Nuclear Energy in Finland
Operation, projects and licensing

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Ministry of Economic Affairs
and Employment of Finland
Nuclear energy production in Finland in 2017
33 % of electricity produced in Olkiluoto and Loviisa NPPs

2017 Total electricity production in Finland 65 TWh
Imported electricity 20.4 TWh (24%)

**TVO**: 2 x BWR 880 MW (net)
- Olkiluoto 1 (1978) 7 TWh
- Olkiluoto 2 (1981) 7 TWh
  (OL3 – EPR, 1650 MW)

**Posiva**: spent fuel repository, under construction

**Fennovoima**: Hanhikivi 1 site and license application for AES2006 1200 MW

**Fortum**: 2 x PWR/VVER 488 MW (net)
- Loviisa 1 (1977) 4 TWh
- Loviisa 2 (1980) 4 TWh

**VTT**: Test reactor FiR1, Shut down in 2015

- Fuel: no front-end facilities, potential uranium recovery from a nickel mine (Terrafame Oy, Sotkamo)
- No reprocessing of spent fuel – ban to import/export nuclear waste (since 1994).
Teollisuuden Voima Oyj, TVO
OLKILUOTO site
Almost 40 years electricity production,
17 % of the electricity needs in Finland
TVO - OLKILUOTO site – OL1, OL2 and OL3

- **OL1 and OL2** - **continuous improvement through modernization projects**
  - 2018 renewal of operating license
  - Submission of the license application in January 2017, license in 2018.

- **OL3** - **towards commissioning**
  - Operating license application in 2016. License in 2018 > fuel loading in August 2018 > start of operating tests with fuel.
  - Electricity generation starts in spring 2019.

- **All nuclear waste management on one island**
  - Operating waste repository (VLJ repository at the site), since 1996 in operation.
  - Interim storage for spent nuclear fuel (Renewal and extension 2015).
  - Final disposal facility for spent nuclear fuel, Posiva / ONKALO in Olkiluoto under construction.
Fortum Power and Heat: Loviisa Nuclear Power Plant

Lo1/2: 2 x VVER 488 MW
Loviisa nuclear power plant

- Lo1 and Lo2: 2 x VVER 488 MW
- Operating licenses till 2027 and 2030 in force – 50 years of life time for both the units.
- To be decided whether Fortum will apply for a new operating license for over 50 years of operation or start the decommissioning. License application in both the cases well before the licenses expire.
- Continuous maintenance and modernisation works carried out at the site, eg. automation.
- Fukushima improvements for safety implemented as agreed with STUK (cooling towers the most significant new function)
- Development of operating waste handling for final disposal at the site (underground repository for LILW)
- Spent fuel wet pools for storage of spent nuclear fuel. Final disposal in Olkiluoto Posiva repository after cooling.
Hanhikivi 1 to be built in Pyhäjoki
Fennovoima Hanhikivi1

- ROSATOM VVER / AES2006, 1200 MWe reactor
- Owners – Voimaosakeyhtiö Suomi 66 % & ROSATOM 34 %
- Site in Pyhäjoki, Hanhikivenniemi
- Construction license application submitted in 2015
- License handling ongoing (Safety assessment delayed due to the submission of documents), present schedule till spring 2019.
- Construction license in 2019
- Open questions in nuclear waste management to be solved. Today a contract with Posiva Solutions for development.
- Fennovoima staff about 350 in 2017, project staff from ROSATOM.
Existing functions for spent fuel

- Storage, transport activities and the research tunnel ONKALO in operation.
- ONKALO final depth of 420 metres and length more than 4000 meters.
- First in the world Construction license in 2015 for the final disposal facility, start of construction in 2017.
- Readiness to start the operation for disposal in 2024 (Posiva).

Olkiluoto spent fuel transport

ONKALO, excavation started in 2004
POSIVA - FINAL DISPOSAL FACILITY
ONKALO underground repository for the spent nuclear fuel

Construction licence in 2015

Ground connections: access tunnel and vertical shafts
- personnel, canister and ventilation shafts

Volume of tunnel system ca. 2 million m³

A total of ca. 200 tunnels

Depth of tunnel system 400 - 450 metres

Capacity 6,500 tU
(ca. 3,250 canisters)

Tunnel length ca. 60-70 km

from research project towards implementation
MEAE Nuclear Energy Section under the Department of Energy

• Works for the licensing, legislation, skilled resources and technology demands in the use of nuclear energy and other nuclear installations.

• Covers nuclear power construction, generation, waste management, decommissioning, other nuclear installations and uranium recovery.

• Handles and presents nuclear related issues for the decision making in the Government.

• The license handling includes eg. following criteria:
  • Overall good of the society is the leading principle
  • The goals are contributing to the national Finnish Energy Strategy (by MEAE Department of Energy) and the national energy needs
  • Overall safety requirements are presented and fullfilled (STUK safety assessment is to be positive)
  • Presented technologies and services are relevant and cover the full life time of the nuclear installation
  • Waste management is developed and the preparations for the waste funding are on an adequate level with the licensing.
  • Economical feasibility and solid financing are presented.
Carried out by the applicant

EIA procedure (EIA report)

Decision-in-Principle
(to be ratified by the Parliament – overall good of the society)

Competitive bidding, choice of the plant supplier
(and possibly plant site)

Construction license

Construction of the nuclear plant

Operating license

Operation of the nuclear plant

Decommissioning license

Decommissioning and final disposal > green field.

Nuclear energy act: licensing process

Decision by the Government after preparation of MEAE
Nuclear installations and licensing projects in Finland, MEAE

Guides
- STUK YVL-guide renewal
- Start of the use
- Update

Lo1/2
- Fukushima improvements, modernisation projects
- LO 1/2 (PSR)

OL1/2
- Fukushima improvements, modernisation projects
- OL1/2 operating license renewal

OL3
- Construction
- Testing (reactor island)
- Operating license
- Construction license
- PTO

FH1
- Construction license
- Construction, Testing, Operating license

POSIVA: Spent fuel disposal
- Construction license

FiR-1 test reactor
- EIA for decommissioning

Terrafame, Ni-mine
- Uranium recovery?
- Licensing
- Decommissioning

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Thank you!