

Ljubljana, 22.11.2012

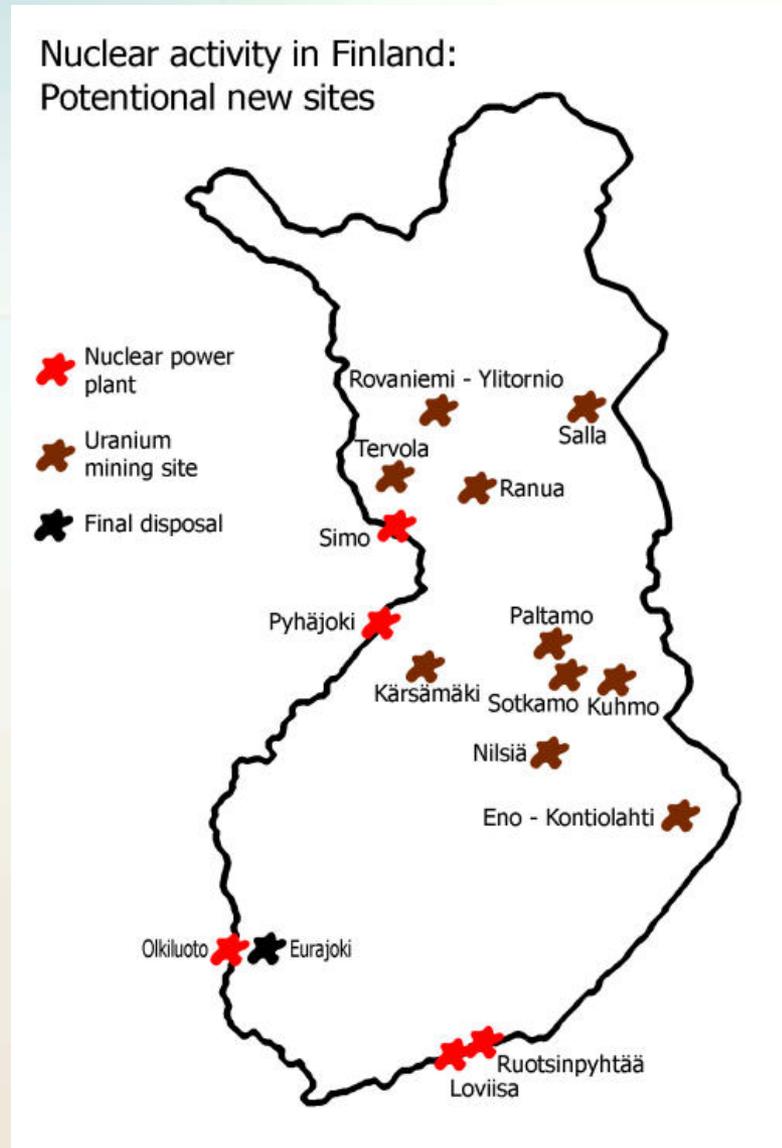
Jedrska tehnika in energetika

OLKILUOTO NUCLEAR POWER PLANT

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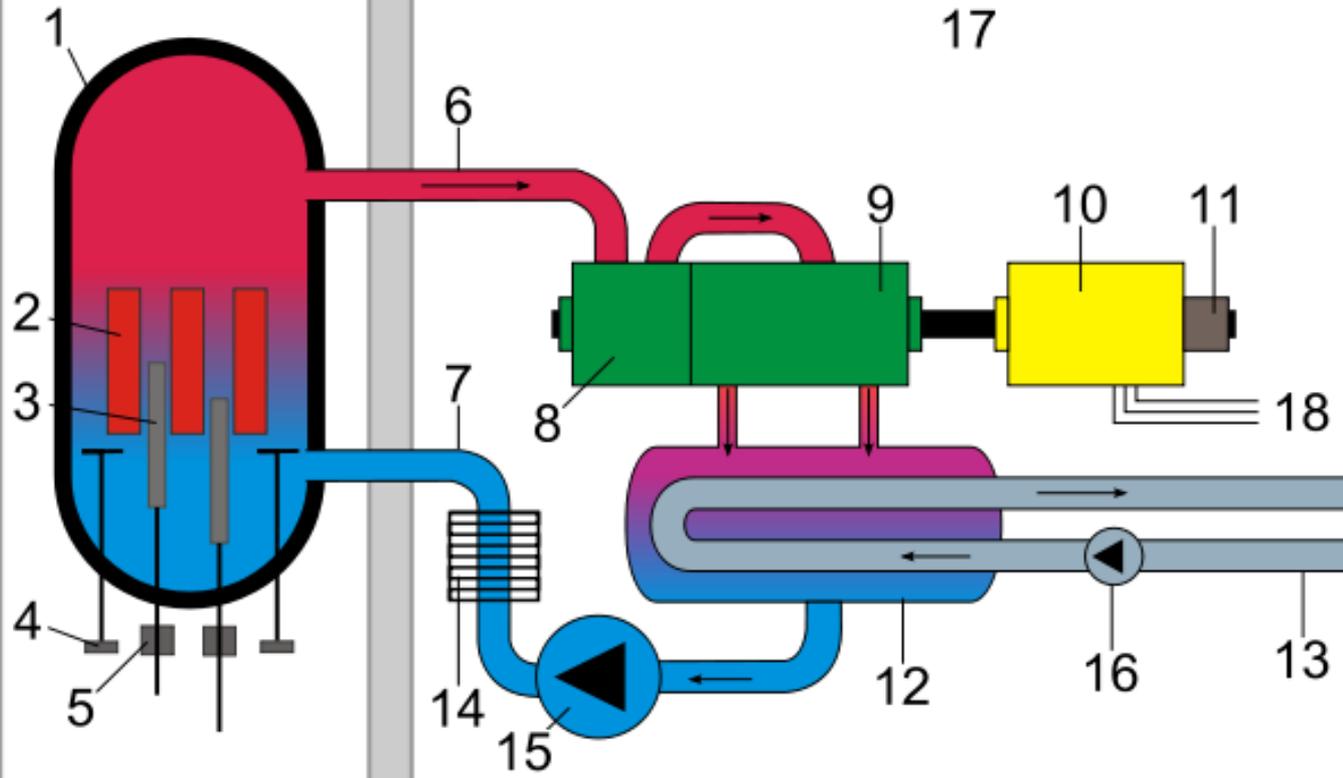
- Finland's nuclear power program has four nuclear reactors in two power plants: Loviisa plant, Olkiluoto plant
- In 2007 they provided 28.4 % of Finland's electricity

	Type	MW net	First power	Expected shutdown
Loviisa 1	WER-440/V-213	488	1977	2027
Loviisa 2	WER-440/V-213	488	1980	2030
Olkiluoto 1	BWR	885	1978	2039
Olkiluoto 2	BWR	880	1980	2042
Total (4)		2741		



OLKILUOTO:

- operated by Teollisuuden Voima Oyj (TVO) –
is a private electricity generation company owned by Finnish industrial and power companies, to which TVO supplies electricity at cost price
- Two operating units (880 MW), both **Boiling Water Reactors (BWR)** –
a type of light water nuclear reactor. Heat is produced by nuclear fission in the reactor core and this causes the cooling water to boil, producing steam. The steam is directly used to drive a turbine, after which it is cooled in a condenser and converted back to liquid water. This water is then returned to the reactor core, completing the loop.
- Third unit under construction



- 1 reactor vessel
- 2 fuel core element
- 3 control rod element
- 4 circulation pumps
- 5 control rod motors
- 6 steam
- 7 inlet circulation water
- 8 high pressure turbine
- 9 low pressure turbine
- 10 electric generator
- 11 electrical generator exciter
- 12 steam condenser
- 13 cold water for condenser
- 14 pre-warmer
- 15 water circulation pump
- 16 condenser cold water pump
- 17 concrete chamber
- 18 connection to electricity grid



P: Olkiluoto nuclear power plant with the two existing units and third unit shown as complete

OLKILUOTO 3:

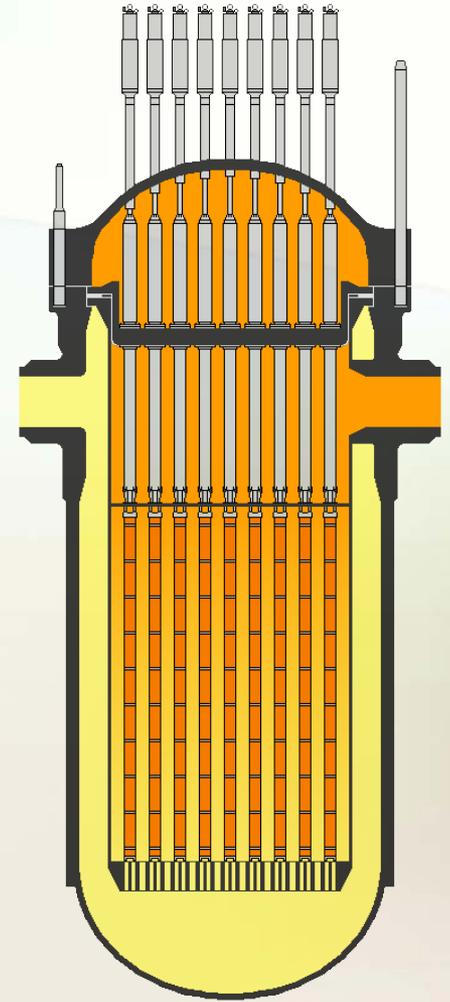
- **Supplier:** Consortium formed by AREVA NP and Siemens AG, led by AREVA NP
- **Net electric out:** 1,600 MW
- **Reactor thermal output:** 4,300 MW
- The construction of the unit began in July 2005, it should go online in 2009 but based on information by the Areva-Siemens, the plant will not be ready for regular electricity production till 2014/2015.
- **Delays:**
 - problems with planning, supervision,
 - subcontractors inexperience in nuclear construction
 - The Finnish Radiation and Nuclear Safety Authority had found a number of safety-related design and manufacturing deficiencies (foundation concrete had to be re-cast)
 - problems with license

EPR - European Pressurized Reactor or Evolutionary Power Reactor:

- A type of third generation **PWR (Pressurized Water Reactor)** :

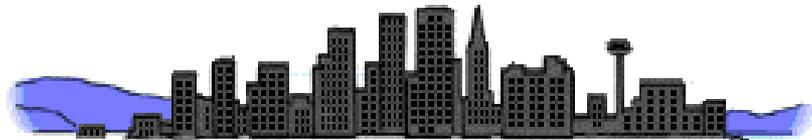
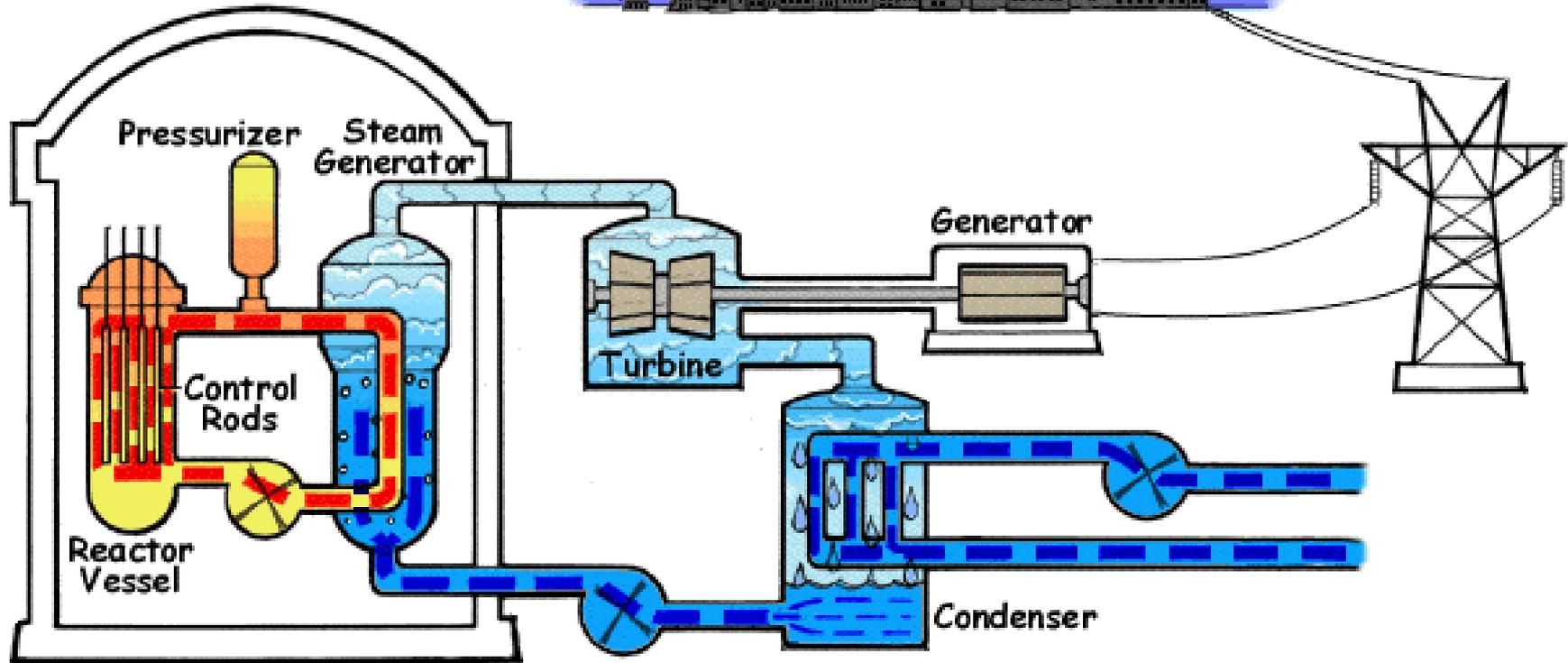
the reactor core heats water, which doesn't boil.
The heat is exchanged with a lower pressure water system, which turns into steam and drives turbine

- The reactor can use:
 - 5% enriched uranium oxide fuel
 - reprocessed uranium fuel
 - 100% mixed uranium plutonium oxide fuel



P: Reactor pressure vessel

Containment Structure



- Protection measures against accidents:
 - Four independent emergency cooling system
 - Leaktight containment around the reactor
 - an extra container and cooling area if a molten core manages to escape the reactor
 - Two-layer concrete wall (2.6 m), designed to withstand impact by aeroplanes, internal overpressure



P: Areva installs dome (September 2006)



P: Installation of the reactor pressure vessel

Date	Event
17. Feb 2005	the Finnish cabinet approves the construction application
August 2005	start of construction
May 2006	installation of the bottom part of containment liner
May 2008	fuel building APC shell completed
Jan 2009	reactor pressure vessel and vessel head arrive
May 2009	main control lifting in Safeguard Building 2
Summer 2009	steam generators arrive
Sep 2009	EPR dome installed
June 2010	installation of the reactor vessel in the reactor building
Nov 2011	primary cooling system complete
July 2012	delay in start production to 2014
August 2014	ready for regular power production (TVO – March 2012)



P: A steam generator is lifted into place

OLKILUOTO 4:

- In February 2008, TVO submitted an environmental impact assessment of the unit four to the Ministry of Employment and Economy
- In April 2010, the Government of Finland decided to grant a permit for construction of the fourth reactor
- The decision was approved by the parliament in July 2010
- Power output of 1,000 to 1,800 MW
- PWR or BWR



SOURCES:

- <http://www.youtube.com/watch?v=6tM9wsOcEBM&feature=autoplay&list=UUAvVVHhjgJOzL6CorXLzMTQ&playnext=1>
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