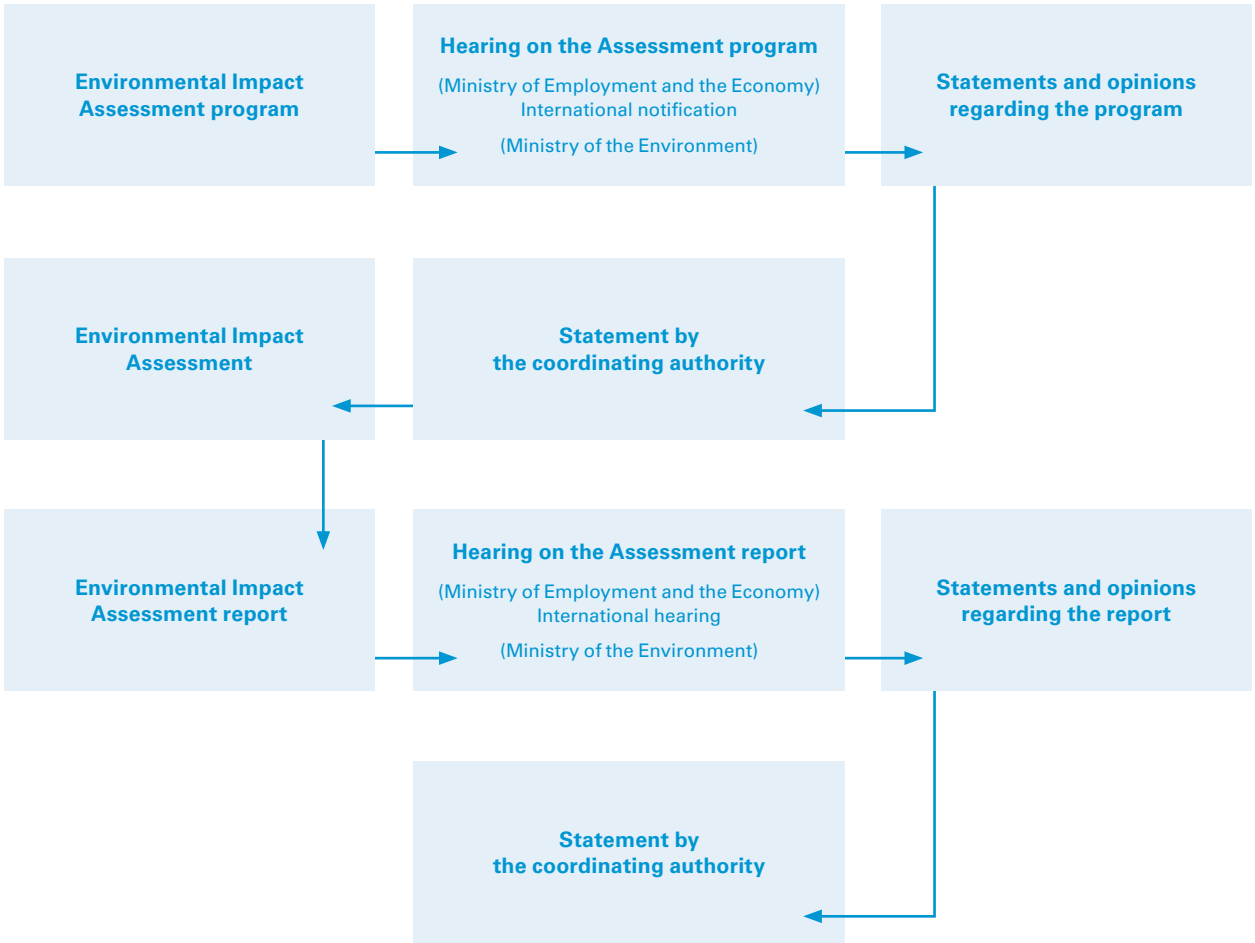
The Directive on Environmental Impact Assessment (85/337/EEC) issued by the Council of the European Community (EC) has been enforced in Finland through the EIA Act (468/1994) and EIA Decree (713/2006) by virtue of Appendix twenty of the agreement on the European Economic Area. The stages of the EIA procedure are presented in Figure 1.

Based on this environmental impact assessment program (EIA program) and the opinions and statements expressed relating to it, an environmental impact assessment report (EIA report) will be prepared. The EIA report presents the data of the project and its alternatives, as well as a uniform assessment on their environmental impacts. The existing environmental studies and studies to be carried out during this environmental impact assessment procedure will be compiled to the EIA report.

In the EIA procedure for a nuclear power plant, the Ministry of Employment and the Economy will act as the coordinating authority. The coordinating authority will request statements from various authorities during the EIA procedure. Also the residents of the site region, civic and environmental organisations and other stakeholders have the opportunity to take a stand on this EIA program, assessment of the environmental impacts and to the project. The coordinating authority of the EIA procedure notifies of the public display. This states more clearly how and when the opinions can be stated. The EIA report will be displayed publicly in due course, in order to allow expressing statements and opinions.

The Ministry of the Environment will act as the coordinating authority in the international hearing. If the target state decides on participating in the procedure, it will put the EIA program on public display for possible statements and opinions. The EIA report will be displayed in the same way. The statements and opinions expressed will be compiled by the Ministry of the Environment who will pass the data on to the coordinating authority to be taken into consideration in the coordinating authority's statements on the EIA program and the EIA report.

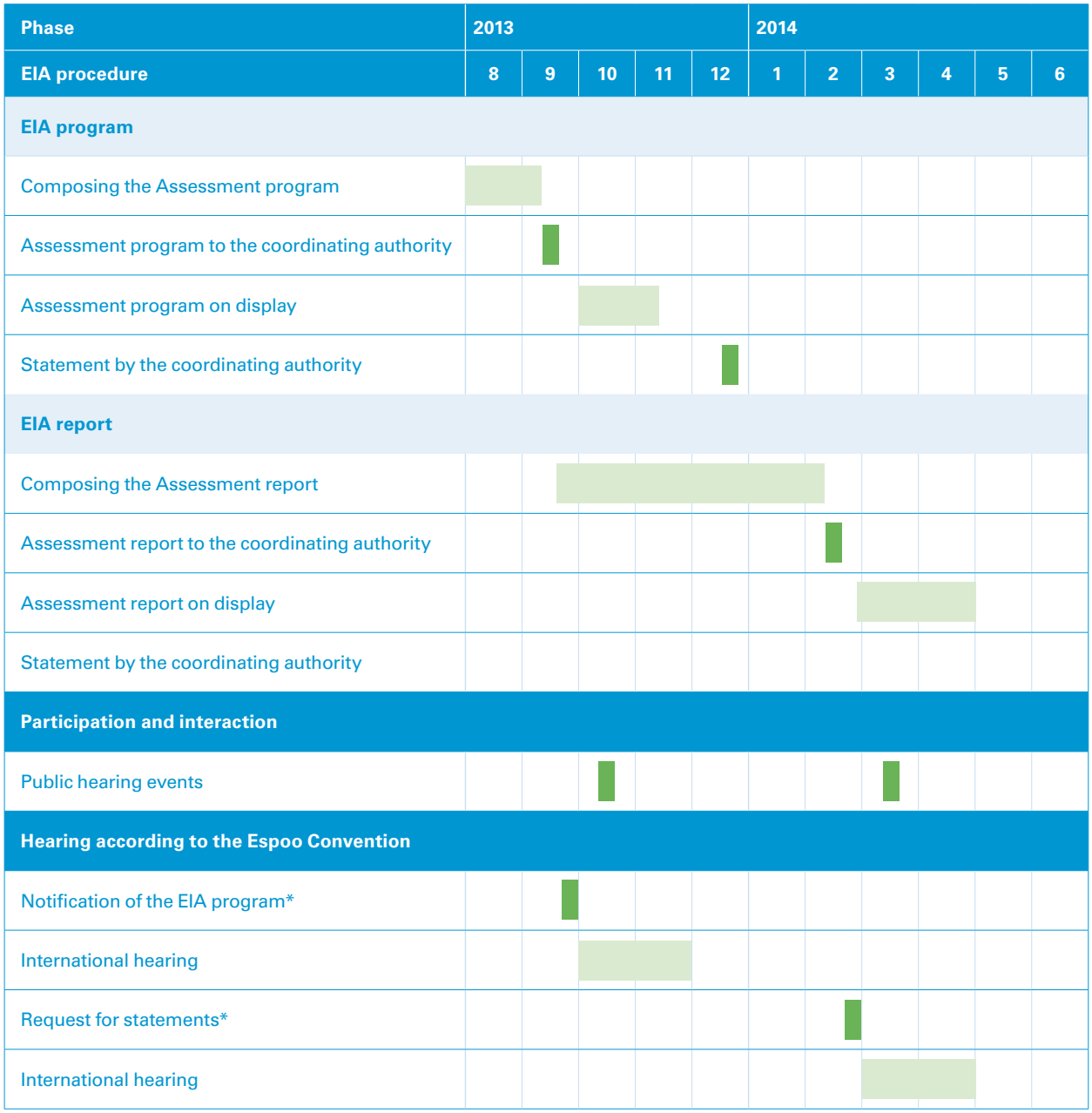
Figure 1 Stages of EIA procedure.



4 Schedule

The main stages of the EIA procedure and the planned schedule are presented in the following figure (Figure 2).

Figure 2 Planned schedule of the EIA procedure.



*by the Ministry of the Environment

Figure 3 Location of the project and the countries in the Baltic Sea region including Norway.

5 Description of the environment in the project area

Location and land use planning

The project site is located on the west coast of Finland in Northern Ostrobothnia, at the Hanhikivi headland in an area of Pyhäjoki and Raahe municipalities (Figure 3). Altogether five different land use plans are legally in force; Hanhikivi regional land use plan, and local master plans as well as detailed master plans for the nuclear power plant area in the municipalities of Pyhäjoki and Raahe.

The immediate surroundings of the Hanhikivi site are scarcely populated. There is no industrial activity in the close vicinity of the headland. The population centre of Pyhäjoki municipality is located approximately five kilometres to the south of the headland. The centre of Raahe is located approximately 20 kilometres away. Approximately 140 people live permanently within a radius of five kilometres from the location area. Within a 20-kilometer radius, the number of permanent inhabitants is 11,300. There are some 20 holiday residences in the area of the Hanhikivi headland, and roughly a couple of hundred holiday residences within a distance of 20 kilometre

Natural conditions

The Hanhikivi area is low-lying land-uplift coast with typical natural conditions of seaside meadows and low-lying bay overgrown by aquatic plants (Figure 4). The habitat type of the majority of the Hanhikivi headland is land-uplift coastal forest. The area is one of the significant succession forests, but this area is lacking more aged forests.

Less than two kilometres to the south of the project area lies the Natura 2000 area of Parhalahti-Syölätinlahti and Heinikarinlampi. This Natura area is also a nationally valuable wetland for birds and it belongs to the national

Figure 4 Hanhikivi headland in Pyhäjoki in the Northern Finland.

protection program of valuable bird-rich wetlands. In the vicinity of Hanhikivi there is a naturally valuable classified (FINIBA) avifauna area, several nature conservation areas, and other areas of special attention.

In the Hanhikivi area, the overburden mainly consists of moraine. The bedrock comprises mainly metaconglomerate. The headland area is classified as valuable rock area. The headland is also the location of a boundary mark, Hanhikivi, dating back to the historical period. The closest classified groundwater region is located at approximately 10 kilometres' distance from the Hanhikivi area.

Water systems

The coastal water area surrounding the Hanhikivi headland is shallow and its shores are rocky. The shoreline is open and water changes efficiently. Typical to the Gulf of Bothnia, the salinity of the water is low as is the number of species. The land-uplifting constantly changes the low-lying shore zone, which is a mixture of salty, freshwater and brackish water species. The sea area in front of the Hanhikivi headland is significant for both fish stocks and fisheries.

Noise, traffic and air quality

At present, there are no activities causing significant noise or emissions in the vicinity of the nuclear power plant planned to the Hanhikivi headland area.

Highway 8 (E8) passes at approximately six kilometres distance from the location of the nuclear power plant site. The closest railway station and harbour are located in Raahe. The closest airport is located in Oulu at approximately 100 kilometres distance from Pyhäjoki.

6 Environmental impacts to be assessed

In accordance with the EIA Act, the assessment will include studies of the environmental impacts caused by the approximately 1,200 MW nuclear power plant to:

- human health, living conditions and wellbeing,
- soil, water, air, climate, vegetation, living organisms and diversity of nature,
- community structure, buildings, landscape, cityscape and cultural heritage,
- utilisation of natural resources,
- mutual interdependencies of these factors.

The assessment particularly highlights the impacts that deviate from the impacts assessed in the EIA carried out in 2008 or those not covered by the 2008 EIA. In addition, the environmental impacts that are considered significant or felt as significant by the interest groups will be taken into consideration.

The assessment of the impacts will utilise the assessments performed for the EIA that was prepared in 2008 for the Fennovoima nuclear power plant, as well as other studies of the current state of the environment and environmental impacts of the project, completed after said assessment.

The following table presents a preliminary assessment of the environmental impacts of an approximately 1,200 MW plant compared to the 1,800 MW plant presented in the 2008 EIA, as well as the assessment methods of environmental impacts.

Impact	Preliminary assessment on the environmental impacts of an approximately 1,200 MW plant compared to the 1,800 MW plant presented in the EIA of 2008	Assessment methods
Impacts during construction	There are no significant differences in the impacts, since both the construction work and the duration and extent of construction are similar to those of a plant with a higher electrical power.	Assessment based on the assessments presented in the EIA of 2008 and the present data.
Impacts on air quality and climate	Radioactive emissions in normal conditions are similar, and the radiation dosages caused by them are of the same magnitude. Other emissions to air and their impacts are of the same magnitude.	Assessment based on the assessment performed in the EIA of 2008 and the present emission data.
Impacts on water systems	Radioactive emissions in normal conditions are similar, and the radiation dosages caused by them are of the same magnitude. The quantities of cooling and waste waters are smaller, the impact less than in the previous assessment.	The impacts of the cooling waters are assessed by modelling the dispersion of the thermal load to be directed to the water system. In addition to the modelling, the assessment is based on assessments performed in the EIA of 2008 and the updated present-state assessment on the water systems, as well as new emission data.

Impacts of waste and their treatment	The quantity of spent nuclear fuel and operating waste is smaller, in which case the impacts are at the most of the same magnitude. There are no significant differences in the quantity of other waste, in which case the impacts are of the same magnitude.	Assessment based on the assessments presented in the EIA of 2008 and the present data, as well as additional assessments when necessary.
Impacts on soil, bedrock and groundwater	The extent and dimensions of construction and structures are of the same size or smaller, in which case the impacts are at the most of the same magnitude.	Assessment based on the assessments presented in the EIA of 2008 and on the present-state assessments performed after it.
Impacts on vegetation, animals and conservation areas	There are no significant differences in the impacts, since emissions, noise, traffic and thermal load to be directed to the water systems, as well as other factors with possible impact on nature are smaller or of the same magnitude.	Assessment based on the assessments presented in the EIA of 2008 and on the present-state assessments of nature performed after it.
Impacts on land use, structures and landscape	There are no differences in the impacts, since the extent and dimensions of construction and structures are of the same size or smaller.	Assessment based on the assessments presented in the EIA of 2008.
Impacts on traffic	There are no significant differences in the impacts, since the necessary transports for materials and personnel are of the same magnitude.	Assessment based on the assessments presented in the EIA of 2008 and on the necessary updated.
Noise impacts	The sources and magnitude of noise are similar, so there are no significant differences in the impacts.	Assessment based on the assessments presented in the EIA of 2008.
Impacts of abnormal and accident situations	There are no differences in the impacts, since the requirements by the authorities to be set as the maximum sanction for the various plants due to these situations are the same.	Assessment based on the EIA of 2008 and on the additional assessments of the decision-in-principle.
Transboundary environmental impacts across the borders of the state of Finland	According to the preliminary estimate, the impacts of radioactive emissions generated only by a serious nuclear power plant accident could have impact outside of the borders of Finland.	Assessment based on the assessments presented in the EIA of 2008. Impacts exceeding the borders of the state of Finland are assessed also in conjunction with the international hearing in accordance with the Espoo Convention.
Impacts on people and society	There is no difference with regard to adverse impacts to wellbeing and health, since the emissions, noise, traffic and other factors with possible impact on humans are either smaller or of the same magnitude. There are no significant differences in the impacts on regional economy and structure, or on the employment.	Assessment based on the assessments presented in the EIA of 2008 and on the assessments performed after it, as well as on a new resident inquiry, when necessary.
Impacts on energy markets	A new nuclear power plant will reduce Finland's dependency on the import of electricity and increase the supply on the electricity markets.	Assessment based on the assessments presented in the EIA of 2008.
Impacts of power plant decommissioning	There is no significant difference in impacts, since, among others, the structures, methods of dismantling and the quantities of waste are of similar nature.	Assessment based on what was presented in the EIA of 2008.
Impacts of nuclear fuel production	In general terms, the impacts are the same.	Assessment based on the data presented in the EIA of 2008 and on updated dated as far as deviating from the EIA of 2008.
Impacts of associated projects	Associated projects, such as construction and utilisation of transport connections and access power transmission lines are the same, in which case also the impacts will be of the same magnitude. Due to the lower power, the needs for strengthening the power transmission network will be smaller.	Assessment based on the assessments presented in the EIA of 2008.

7 Possible transboundary environmental impacts

According to the preliminary assessment, the impacts of radioactive emissions generated only by a serious nuclear power plant accident could extend outside the borders of Finland. This impact will also be assessed in conjunction with the international hearing in accordance with the Espoo Convention.

In conjunction with the 2008 environmental impact assessment and the additional assessment attached to the application for the Decision-in-Principle in 2009, the impacts of a nuclear power plant accident were modelled. The modelling was carried out using general and conservative assumptions which are not plant type specific. Thus the modelling will also apply to the assessment of the nuclear power plant accident of the plant alternative being assessed in this EIA procedure. The modelling studies carried out in 2008 and 2009 considered unfavourable weather conditions, as well as emission from a serious accident, containing 100 TBq cesium-137-nuclides. The modelling studies showed that with the assumed emissions, the need for population protection measures and long-term restriction on the use of land and water areas would be limited within a radius of 150 kilometres from the site in Pyhäjoki.

The EIA report presents an estimate on transboundary environmental impacts due to accident situations on the basis of the assessments described above.

At the present stage, no other impacts that could reach beyond the Finnish borders have been identified for the project. These other possible impacts are studied in more detail in the EIA report.

8 Permits required by the project

No decisions relating to the project are made in the EIA procedure. Its objective is to produce information for the basis of decision-making.

Fennovoima has been granted the Decision-in-Principle in accordance with the Nuclear Energy Act (990/1987) for the construction of a nuclear power plant.
Since the project as the subject of this EIA was not mentioned as one the plant alternatives in the original Decision-in-Principal application, the Ministry of Employment and the Economy has required additional studies.

According to the Decision-in-Principle, Fennovoima shall apply for a construction licence in accordance with the Nuclear Energy Act at the latest on 30 June 2015. The construction licence will be granted by the Council of State, provided that the prerequisites set in the Nuclear Energy Act for granting of a construction licence for a nuclear power plant are met.

The operating license for a nuclear power plant is granted by the Council of State, provided that the prerequisites listed in the Nuclear Energy Act are met and that the Ministry of Employment and the Economy has ascertained that provision for the cost of nuclear waste management has been arranged in a manner required by law.

In addition to the above, the project will in various stages require permits in accordance with the Environmental Protection Act, the Water Act, as well as the Land Use and Building Act.

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