OLKILUOTO NUCLEAR POWER PLANT
Finland’s nuclear power program has four nuclear reactors in two power plants: Lovissa plant, Olkilouto plant.

In 2007 they provided 28.4% of Finland’s electricity.

<table>
<thead>
<tr>
<th></th>
<th>Type</th>
<th>MW net</th>
<th>First power</th>
<th>Expected shutdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loviisa 1</td>
<td>WER-440/V-213</td>
<td>488</td>
<td>1977</td>
<td>2027</td>
</tr>
<tr>
<td>Loviisa 2</td>
<td>WER-440/V-213</td>
<td>488</td>
<td>1980</td>
<td>2030</td>
</tr>
<tr>
<td>Olkiluoto 1</td>
<td>BWR</td>
<td>885</td>
<td>1978</td>
<td>2039</td>
</tr>
<tr>
<td>Olkiluoto 2</td>
<td>BWR</td>
<td>880</td>
<td>1980</td>
<td>2042</td>
</tr>
<tr>
<td><strong>Total (4)</strong></td>
<td></td>
<td><strong>2741</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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-wamer
15 water circulation pump
16 condenser cold water pump
17 concrete chamber
18 connection to electricity grid
Olkiluoto nuclear power plant with the two existing units and third unit shown as complete.
OLKILUOTO 3:

- **Supplier:** Consortium formed by AREVA NP and Simens 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-Simens, 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
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
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Feb 2005</td>
<td>the Finnish cabinet approves the construction application</td>
</tr>
<tr>
<td>August 2005</td>
<td>start of construction</td>
</tr>
<tr>
<td>May 2006</td>
<td>installation of the bottom part of containment liner</td>
</tr>
<tr>
<td>May 2008</td>
<td>fuel building APC shell completed</td>
</tr>
<tr>
<td>Jan 2009</td>
<td>reactor pressure vessel ad vessel head arrive</td>
</tr>
<tr>
<td>May 2009</td>
<td>main control lifting in Safeguard Building 2</td>
</tr>
<tr>
<td>Summer 2009</td>
<td>steam generators arrive</td>
</tr>
<tr>
<td>Sep 2009</td>
<td>EPR dome installed</td>
</tr>
<tr>
<td>June 2010</td>
<td>installation of the reactor vessel in the reactor building</td>
</tr>
<tr>
<td>Nov 2011</td>
<td>primary cooling system complete</td>
</tr>
<tr>
<td>July 2012</td>
<td>delay in start production to 2014</td>
</tr>
<tr>
<td>August 2014</td>
<td>ready for regular power production (TVO – March 2012)</td>
</tr>
</tbody>
</table>

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.