

Olkiluoto 3 and new reactor projects in Finland

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World's largest, first-of-a-kind nuclear reactor is being built in Olkiluoto, Finland by the French company Areva. When the construction started in 2005, making Olkiluoto 3 the first nuclear plant ordered in developed countries for more than a decade. The project has been plagued from the onset by quality problems, delays and cost overruns.

Promises and reality

In Finland, parliament has the final say on nuclear projects. Here is what the parliament was told about the project before their vote by TVO and by the pro-nuclear trade and industry ministry that produced the material that “guided” the parliament in their decision.

Promise: Olkiluoto 3...	Reality
<i>...will cost EUR2.5 billion and take 4 years to build.¹</i>	The contracted price was EUR3.2 billion and the agreed construction time 4.5 years. The cost overrun is EUR1.5 billion so far, putting realized cost at about EUR5 billion. Construction will take at least 7,5 years. ²
<i>...is the easiest and cheapest way to reach Kyoto targets.³</i>	The emission reductions that OL3 was claimed to deliver were overblown. It was supposed to reduce CO2 emissions by 7.5 million tons per year, but now the reductions are expected to be a third of this ⁴ (see figure 1). The delay of the reactor means that it will not help in reaching the Kyoto target practically at all since it will come to operation only half a year before the Kyoto target period ends. A lot of emission reduction options were abandoned because Olkiluoto 3 was expected to deliver the needed reductions. <u>Reaching Kyoto targets would have been easier and cheaper without Olkiluoto 3.</u>
<i>...will deliver cheap electricity, saving consumers EUR0.5 billion a year³</i>	According to Finnish heavy industry, the delay of OL3 will cost electricity consumers EUR3 billion – or EUR600 per person – in higher prices. ⁵ <u>Electricity price during 2008-2012 would have been lower had Olkiluoto 3 not been built.</u>
<i>...is a market financed private investment¹</i>	The French export credit agency Coface and several public banks headed by Bayerische Landesbank are involved in ensuring a very low interest rate and favorable terms for the project. ⁶ About 60 % of direct investment comes from companies controlled by Finnish state and municipalities. ⁷
<i>...will offer jobs to Finnish workers. Half of the investment will stay in Finland. ¹</i>	All significant subcontracts have been won by foreign companies and even in Olkiluoto itself, about a third of the workforce is Finnish. ⁸ A maximum of 25% of the investment stays in Finland. There would have been <u>more jobs and business opportunities</u> had Olkiluoto 3 not been built and renewable energy sources be allowed to grow instead. ⁹
<i>...is going to reduce Finland's reliance on energy imports from Russia³</i>	Imported gas is used for district heating and peak load generation – nuclear power cannot provide either. Also electricity is imported mainly in situations of high demand. Because of the failure to increase energy efficiency in buildings as well as the in the housing and services sector, <u>Finland will be more reliant on Russian electricity and gas after Olkiluoto 3 is in use than before the decision to build it.</u> ¹⁰
<i>...will not hinder development of energy efficiency and renewable energy. New policies will be introduced.¹</i>	Development of renewable electricity sources, especially wind, has lagged behind and development of combined heat and power has ceased. ¹¹ Despite huge potentials, Finland is ranked by Ernst&Young the third least attractive country for investments in renewable energy and least attractive for wind. The ranking covers 25 countries. ¹² (See also Figure 2.) Finland is clearly behind Scandinavian countries in energy efficiency policies.

Olkiluoto 3 is often presented as a showcase of an open process in a democratic country. The process might have been democratic but the information that the democratic decisions were based on has turned out to be false and misleading.

Safety problems¹³

Olkiluoto 3 was also supposed to be way safer than present reactors, “set a new standard” for nuclear safety. Finnish nuclear safety authority STUK has detected 2300 safety and quality problems in the OL3 project, ranging from minor to critical.¹⁴ The authority themselves said that the number of problems is so large that it is possible that all of them are not detected¹⁵.

It is alarming that there have been problems in manufacturing each of the key parts of the primary circuit of OL3. The primary circuit is the subsystem of a nuclear power plant that is probably most crucial to safety. The primary circuit is subject to extreme heat, pressure and radiation for decades. Its components are hard, some impossible, to replace once the reactor is in use.

Examples of problems (see also last page for additional information)

- The primary coolant circuit was found to have too large and irregular grain size. The problem was caused by an attempt by the subcontractor to save time and reduce costs. All eight pipes have been recast but it is unclear whether the new methods have actually resolved the problem or caused new ones. Failure of the primary coolant circuit can initiate a severe nuclear accident.
- The concrete containment building of the reactor was welded for at least half a year before the obligatory tests and paperwork were done. Tests to ensure the quality of welds were not carried out.
- Steel liner of reactor containment was manufactured by a Polish machine yard that had no earlier experience of nuclear projects. Safety standards were violated in welding and holes were cut in wrong places. The bottom of the liner is wavy and it was damaged during storage. Violations continued during assembly of the liner in Olkiluoto. The substandard quality of the liner can lead to higher radioactive releases in case of an accident.
- Concrete base slab of the reactor is more porous than was allowed, making the structure more vulnerable to chemically reactive substances. This can lead to long term deterioration of the reactor containment building. The concrete has a high water content, which could, under certain accident conditions, lead to rapid formation of cracks.

What caused the problems?

- Olkiluoto 3 is constructed under a tight schedule, with considerable cost pressure. The same is likely to hold for any future nuclear projects. The unrealistic price and timetable of Olkiluoto 3 have been a strong incentive for Areva to cut down prices and to refuse to perform time-consuming corrections when problems arise. Areva's attempts to reduce costs led the company to select cheap, incompetent subcontractors, overlook safety related problems and not to provide nuclear safety training to workers.
- Construction of Olkiluoto 3 was allowed to commence before the design of the reactor was finalized (“fast track licencing”), even though this should not be legal in Finland. Nuclear industry has high hopes of cutting down lead times through this procedure and governments in e.g. the US and UK are under pressure to legalize it. Because of fast track licensing, Olkiluoto 3 subcontractors have used outdated blueprints and Finnish authorities have been at times unable to supervise work as they haven't had the design documents.
- New reactor designs are inherently harder to build and control because of larger size and fuel burn-up, which places high demands on construction.
- The stagnation of nuclear construction over the last decade or two has caused a lack of competent personnel and companies. Together with complicated project structures (Olkiluoto 3 involves over 1000 subcontractors from over 25 countries), major language problems and long control chains, this makes quality assurance prone to failures.

In January 2009, the Finnish nuclear safety watchdog STUK published documents confirming, that illegitimate practices have continued at the site. The documents show that the buyer of the reactor, Finnish utility TVO, has still failed to address many of the problems. Qualifications of welders and the use of mandatory welding guidelines are still not being systematically controlled; information flow is hampered as managers and workers in many cases don't have a common language; and training on nuclear safety is not being provided to all workers as required.

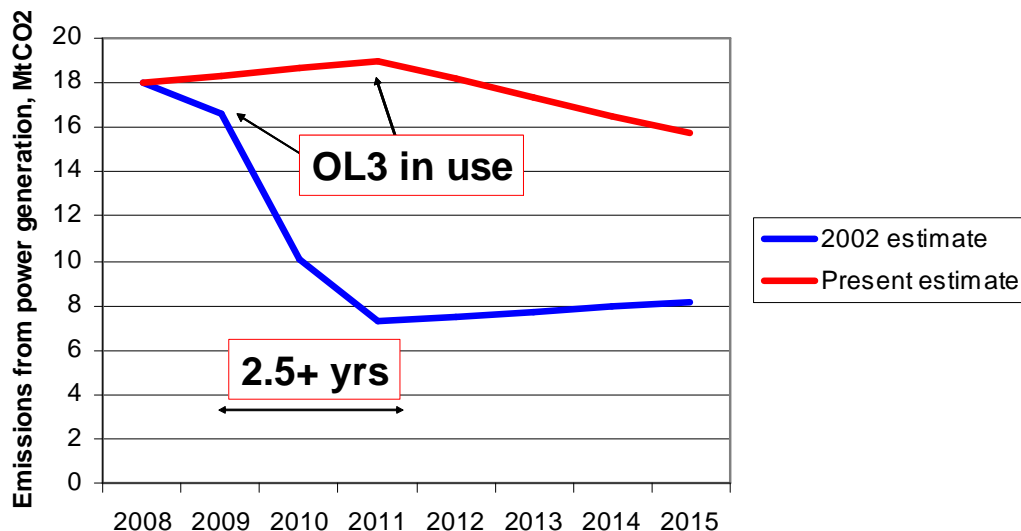


Figure 1. In a new scenario commissioned by Finnish energy industry⁴, the emission reductions achieved by Olkiluoto 3 are a third of what the Finnish parliament was told in 2002³. In addition, the 2-3 year delay means that the reactor is practically of no help in fulfilling the Kyoto target that covers years 2008-2012.

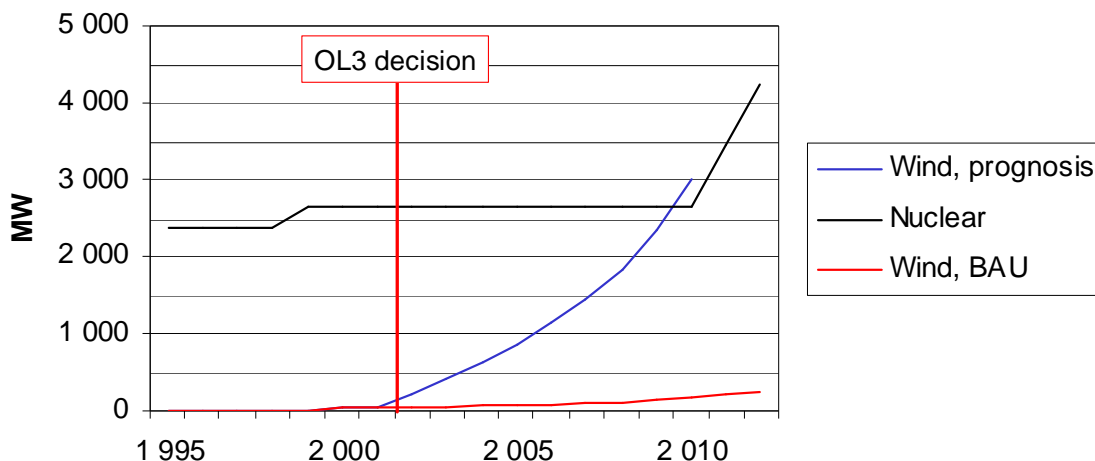
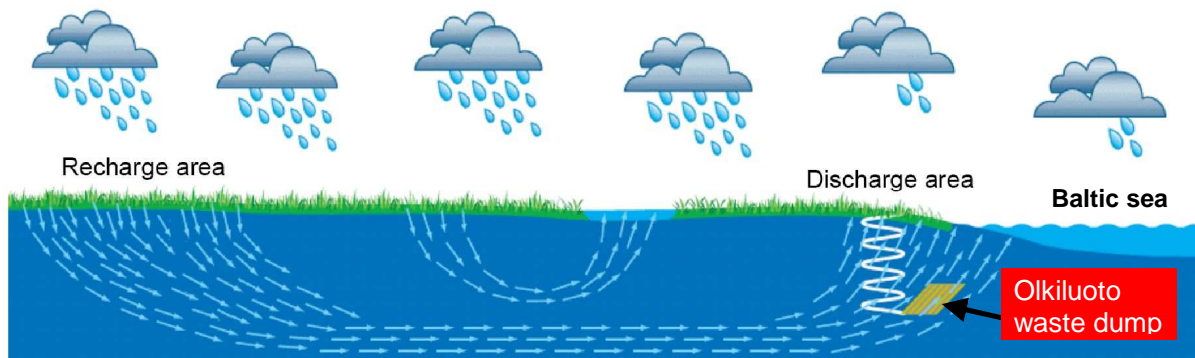


Figure 2. In 2001, Wind power capacity in Finland was projected to reach 3000 MW by 2010 (blue curve), which could have created 10 000 jobs. After the decision on OL3, made in 2002, interest in renewables evaporated and the prospects for wind power look bleak (red curve).



Source: MKG/Mikael Kärelind

Figure 3. The proposed waste repository in Olkiluoto is on the coast of the Baltic sea, in a place where the groundwater flows from the bedrock directly into the sea.

Financing

No nuclear reactor project has been realized on a commercial basis under free market conditions. This is also true of Olkiluoto 3. Most importantly, the project was only made possible by a very low fixed price offered by Areva-Siemens. At the time, Areva was starving for orders and decided to build Olkiluoto 3 at a loss in order to demonstrate its new reactor design, which the company has also publicly admitted. The cost overruns are borne by owners of Areva and Siemens, especially French and German taxpayers.

Another important part of the financial package was an export credit guarantee from France. This helped the project secure an extremely cheap loan, with about 0.5% margin, from a coalition of banks headed by Bayerische Landesbank, which has gone bankrupt. Once again, French and German taxpayers foot the bill. It is also notable that most of the investment is made by the public sector, i.a. municipal energy companies and the state electricity company Fortum.

Political Situation

In addition to the reactor under construction in Olkiluoto, there are two applications pending for new nuclear reactors. TVO, the company operating the Olkiluoto nuclear site, is applying for yet another reactor. A new company formed around the German electricity giant E.ON, Fennovoima, is in the process of selecting a site for a reactor process and has already applied for a political go-ahead. Both companies would sell the electricity directly to their shareholders, at a price set to cover all production costs, which removes all risk from the company.

Opinion polls show that over half of Finnish people are opposed to new nuclear projects, and only ten percent support the industry plan of two or more reactors. According to Finnish law on nuclear energy, the parliament has the ultimate right to determine whether a nuclear project is in the overall interest of the society and accordingly either grant or deny a permit. Practical preparation of the project only takes off if it gets a political go-ahead.

Why new nuclear? – Two ways forward

In December 2008, Greenpeace unveiled an energy plan, titled Revolution of Sustainable Energy in Finland. The plan outlines measures to reduce greenhouse gas emissions by 35% from 1990 levels, fully end dependency on electricity imports and significantly increase the share of domestic energy, all by 2020. It is estimated that the plan would cost no more to implement than the government's energy strategy that opens the door for new nuclear reactors but achieves a less than 10% cut in emissions and provides much more employment and better security of supply.

Why is nuclear power still debated then? An energy solution based on smart use of energy and renewable sources would clearly be in the overall interest of the society, but it is not in the interest of big power companies, who stand to lose if new, dynamic competitors take over the market. Some heavy industries are also heavily opposed to any effective measures to reduce domestic greenhouse gas emissions. On the other side are companies that are ready to implement at least 5000 MW of wind power and a few thousand MW of biomass-fired generation. The fight is about who reaps the profits from electricity sales in the future, since there is no space in the market for both approaches to be fully realized. The main driving force behind nuclear projects is not the economical benefit of the nation or the consumers but the economic benefit of a few powerful companies.

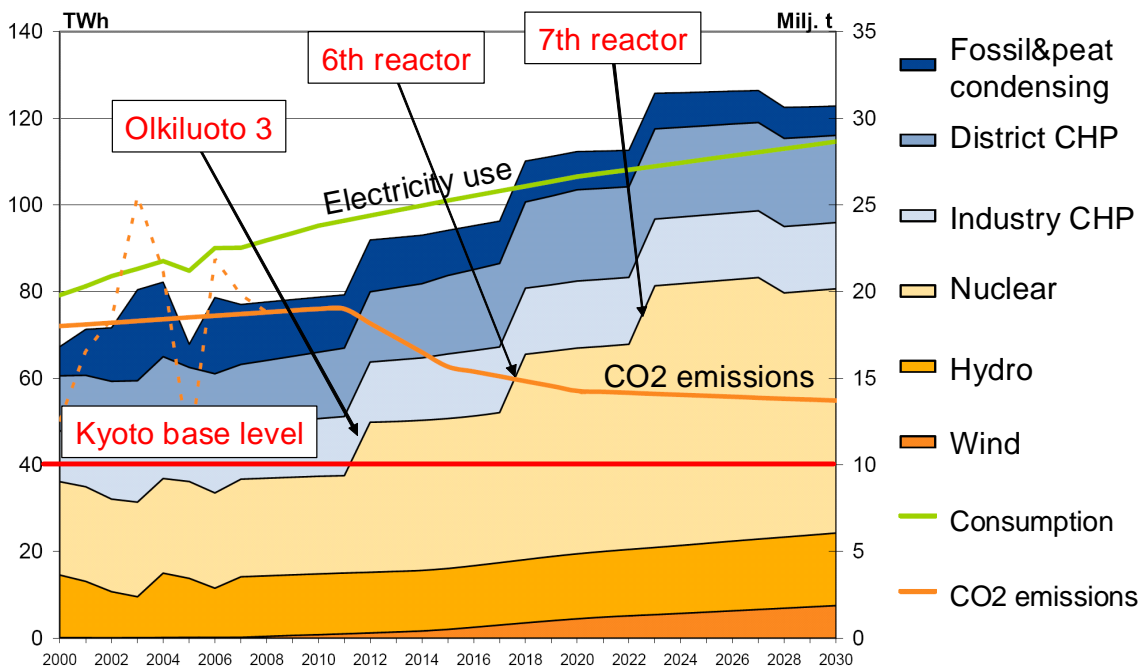


Figure 4. The nuclear lobby has no climate solution. A graph from Finnish energy industries shows that even if two more reactors were built after Olkiluoto 3, Finnish CO2 emissions from power sector would not decline even below the 1990 level by 2030! Emissions need to be about 50 percent below this level in 2030. Another concern is that the reactors would only come online in 15 years at the earliest. An energy plan based on smart use of energy and renewable sources would deliver emission reductions and security of electricity supply much faster.

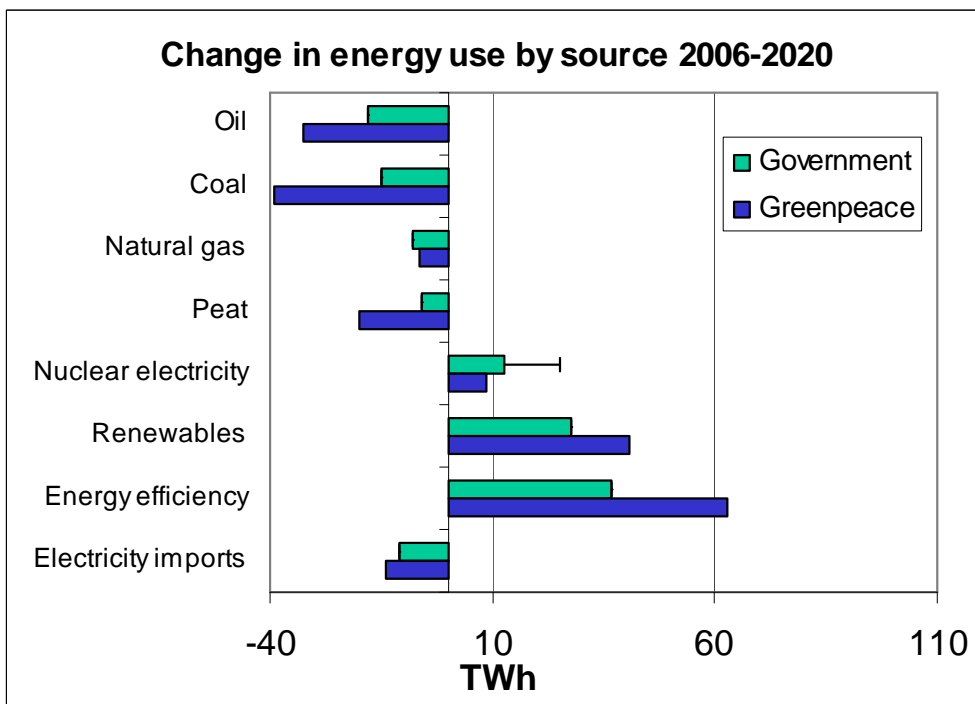


Figure 5. Comparison of the Greenpeace and government energy visions for Finland.

For more information

For briefings, background information etc, see: www.olkiluoto.info

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¹ Finnish cabinet of ministers, January 2002 – decision-in-principle on the construction of OL3. <http://www.tem.fi/files/13606/tvo1401.pdf>

² AFX News Limited, 28 Sep 2007: TVO says won't share nuclear reactor cost overruns with Areva.

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⁴ Finnish Energy Industries 2008: Sähköntuotantoskenaariot vuoteen 2030. <http://www.energia.fi/>

⁵ Kauppalehti (Finnish financial newspaper) 11 Sep 2007: Olkiluodon myöhästymisen maksaa kolme miljardia euroa.

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⁶ European renewable energies federation press release 24 Oct 2006. http://www.eref-europe.org/dls/pdf/2006/eref_pr_241006.pdf

⁷ TVO Ownership and finances. <http://www.tvo.fi/www/page/261/>

⁸ Finnish Broadcasting company YLE 11 Oct 2007: Ydinvoimalan kotimaisuusaste voi jäädä tavoitteista.

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⁹ Wind power alone could have created 10000-20000 jobs: Tuulivoima Suomessa - Vientinäkymiä ja päästövähennyksiä. CLIMTECH 2/2002. www.vtt.fi/pro/climtech/material/climtech_2-02_fin2.pdf

¹⁰ Energy scenario report commissioned by the Finnish government as a basis for the 2005 energy strategy. Forsström, J. and Lehtilä, A. 2005: Skenaarioita ilmastopolitiikan vaikutuksista energiatalouteen. VTT Processes. <http://www.vtt.fi/inf/pdf/workingpapers/2005/W36.pdf>

¹¹ See for references and graphs Lauri Myllyvirta 2007: Real, nuclear-free energy solutions for Finland.

<http://www.olkiluoto.info/en/18/3/127/>

¹² Ernst&Young 2007: Renewable Energy Country Attractiveness Indices Q3.

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¹³ For a detailed analysis and references, see Hirsch H., Neumann W. Progress and Quality Assurance Regime at the EPR Construction at Olkiluoto - Safety Implications of Problems Encountered. May 2007.

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