

Progressive Finland Sees Progress With Nuclear Projects

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THE NUCLEAR COMMUNICATIONS NETWORK

The *Hanhikivi-1* reactor project is firmly on track and a licence has been granted for construction of a final disposal facility for spent nuclear fuel – the first final repository in the world to enter the construction phase.

Significant progress has been made with plans for Finland to build its sixth nuclear reactor unit at *Hanhikivi* with the construction licensing process on schedule and the pouring of first concrete expected in early 2018, utility *Fennovoima*'s licensing manager *Janne Liuko* told NucNet.

Mr Liuko said the company expects to receive the construction licence for the Generation III+ *Hanhikivi-1* plant, to be built with Russia at *Pyhäjoki* on Finland's northwest coast, in late 2017. The application was submitted to the Finnish *Ministry of Employment and the Economy* in June 2015.

During 2015 the project overcame what could have been a significant hurdle when the *Ministry of Employment and the Economy* said *Fennovoima* met the government's requirement for at least 60 percent domestic or European ownership after two companies announced they would be taking a stake in *Hanhikivi-1* and another would increase its participation.

The three companies were construction company *SRV*, which took a 1.8 percent share in the project, energy company *Fortum* (6.6 percent) and stainless steel company *Outokumpu* (14.1 percent – an increase of 1.8 percent).

Fennovoima said in a statement at the time: "Taking into account the latest financial commitments, domestic ownership of *Fennovoima* now stands at 65.1 percent and meets the ownership conditions set by the Finnish Government and the Finnish Parliament."

The companies become shareholders of the main owner of *Fennovoima*, *Voimaosakeyhtiö SF*.

One issue which could impact the licensing process is the plant design layout, *Mr Liuko* said. He said *Fennovoima*, founded in 2007 to build and operate *Hanhikivi-1*, has "a very mature design" used at the reference plant *Leningrad 2-1* in Russia, which is almost complete and nearing the commissioning phase.

However, local requirements in Finland or specifications from equipment suppliers may bring about changes to the design layout.

"We are cooperating with the authorities on a daily basis", *Mr Liuko* said. He said *Fennovoima* has been submitting technology and safety related material in stages to the Finnish *Radiation and Nuclear Safety Authority (Stuk)* since the beginning of the scrutiny of the construction licence application (CLA).

This process, which is linked to the CLA, will take up to two years. The construction licence for *Hanhikivi-1* can only be obtained from the Finnish government following a positive safety assessment, carried out according to Finnish standards, by *Stuk*.

Mr Liuko said infrastructure work that has begun at the *Hanhikivi* site – a contract was recently signed for dredging and an access road is complete – is not related to nuclear safety and was subject to a separate set of "conventional" permits.

Hanhikivi-1 will be a Generation III+ 1,200-megawatt VVER pressurised water reactor of the Russian *AES-2006* type. The start of commissioning is scheduled for 2022 and commercial operation for 2024.

Last month, *Fennovoima* and *Stuk* carried out a three-day audit which confirmed that nuclear project documentation produced by Russian nuclear design and research company *Atomproekt* for *Hanhikivi-1* complies with European standards.

In October 2014, *Atomproekt*, a *Rosatom* subsidiary, signed an agreement to develop the full package of project documentation for *Hanhikivi-1*. The agreement was signed as part of the contract for engineering, procurement and turnkey construction of the unit.

According to *International Atomic Energy Agency (IAEA)* statistics from 2013, energy from Finland's existing nuclear reactors – *Loviisa-1*, *Loviisa-2*, *Olkiluoto-1* and *Olkiluoto-2* – provide around 30 percent of the country's electricity. The *Loviisa* station is owned and operated by *Fortum* and *Olkiluoto* by *Teollisuuden Voima Oyj (TVO)*.

According to the *IAEA*, Finland is highly dependent on foreign energy supplies. Crude oil and oil products constitute a major part of imported energy. Other main fuels imported to Finland are coal and natural gas. Finland imports all of its oil, natural gas, coal and uranium. The primary indigenous energy resources in Finland are hydro power, wood, wood waste, pulping liquors and peat.

Finland's progressive policy towards nuclear energy resulted in another landmark being reached in 2015 when nuclear waste management company *Posiva* was granted a licence by the government for the construction of a final disposal facility for spent nuclear fuel at *Olkiluoto* on the country's southwest coast – the first final repository in the world to enter the construction phase.

The final disposal of spent fuel generated at the *Olkiluoto* and *Loviisa* nuclear power stations is expected to start in the early 2020s.

Posiva said the licence is recognition of "the extensive R&D work" carried out by *Posiva* for more than 40 years to develop a safe final disposal solution for spent nuclear fuel.

The company has been developing a solution for final disposal of spent nuclear fuel since the 1970s and has carried R&D at the *Onkalo* characterisation facility at *Olkiluoto*.

Posiva president and chief executive officer *Janne Mokka* called the *Olkiluoto* final disposal project "pioneering" and said it is important not only for Finland, but also on a global scale.

In the final disposal facility, spent fuel assemblies will be encapsulated and placed in the bedrock at a depth of about 400 metres for permanent disposal. The facility comprises two sections: the above-ground encapsulation plant for the encapsulation of the spent fuel in canisters, and the final repository deep in the bedrock, with tunnels in which the spent fuel will be placed.

Posiva is responsible for the final disposal of used nuclear fuel generated by *TVO* at *Olkiluoto* and *Fortum* at *Loviisa*. *TVO* owns 60 percent of *Posiva* and *Fortum* owns 40 percent.

The company has estimated the total cost of final disposal is at € 3 bn (\$ 3.2 bn), with the long service life of the final disposal facility contributing most to that figure.

It hasn't all been good news. The country's fifth reactor, the *Olkiluoto-3 EPR*, is under construction and expected to enter commercial operation in 2018, but the project has been hit by delays and disputes. In August 2015 *TVO* and plant supplier *Areva-Siemens* updated the amounts they are claiming from *International Chamber of Commerce* arbitration proceedings concerning the delays.

TVO's updated estimate of its costs and losses increased to approximately € 2.6 bn until December 2018, which is the expected start of commercial operation at *Olkiluoto-3* according to a schedule submitted by *Areva-Siemens* in September 2014. The start date is around nine years later than originally planned.

TVO said *Areva-Siemens'* updated claim is now approximately € 3.4 bn. *TVO* said the claim includes penalty interest and payments allegedly delayed by *TVO* under the plant contract amounting to approximately € 1.4 bn, as well as approximately € 140 m in alleged loss of profit.

In October 2014 *TVO* said it was submitting a claim of € 2.3 bn based on estimated costs and losses up to the end of 2018. *Areva-Siemens* said it was claiming approximately € 3.5 bn for "additional work, disruption and prolongation of the project".

TVO said that despite the arbitration claims, the project is "making progress" and *TVO* is continuing to support *Areva-Siemens* to complete the facility.

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DAtF Notes

Milestone of Global Climate Policy – International Opportunity for Nuclear Energy

At the 21st *Conference of the Parties on the UN Framework Convention on Climate Change (COP21)* in Paris, a binding agreement was reached based on national climate protection contributions. This clears the way for an ambitious climate policy. Of crucial importance is the implementation of national commitments which in many countries represents a major technological, economic and social task. There are no universal panaceas, in fact the countries each have to find their own adequate way in which to achieve the objectives reliably, cost-effectively and with public acceptance.

Nuclear energy makes a significant contribution to climate protection worldwide and, with an approximately 11 percent share of global electricity production, it is the second most important source of low-carbon electricity after hydropower. According to *Dr. Ralf Guldner*, President of the *German Atomic Forum (DATF)*, "In many countries, nuclear energy is also part of the long-term energy and climate strategy. Together with the expansion of renewables, it can be a key part of the climate policy where there is acceptance and the general economic conditions are right." Particularly in countries with sharply increasing electricity demand, a significant reduction or strict

limitation of greenhouse gas emissions poses a major challenge and requires a broad approach in which all low-carbon technologies are used appropriately. So far this year, eight nuclear power plants have been commissioned in China alone. According to current planning, a further 80 nuclear power plants will become operational there by 2030.

Guldner continued, "In Germany, nuclear power plants will reliably continue during their operating times to make their contribution to reducing emissions and to providing power as in past decades." Since the use of nuclear energy had begun, the production of electricity in nuclear power plants had prevented the emission of about 5 billion tons of CO₂ in Germany. To achieve the same effect in the transport sector, there would have to have been no road traffic in Germany since 1983.

Guldner explained, "With their expertise in the safe and peaceful use of nuclear energy, industry and research in Germany will continue to make a contribution to climate policy where nuclear power remains or is intended to become a part of the energy future."

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