

THE DECISION-IN-PRINCIPLE (DIP) IN 2002 TO BUILD A FIFTH NUCLEAR POWER PLANT MADE FINLAND THE CENTER OF ATTENTION WHEN THE NUCLEAR POWER INDUSTRY BEGAN TO SEE ITS CHANCES. **FINLAND IS THE FIRST COUNTRY TO HAVE MADE A DECISION ON FINAL STORAGE OF NUCLEAR WASTE.** FINLAND IS ALSO THE ONLY NORDIC COUNTRY IN WHICH ENERGY CONSUMPTION IS RISING.

Nuclear power has a preeminent role in the Finnish government's energy policy. The country's metal and forestry industries are energy-intensive sectors. A model calling for nuclear power-generated electricity as driving force is intended to secure jobs and the welfare state. Economic stimulus plans and improved competitiveness are the prerequisites for the implementation of the major renewable energy package debated in the parliament this autumn, in connection with budget negotiations. This has been the position of Mauri Pekkarinen, Minister of Economic Affairs. It has been suggested that these new programs shall take effect in early 2011.

The nuclear power decisions have drawn international attention to Finnish energy policy. Finland was among the first countries to join a rapidly deregulated electricity market and is now a member of Nord Pool, the biggest electricity exchange in Europe.

In *The Renewal of Nuclear Power in Finland* (London 2009, eds. Matti Kojo & Tapio Litmanen), six Finnish researchers analyze the arguments and circumstances that led Finland to its Decision-in-Principle on final storage in 2001, which was soon followed by a permit to build a fifth nuclear power plant in 2002. The initiative to build the fifth reactor came from the paper and metal industries. In short order, nuclear power was transformed from environmental threat to climate solution and a central mechanism for achieving emissions limits under the Kyoto Protocol.

Tapio Litmanen of Jyväskylä University mentions four "articles of faith" that are deeply rooted in the Finnish political culture and have guided the renewed expansion of nuclear power — belief in education, authority, technology, and bureaucracy. Ari Lampinen, associate professor at Strömstad Academy in Sweden, highlights the dominant role of the Ministry of Employment and Economy in the permit process. This Finnish Ministry is, at once, the licensing authority, chief expert, manager of environmental impact assessments, and funder of research. Moreover, the Ministry administers the so-called nuclear waste fund and the state's holdings as a partner in energy companies and the electricity grid.

Olkiluoto 3, the first nuclear power plant in the West, whose construction began after Chernobyl, was built on an island in the municipality of Eurajoki, on the west coast of Finland. The energy company Teollisuuden Voima (TVO) already had two reactors in operation on the island. The new EPR reactor type, a third-generation pressurized water reactor, is the flagship of French nuclear power giant Areva. With its net output of 1,600 MW, it will be the world's largest nuclear power plant.

The construction contract was made in 2003 at

a fixed price of three billion euros. As of today, the price has nearly doubled and the project is four years behind schedule. TVO is blaming Areva for poor planning. Areva is blaming TVO for delaying construction. Responsibility for the cost overruns has become a matter for the courts. More than 3,000 quality assurance problems have been identified. Radiation safety agencies in Finland, France, and Britain have criticized the automation system. The plant will not become operational before 2013 at the earliest.

Petteri Tiippana, director of nuclear reactor regulation at the Finnish Radiation and Nuclear Safety Authority, STUK, is responsible for safety.

"The automation system has not yet been approved in every aspect", he says. "Safety standards in Finland are among the most stringent in the world. Many shortcomings are remedied. The reactor is being built to ensure that only minor quantities of radioactive substances are discharged to the surrounding area even if the highly unlikely were to occur, that is, if an accident were to happen. Even the worst conceivable scenario, a meltdown, will not be able to cause injury to people or the immediate environs."

Tiippana confirms that the Finnish version of the EPR has a lower output than the one being built in Flamanville, France:

"Nuclear fuel with a higher combustion rate is until further notice not permitted in Finland."

Might it be in the future, then?

"Any application by the nuclear power company will be dealt with by STUK as an operational change in the plant. This does not require parliamentary or government approval."

The Onkalo final storage cave, where the waste will be buried, is next door to the power plants on Olkiluoto Island. Under Finnish law, permission to operate a nuclear power plant is conditional upon settlement of the question of final disposal of the used nuclear fuel. A separate company, Posiva, was formed in 1995 by the two power companies TVO and Fortum solely for the purpose of solving the problem of final disposal.

The KBS-3 method is a Swedish concept based on stable bedrock and multiple barriers. The nuclear fuel is placed in steel capsules and then encapsulated in copper, 5 cm thick. The capsules are lowered into drill holes in the rock and deposited in bentonite clay at a depth of 400–500 meters. The tunnels are then filled and the opening sealed.

Posiva's design manager Erkki Palonen provides a tour of the area.

"The nuclear waste in ground-level water basins is the greatest hazard. Encapsulation in the rock is a considerably safer alternative", he says. "Regardless of whether or not more nuclear power is commissioned,

we are not going to get away from the nuclear waste that has already been produced."

Palonen likes the Finnish way of making decisions:

"We are pragmatic. The debate was carried out in connection with the Decision-in Principle of 2001. The Finnish people have approved the plan through the vote in Parliament. Our task is to execute the decision with the greatest possible expertise. We are also paying the costs."

There is a downside to decision making at the political level. Members of Parliament are replaced every four years. Important information is forgotten.

Matti Saarnisto, professor of geology, is a former research director of the Geological Survey of Finland and former secretary general of the Finnish Academy of Science and Letters. Saarnisto is doubtful about the safety of final storage.

"It is insane to believe you can store nuclear waste for 100,000 years. The Ice Age reached its maximum distribution 20,000 years ago. Olkiluoto was covered by ice two-kilometers thick. The earth's crust was pushed down about 800 meters. You can see traces in the landscape of major earthquakes that have occurred about every 2,500 years."

Onkalo and final storage are monitored by STUK, under the management of Jussi Heinonen:

"We are aware of the uncertainty with regard to copper corrosion. Discussions are in progress among Posiva, STUK, and the research community. The national nuclear waste research program, KYT, which reports to and is funded by the Ministry of Employment and Economy, has initiated two investigations into copper corrosion that are not yet complete. Thus far, the Finnish researchers have found no factual information to indicate that corrosion is a problem."

The processes that take place during glaciation are the most critical phase, which is now being analyzed, according to Heinonen.

"When the ice masses melt, enormous pressure is released. Matti Saarnisto is an expert on glaciation and permafrost, and has evaluated Posiva's report at our request."

The report indicates shortcomings in Posiva's study: "Permafrost may have major effects on the hydrological conditions and in the worst case result in the release and dispersion of radionuclides from a depository. The depth of permafrost is of vital importance." The report goes on to state that "all predictions of depository safety beyond the next glaciation 55,000 to 65,000 or 90,000 to 110,000 years after the present are speculation and not based on scientific facts".

(Matti Saarnisto, *Expected Evolution of a Spent Nuclear Fuel Repository at Olkiluoto*. Evaluation report on the Posiva Report 2006:5. January 2008, pp. 14 and 22)

A research project in Greenland involving researchers from Posiva, Canada, and Sweden is investigating the water currents of inland ices and how they affect

A BALTIC
WORLDS
feature

FINLAND — LAND OF URANIUM

PICTURES FROM THE MOVIE INTO ETERNITY. ILLUSTRATION: KARIN SUNNIVSSON



What does radioactivity taste like? A bit like blueberries perhaps.

groundwater. The project, which will run until 2013, is expected to provide information about future conditions.

Opinion surveys show that more than half the Finnish population opposes further expansion of nuclear power. Less than one fifth of the population supports the construction of two new nuclear power plants. The greatest opposition is on the Åland Islands. In spite of this, the Finnish parliament ratified in July the government's decision to allow TVO and Fennovoima each to build a new reactor and Posiva to expand the final storage facility. Fortum, which is half-owned by the state and has years of experience with nuclear power through its two units in Loviisa, also applied for permission to expand, but was denied.

The nuclear power projects of both TVO and Fennovoima, a new player, are based on a unique Finnish ownership structure known as the Mankala Principle, which is based on electricity at prime cost, with no markup. The EU Commission is in the midst of studying competition and tax issues related to the energy companies in response to a complaint by Green Party European Parliament Members Heidi Hautala and Satu Hassi.

Fennovoima was founded in 2007. It is owned by Finnish industrial companies and local energy companies. German E.ON, which holds a minority stake of 34 percent, is providing the financial security and the expertise. Fennovoima is not worried about the final storage issue, which is still unresolved.

"We have direct contact with the Swedish Nuclear Fuel and Waste Management Company (SKB) in Sweden via E.ON", says Timo Kallio, head of construction at Fennovoima. SKB and Posiva are working together on final storage.

"Power plant locations under consideration are Simo and Pyhäjoki along the Gulf of Bothnia. We have the support of local government and the public", he says.

Helena Majjala from Pro Hanhijoki in Pyhäjoki does not believe Fennovoima's opinion poll showing that 60 percent of the people in the municipality support the nuclear power plans:

"We have asked the municipality for a referendum twice, and were turned down both times."

The nuclear power decision was pushed through Parliament at breakneck speed in the shadow of domestic campaign financing scandals, the replacement of the prime minister, and the complaint by the Chancellor of Justice that Taisto Turunen, leading energy official at the Ministry of Employment and Economy, was biased because he sat on the board of directors of the Outokumpu steel company, one of the founding partners of Fennovoima when the latter was being founded. ("Preparation of the matter was not jeopardized, but the impartiality of government agencies sustained a blow.") Taisto Turunen retired in August.

A lot of people thought that the law imposing unlimited financial liability on nuclear power plants should an accident occur, proposed by the Minister of Trade and Industry just before the vote, was only done for show. The law applies only to losses that arise in Finland.

Researchers who have issued critical opinions have been censured by their employers. A report from Greenpeace shows that the more campaign financing



PICTURES FROM THE MOVIE INTO ETERNITY. ILLUSTRATION: KARIN SUNVISSON

from business interests accepted by a member of Parliament, the more obvious was the tendency to vote in parliament in favor of two nuclear power plants. Those who opposed nuclear power were found in the group of MPs who had received the least contributions.

The Green Party's situation as governing party on the one hand and, on the other hand, as the opposition with regard to the specific issue is complex, to say the least. From the outset of negotiations on the formation of the government, the Greens announced that they opposed expansion of nuclear power and supported renewable energy solutions and green values. The party voted unanimously against the pro-

posal, though without bringing down the government. The main proponents of expanded nuclear power are the right-wing National Coalition Party, the business community, and big industry. Ten leading politicians from the Center Party, among them the Minister of Economic Affairs and the Minister of the Environment, who opposed nuclear power in 2002, now voted for two new reactors.

The Finnish paper industry, which has not done well in recent years, sees electricity production in the integrated European market as an appealing alternative. The main argument is to give a clear signal to business and investors that Finland can supply energy securely at a reasonable price — to reduce energy im-

Nuclear waste can justify the police state. Yes, and then we will have created the permanent state of emergency.

ports from Russia and bring down carbon emissions.

Opponents to nuclear power, on the other hand, are worried that investments in renewable energy and energy conservation will suffer.

“We don’t have the time to wait ten years. Emissions have to come down now. The hurried schedule got in the way of thorough preparations and the decisions were based on insufficient facts”, says Janne Björklund of the Finnish Association for Nature Conservation.

According to Matti Saarnisto, expert testimony before the parliamentary committee was a farce: “Everything had been decided in advance.”

The rising price of uranium and the nuclear power initiatives have also made Finland interesting in terms of mining exploration. Finland is part of the mineral-rich Fennoscandian Shield. Accession to the EU in 1995 opened the doors to foreign subsidiaries, and an outdated mining law from 1965 promotes mining operations. An amendment to the law in order to better protect the rights of citizens and the environment has been in progress for years; the process has been protracted. Intensive uranium exploration has been taking place for about a decade. When Areva’s application for a mining concession in two areas — 70 km east and 70 km west of the capital city of Helsinki, respectively — became generally known in 2006, opposition against uranium mining arose and grassroots movements around the country were born in the wake of the mining concessions.

A mining boom is now under way. Finland’s largest nickel and zinc mine, Talvivaara, began operating in 2008 in the municipality of Sotkamo in the province of Kainuu. The Ministry is currently dealing with an application to extract the uranium in the ore.

Mika Flöjt, researcher at the Northern Institute for Environmental and Minority Law at the University of Lapland’s Arctic Centre in Rovaniemi, has been sounding the alarm for years that there are mines in Finland with permits to extract other ores that are also abundant in uranium:

“Facts are being withheld. The public and local politicians do not have enough information when permits are granted. When problems arise, it is too late.”

“The dust particles in Talvivaara contain radioactivity, but the uranium content is low. Real uranium ore is a hundred times more radioactive”, says Esko Ruokola, principal advisor on the monitoring of nuclear waste and nuclear material at STUK:

“The expectation is that 350 metric tons of uranium per year will be extracted as an ancillary product. The motive is not financial. The uranium makes nickel processing more difficult. If the uranium is not removed in the mining stage, Norilsk Nickel in Harjavalta, the ore refiner, will have to deal with the problem.”

Matti Saarnisto is of the firm opinion that mining can only be permitted as long as the uranium is left in the earth:

“When uranium is enriched on-site, the facility is contaminated. The consequences are precisely the same as in a uranium mine. Why was Talvivaara granted a mining permit even though it was known that uranium was present?”

The environmental impact is massive. When the bedrock is crushed, the area that emits radiation in-

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creases markedly. The basins have already leaked.

Before Parliament on August 12, 2010, Minister of the Environment Paula Lehtomäki, who is from Kainuu, answered a question about the environmental impact of mining in the Talvivaara mine. Her family owns shares in Talvivaara worth nearly € 300,000, purchased shortly before the company announced it would be utilizing the uranium. Olli Mäenpää, professor of administrative law at the University of Helsinki, believes that Lehtomäki was biased both when she spoke in Parliament and when she participated in the decision process about permit issuance. She was recently freed from suspicions of trading on insider information.

(See http://www.eduskunta.fi/faktatmp/utatmp/akxtmp/kk_625_2010_p.shtml;

http://www.suomitv.fi/uutiset/oikeusprofessori_lehtomaki_jaavi_talvivaara_lausunnoissa_kuuntele_hastattelu. Accessed 2010-11-18.)

It has also emerged that Elias Ekdahl, director-general of the Geological Survey of Finland, which reports to the Ministry of Trade and Industry, owns 7,500 shares in Talvivaara. He signed the official opinions when the company applied for mining permits.

(See Mäenpää’s remarks in this case as well: <http://www.apu.fi/ajassa/article162662-1.html>. Dated October 13 2010.)

The Sokli phosphate mine being planned in Eastern Lapland at the Russian border is surrounded by national parks, untouched nature, and unique watercourses. Yara, a Norwegian industrial group whose business is agricultural chemicals and fertilizers, has admitted that the phosphate ore is radioactive. The values are several times higher than those at Talvivaara.

The jobs provided by the mining company do not compensate for the jobs lost in tourism and nature-based business, according to reindeer herders and the sparse local population. About one hundred families in the area make a living from reindeer husbandry. A mine will result in the destruction of the reindeer pastures.

The environmental impact assessment for the Sokli phosphate deposit in the province of Lapland will be determined in late 2010. The small window of opportunity for local residents to make their voices heard is found somewhere among the various bureaucratic processes. If they miss this chance, political and business interests decide. There is a risk that uranium-containing fertilizer will be spread on farm fields and enriched in the food chain.

Esko Ruokola concedes that both uranium and thorium are found in the ore:

“One suggestion is to mill the ore in Russia, which will lessen the environmental load on the Finnish side. In connection with the environmental impact assess-

ment, the question of whether the project is in the best interests of the public will be carefully reviewed.”

Mika Flöjt criticizes the authorities:

“Nuclear power companies and mining companies, with the assistance of officials with the Ministry of Employment and the Economy and STUK, have sold the public a misleading picture. This applies to both the hazards of uranium in mining operations and the radioactive emissions of nuclear power. Problems are glossed over and critics are branded. The limits that apply to uranium and other radioactive substances should be tightened. Nuclear power is not emission-free. Toxic radioactive nuclides are released in the various production processes and end up in the air and in the groundwater, watercourses, and finally the sea.”

More than 800 radiation safety experts from all over the world gathered at Finlandia Hall in Helsinki, June 14–18, 2010, for the Third European IRPA (International Radiation Protection Association) Congress. Professor Wolfgang Weiss from Germany, chairman of MELODI, the Multidisciplinary European Low Dose Initiative, which is an assembly of central research institutes and financiers in the field of radiation research, says the goal is to establish a permanent European center of excellence:

“We must gain a better understanding of the risks of radiation mechanisms. The results science gives us do not constitute sufficiently clear signals to make us change the way we assess radiation — but they are clear enough to arouse our concern.”

STUK, the Finnish Radiation and Nuclear Safety Authority, acts in accordance with the risk model in use. The task is to ensure that radiation does not exceed stated limits and to protect people from harmful exposure. But who, then, is responsible if the risk models we rely on do not correspond to reality? The issue is bounced around among the various actors. The nuclear power companies are responsible for any emissions and environmental damage. In turn, these companies have permits for their operations issued by the ministries, and they comply with STUK regulations. The final storage is an execution of a parliamentary decision. STUK, the ministries, and the companies are the experts heard when Parliament makes its decisions.

For the moment, it looks like the nuclear power zealots have won the day in Finland. The general election in March 2011 will show whether the decisions reflect the will of the people. Time will tell if these decisions are in the “overall interests of society” — the phrase used in the most varied of contexts, especially when projects need to be forced through. ≈

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