

1. Nuclear 2007 highlights:

Year 2007 was a very interesting year for the nuclear energy community in Finland. Both Fortum and TVO, who own and operate the current 4 reactor units, started their Environmental Impact Assessment (EIA) procedures. The EIA-programs were submitted to the contact authority and the companies announced that their reports will be ready during the spring 2008. In addition to these two EIAs, the new player in Finland, Fennovoima, also announced in 2007 that it will start the EIA at four locations for a new site. Consequently, there will eventually be three applications for the Decision-in-Principle (DiP). In case of positive DiP the bidding process for a new reactor will follow.

2. Nuclear overview:

Energy policy:

Finland has a broad energy palette, where nuclear has the largest share of electricity supplies with 24.9% of electricity consumption. Next are hydro power (15.5%), coal (14.8%), natural gas (11.4%) and bio fuels (10.9%). The net import is also fairly high (13.9%). The rest is covered by peat, waste fuels, oil and wind power. The electricity production by the nuclear power plants in Finland in 2007 amounted to 22.5 TWh (net) or 28.9% of the domestic production.

Finland has four operating nuclear power reactors. Two of the units are boiling water reactors (BWR) of Swedish origin. They are situated at Olkiluoto. The net capacity of each unit is 860 MWe. Unit 1 was taken into operation in 1979 and Unit 2 in 1982. The units are owned and operated by Teollisuuden Voima Oyj (TVO). The other two units are of the Russian pressurised water reactor type (VVER). They are situated at Loviisa. The units are owned and operated by Fortum Power and Heat Ltd. The net capacity of each unit is 488 MWe. Unit 1 was taken into commercial operation in 1977 and Unit 2 in 1981. There are neither permanently closed nor decommissioned power reactors in Finland.

One unit is under construction in Olkiluoto (Unit 3). This unit is an EPR (European Pressurized water Reactor), the first 3rd generation reactor in the world. The turn-key supplier is a consortium formed by Framatom ANP and Siemens. The net electric output will be about 1600 MW. TVO is expected to submit the application for an operating licence to the Government in 2009, and commercial operation is planned to begin in 2011.

Additional construction projects are planned. Two environmental impact assessment (EIA) reports have been filed during spring 2008 (TVO and Fortum) and a third one by Fennovoima will be filed in September 2008. TVO has already filed an application of decision-in-principle (DiP) in April 2008, and Fortum and Fennovoima are expected to file their DiPs during the autumn 2008. The Government's decision and approval by the Parliament is expected in 2009.

In addition to the commercial reactors, Finland has one research reactor of type TRIGA Mark II. It is situated in the premises of VTT Technical Research Centre of Finland at Otaniemi, Espoo. The principal use is the boron neutron capture therapy (BNCT) for the treatment of brain tumours. The treatment is in experimental phase. Promising results have been achieved – especially for head and neck tumours. So far some 130 patients have been treated.

Public acceptance:

The public opinion on nuclear power has been measured in Finland with quite regular intervals since 1982. The latest poll of the Finnish Energy Industries (in 2007) indicates that people are more positive for nuclear than previously although a saturation can be seen. According to the recent research of the energy attitudes in Finland, 43 % support the increase of nuclear power, 28 % say the current number of nuclear power plants is suitable and 25 % want to decrease the production of nuclear power. In the latest poll, as well as in all the previous ones, the attitude of women towards nuclear power is more negative than the attitude of men: 24% of women (61% of men) say that Finland should increase nuclear energy while 36% of women (13% of men) think that nuclear energy should be reduced.

Nuclear waste management:

The Nuclear Energy Act and Degree provide a clear framework for nuclear waste management in Finland. According to the legislation, the producers of nuclear waste are responsible for all measures needed for the safe management of the waste and for the costs that arise. The authorities supervise the management of nuclear waste and issue regulations for this purpose.

Low- and intermediate-level nuclear wastes are disposed of in repositories on the two power plant sites. The underground repositories are located in the bedrock at a depth of 60 to 110 m. They have been designed to house all the radioactive operational waste produced the 5 units currently operating or under construction. The disposal of the waste into the repository began in Olkiluoto in 1992 and in Loviisa in 1997. In Loviisa, an extension of the repository to house both radioactive maintenance waste and solidified waste was taken into use during 2007.

Spent nuclear fuel from the NPPs is stored at the power plant sites until its disposal. At both sites, the capacity will be adequate until early 2010's. In Olkiluoto, planning is underway to extend the storage facility to take into account the construction of Olkiluoto 3. In Loviisa, the current spent fuel intermediate storage capacity will be adequate until 2013. In 2007, two compact racks were acquired to space more fuel in the spent fuel pools. By supplying additional compact racks the capacity in current spent fuel pools can be extended sufficiently before transports to the final disposal facility will begin.

The final disposal facility will be built in Olkiluoto by Posiva. A favourable decision by the government was obtained for the DiP for this facility in 2000 and an extension for the final disposal of the fuel from the fifth unit (OL3) was ratified by the Parliament in 2002. The fuel will be encapsulated in special

containers that will be placed in the bedrock at a depth of around 500 metres. The holes drilled for the canisters will then be filled by bentonite clay.

The deep underground rock characterisation and research facility (ONKALO) is under construction in Olkiluoto. The excavation work began in 2004 and the main characterisation level at a depth of 420 m should be reached in 2008. The lower characterisation level a 520 m should be reached in 2009 and the whole construction should be completed in 2010. The ONKALO will be later used as an access route to the final repository of spent fuel. The repository should be operational in 2020.

Nuclear research:

Nuclear energy research is done at several institutes and groups. The focus is on the safety and operational performance of the power plants, and the management and disposal of nuclear waste. Publicly funded nuclear energy research provides impartial expertise in nuclear energy issues. It also contributes to maintaining the necessary personnel and equipment for research and development, and has established a framework for international collaboration. The annual total volume of Finnish research into nuclear fission and fusion energy is estimated to be about 200 person-years.

The public nuclear energy research is organised into national research programmes. The main objective of these programmes is to provide the authorities with high-standard expertise and research results relevant to the safety of nuclear power plants, and waste management and disposal. They also support various activities of the authorities and train new nuclear experts. The fusion research is fully integrated with the European Fusion Programme. The current national research programmes on nuclear energy are as follows:

Nuclear Power Plant Safety (SAFIR2010) 2007-2010

Public Research Programme on Nuclear Waste Management (KYT2010) 2006-2010

Euratom-Tekes Fusion Energy Cooperation 2007-2011

3. Nuclear competences:

Academic level education in the field of nuclear energy is given basically at three universities. Nuclear engineering is taught at the Helsinki and Lappeenranta Universities of Technology (TKK and LUT). In addition, radiochemistry is taught at the University of Helsinki. Other universities have some smaller activities too. Annually about 10 to 20 students pass the basic degree (M.Sc) in the subject of nuclear energy. Besides universities the diploma (or Master's) thesis is often done in nuclear companies, research institutes or authority.

Graduate level education is more challenging since the courses are small and there are only 3 professors: two in nuclear engineering and one in radiochemistry. In addition to regular courses at the universities, visiting professors from abroad are giving special courses on specific topics and students participate in summer schools abroad. The doctor theses are often made in national research programs or European research projects.

A special course at the professional level after graduation (M.Sc or D.Sc) exists. This course is specially applied to Finnish needs and is intended mainly for new staff and new recruits from other fields with an expertise in that field. It is arranged jointly by the Ministry of Employment and the Economy, the technical universities TKK and LUT, the power companies Fortum and TVO, the nuclear waste company Posiva, VTT Technical Research Centre and the Radiation and Nuclear Safety authority STUK. Each of these provides lecturers for the course, which consists of 6 modules lasting for 2 to 4 days. The course spans six months and covers basically the whole area of nuclear safety. So far this course has been arranged 5 times with altogether 270 participants and the sixth one is planned for 2008/2009.

4. WIN 2007 Main Achievements:

The Energy Channel is a working group of the Finnish Nuclear Society (FNS). It was founded in 1990, and it has at present some 80 members. The majority of our members are professionals having full-time jobs in public or private sector related to energy, nuclear energy & radiation. The actions of the Energy Channel are organised and realised mainly by the active core – the coordination group.

The main event organised by the Energy Channel in 2007 was the "Radiant Women" seminar for female decision-makers and opinion leaders. According to the tradition of this seminar series, all lecturers were also female. The theme of the seminar was "The climate changes – changes in everyday life". The opening speech was given by Ms. Sirkka Hautojärvi, Permanent Secretary of the Ministry of the Environment. The seminar then continued with lectures by senior researcher Susanna Kankaanpää from the Finnish Environment Institute, who talked about Finland and its adaptation to the climate change, and communications director Päivi Laitila from Motiva, who discussed prevention of climate change in everyday life. The seminar was concluded by senior researcher Heidi Pettersson from the Marine Research Institute who gave an overview of the CO₂-studies and the effect of the sea on the climate change. The seminar gathered some 70 participants.

During 2007, Energy Channel arranged a Christmas party in January for its members. This time we visited the research department of the Radiation and Nuclear Safety authority STUK. After an overview on the research activities in STUK we heard talks on Uranium, on monitoring the radioactivity of natural products and on Polonium.