

Ministry of Employment and the Economy
P. O. Box 32
FI-00023 GOVERNMENT, Finland

Unofficial translation

Request for a statement TEM/11/08.04.01/2014, 6 March 2014

Application by Fennovoima Oy for supplementing the Decision-in-Principle by the Government dated May 6, 2010; Preliminary safety assessment by the Radiation and Nuclear Safety Authority

In its request for a statement, the Ministry of Employment and the Economy (MEE) has requested the Radiation and Nuclear Safety Authority (STUK) to issue a preliminary safety assessment referred to in Section 12 of the Nuclear Energy Act on the application by Fennovoima Oy for supplementing the Decision-in-Principle concerning Fennovoima Oy's nuclear power plant project that the Government issued on 6 May, 2010 in accordance with Section 11 of the Nuclear Energy Act (990/1987). In its request for a statement, the MEE requests STUK to especially focus on the changes that have taken place in the project.

Fundamental changes in Fennovoima's nuclear power plant project include the new plant alternative following Fennovoima's suitability analysis on Rosatom's AES-2006 plant alternative that resulted in a plant delivery contract. Furthermore, there have been changes in Fennovoima's ownership structure as E.ON abandoned and Rosatom joined the project with an approximately one-third ownership.

The preliminary safety assessment that STUK has issued is appended to this letter. STUK appends to its safety assessment a statement from the Advisory Commission on Nuclear Safety as laid down in Section 56(2) of the Nuclear Energy Act.

According to the currently valid Decision-in-Principle issued in 2010, Fennovoima may construct one nuclear power plant unit with a thermal output not exceeding 4,900 megawatts (MW_{th}). The application for supplementing the Decision-in-Principle presents the current plan, according to which the Fennovoima nuclear power plant comprises a nuclear power plant unit that uses the AES-2006 pressurised water reactor and has a maximum thermal output of 3,220 MW_{th} and an electrical output of approximately 1,200 MW_e as well as the other nuclear facilities set out in the 2010 Decision-in-Principle, including the buildings and storage facilities that are necessary for nuclear fuel management and waste management and a repository for the final disposal of low and intermediate level reactor waste. According to the estimates given in the application, the plant will, during its service life, generate 1,200–1,800 tonnes of uranium as spent fuel, some 5,000 m^3 of low and intermediate level waste, and 10,000–15,000 m^3 of decommission-

ing waste. In 2011, Fennovoima selected the Hanhikivi headland in Pyhäjoki as the proposed site of the plant.

The regulations governing the safety of nuclear power plants are set forth on a general level in the Government Decree on the Safety of Nuclear Power Plants (717/2013) and in more detail in the YVL Guides issued by the Radiation and Nuclear Safety Authority. The outset for the Radiation and Nuclear Safety Authority's preliminary safety assessment is that meeting the key safety regulations laid down in the Government Decree means compliance with Section 6 of the Nuclear Energy Act.

The safety regulations that concern a new nuclear power plant unit are, in many respects, more stringent than the regulations that applied to the construction of the currently operating nuclear power plant units. As a result of advances made in science and technology, updated international standards and new operating experience, the current Finnish nuclear power plants have undergone modifications that improve safety. This principle of the further development of safety is included in the nuclear safety requirements set out in Section 7 a of the Nuclear Energy Act, and it shall also apply to the potential new nuclear power plant. Since the 2010 Government Decisions-in-Principle, further changes have been introduced into the nuclear safety requirements, taking the experiences on the Fukushima Nuclear Accident and other experience into consideration. STUK renewed its regulatory guides on nuclear safety (YVL Guides), and essential parts of the new Guides were adopted in December 2013 with regard to new nuclear power plants.

The AES-2006 plant alternative

In 2009, STUK discussed Rosatom's AES-2006 plant alternative when processing Fortum Oyj's application for a Decision-in-Principle. In comparison with the plant design presented to the Radiation and Nuclear Safety Authority in 2009, no material changes have been introduced into the AES-2006 plant that Fennovoima proposes in its application for supplementing the Decision-in-Principle.

The basic design of the AES-2006 plant unit is at an advanced level. The design objectives and design principles mainly comply with the Finnish safety requirements. This covering letter presents the most significant technical deviations that are not in compliance with the Finnish safety requirements identified during the review process of the material submitted to STUK in connection with the application for supplementing the Decision-in-Principle. Furthermore, according to STUK's preliminary safety assessment, there are certain technical details of the AES-2006 that require further analysis, experimental qualification and additional design. The technical details that in STUK's opinion do not currently satisfy the requirements of the Decree are presented in Appendix 1 to the preliminary safety assessment.

The safety functions of the AES-2006 plant are primarily implemented by means of active systems and supplemented, as is typical with pressurised water reactors, with safety injection accumulators. Furthermore, the plant's new passive systems include the residual heat removal system that is con-

nected to the steam generators for cooling the primary circuit during disturbances and accidents and the passive containment cooling system. Both of these are based on natural circulation. Experimental demonstration of the functionality of the new passive systems is a prerequisite for their approval.

According to the Finnish requirements, the design of nuclear power plants shall take the crash of a large commercial aircraft into consideration as an external hazard. The design of the plant shall take into account the direct and indirect effects of an aircraft crash. The protection strategy of the AES-2006 plant against a large aircraft crash is to construct the outer containment to withstand such a crash. Furthermore, the strategy uses shielding and separation by distance to protect the safety functions. In the absence of more extensive structural protection, it is difficult to demonstrate the adequate retention of the safety functions in the event of an aircraft crash. The plant supplier has presented options for the reinforcement of the structural protection of the buildings that are deemed the most important to safety. STUK finds that conformity with the Finnish safety requirements with regard to an aircraft crash has not yet been demonstrated. The solution presented now requires more detailed designs and analyses as well as plant modifications to demonstrate compliance with the safety requirements.

In the AES-2006 plant alternative, the parts of the safeguard building that contain safety systems (safety divisions) are located side by side and connected by service corridors and air-conditioning system channels. These connections between the redundant subsystems are separated by doors and dampers, rendering the adequate implementation of fire compartmentation and other physical separation of the redundant subsystems of the safety systems questionable. According to the Finnish requirements, system design shall apply the separation principle to ensure the implementation of the safety functions even in the event of a failure and during internal and external hazards. The redundant parts of a system implementing safety functions shall be assigned to various safety divisions. Doors, hatches and penetrations between the safety divisions shall be avoided. STUK finds that compliance with the Finnish safety requirements with regard to internal or external events, including flooding and fires, has not yet been demonstrated. The solution presented requires more detailed designs and analyses as well as plant modifications to demonstrate compliance with the safety requirements.

The AES-2006 features severe accident management systems. However, the depressurization of the primary circuit in a severe accident is not in line with the Finnish safety regulations because the depressurization is planned to be carried out using the safety valves in the primary circuit that are designed for the operational conditions and postulated accidents of the plant. The Finnish regulations require that the severe accident systems are independent of the plant's operational conditions and the systems designed for postulated accidents. The plant design shall be modified in this respect.

Fennovoima's organization and management system

N.B. This is an unofficial translation.

Original: http://www.stuk.fi/ydinturvallisuus/ydinvoimalaitosten-toiminta/uudet_laitosyksikot/fi_FI/uudet_laitosyksikot/_files/91805565022778842/default/4_J42211_2014Saatekirje-alustava-turvallisuusarvio-fennovoima.pdf

In its application for a Decision-in-Principle, Fennovoima stated that, in 2010–2014, the number of personnel of the organization necessary for project progress will grow up to 150–200 persons in the procurement and licensing phase. At the time of this assessment, the Fennovoima organization comprises some 80 persons. According to the reports submitted in connection with the application for supplementing the Decision-in-Principle, Fennovoima plans to considerably and extensively reinforce its own organization in the next few years. A timely, well planned and managed reinforcement of competence is important in creating an organization that supports safe operations. STUK finds it important that Fennovoima have sufficient expertise concerning safety and quality matters available already for the design phase that takes place before the application for a construction licence. During the strong growth of the organization, it is necessary to pay attention to information management and knowledge management.

Fennovoima must manage the strong growth of its own organization simultaneously with the ongoing plant design phase and project design phase, which emphasizes the role of having procedures and process descriptions that can be communicated clearly in place. Fennovoima's management system necessary for this purpose is still under development. The development and implementation of the processes and procedures requires Fennovoima to act promptly and obtain additional resources. Fennovoima has prepared a safety culture programme that presents, among other things, the objectives of the safety culture and the principles for assessing and developing the safety culture. STUK finds that the safety culture programme presented for the Decision-in-Principle phase is comprehensive.

The implementation organization of Rosatom, Fennovoima's plant supplier, has not yet been decided on and, therefore, it is presented on a rather general level in Fennovoima's report. Rosatom, the plant supplier, is also one of Fennovoima's owners with an approximately one-third ownership. The Finnish nuclear energy legislation emphasizes the licensee's indivisible responsibility for nuclear safety and radiation safety. Fennovoima is the licensee of the Hanhikivi-1 project.

Site of the plant

STUK has assessed the suitability of the Hanhikivi site for the Fennovoima nuclear power plant as well as the prerequisites for implementing the security arrangements and emergency arrangements. It is the considered opinion of STUK that there are no features at the Hanhikivi site that would prevent the construction of the AES-2006 nuclear power plant presented in the application for supplementing the Decision-in-Principle or the related other nuclear facilities in compliance with the safety requirements. The safety arrangements and emergency arrangements of the plant can be implemented in compliance with the Finnish requirements.

Nuclear waste management

In its report on nuclear waste management, Fennovoima has described the processing and disposal of operational waste and decommissioning waste

that are generated in the operation of a nuclear power plant. Furthermore, the report briefly discusses the interim storage and the options for the final disposal of spent nuclear fuel and the ongoing work to resolve the final disposal project. No fundamental changes have taken place in the plans concerning the plant's nuclear waste management, and STUK finds that they can be implemented in compliance with the Finnish requirements.

Nuclear safeguards

Fennovoima has in its employ the necessary expertise and competence to arrange the monitoring required for the non-proliferation of nuclear weapons, thereby enabling Finland to fulfil the international obligations in this respect. Furthermore, Fennovoima has described the measures to ensure compliance with the regulations and fulfilling the obligations before the construction phase of the nuclear facility. Fennovoima proposes that it will appoint the persons responsible for the nuclear safeguards as required under the Nuclear Energy Act before commencing the construction of the nuclear facility.

No fundamental changes with regard to nuclear safeguards have taken place in the project, and it is the considered opinion of STUK that Fennovoima has the sufficient prerequisites to fulfil its obligations in terms of nuclear safeguards and nuclear non-proliferation in accordance with the applicable requirements.

Summary

In its request for a statement, the MEE requests STUK to especially focus on the changes that have taken place in the project. These include the new plant alternative and the changes in the company ownership. The changes have materially affected the advancement of the project and the development of Fennovoima's organization, resources and operations.

STUK's duty in the preliminary safety assessment is to assess that no factors have arisen indicating a lack of sufficient prerequisites for constructing the new nuclear power plant proposed by Fennovoima in accordance with the provisions of Section 6 of the Nuclear Energy Act. Concluding the preliminary safety assessment, STUK states the following:

1. The AES-2006 plant alternative can meet the Finnish nuclear and radiation safety requirements following the implementation of design changes, additional analyses and qualification. In STUK's opinion, the necessary further engineering and modifications can be carried out in such a manner that the requirements set forth in Government Decree (717/2013) can be met at the construction licence phase.
2. Of the alternatives presented in the Decision-in-Principle, Fennovoima has selected Hanhikivi, Pyhäjoki as the intended site. It is the considered opinion of STUK that there are no features at the Hanhikivi site that would prevent the construc-

tion of the AES-2006 nuclear power plant presented in the application for supplementing the Decision-in-Principle or the related other nuclear facilities or that would prevent the implementation of the security arrangements and emergency arrangements in compliance with the safety requirements.

3. Fennovoima has not grown its organization and developed its management system in accordance with the material submitted with the application for the 2010 Decision-in-Principle (M 4/2010 vp, May 6, 2010). At the time of this assessment, Fennovoima is reinforcing the competence of its organization and developing its management system. It is the considered opinion of STUK that the company has devised a plan to reinforce its organization and develop its management system to satisfy the requirements by the construction licence phase.

Regarding item three, STUK states the following: At the time of this assessment, Fennovoima has approximately one year to submit its construction licence application to the Government. Guiding the design of the AES-2006 plant alternative to comply with the Finnish safety requirements, preparing the documentation to be submitted to STUK in the construction licence phase and verifying the compliance of the documentation require Fennovoima to take measures even before it submits a construction licence application. The task is demanding and, considering Fennovoima's current resources and management system, STUK finds it questionable that the company would be able to submit comprehensive documentation to STUK when submitting a construction licence application to the Government. This fact shall be taken into account when scheduling and planning the documentation to be submitted to STUK in the construction licence phase and when estimating the duration of the construction licence phase.

In the preliminary safety assessment, no obstacles have been found for constructing the new nuclear power plant proposed by Fennovoima in accordance with the provisions of Section 6 of the Nuclear Energy Act.

Director General

Petteri Tiippana

Substitute for the Director,
Deputy Director

Tapani Virolainen

Appendices

Preliminary safety assessment of the Fennovoima Oy nuclear power plant project, May 23, 2014

Appendix 1 to the preliminary safety assessment. Suitability assessment of different plant alternatives, May 23, 2014
Statement from the Advisory Commission on Nuclear Safety, May 22, 2014

For information

Ministry of Social Affairs and Health, Ministry of the Environment, Fennovoima Oy, Municipality of Pyhäjoki, PT, HaK, KiA, RP, LR, TV, ToR, TS, EM, KW, SSu, OO; RO, PVa, RSr, MV, TRe; EHa, JSo, JMo, PSa, TmH, SsH; MHa, AnS, JIK, TWi, VMe, JVa; KaS, MiB, PeV, LPn, JMy, AJu, JSa, UmV, HeN, KV, MaX, KMk, JN

JN