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%)

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

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

- 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).

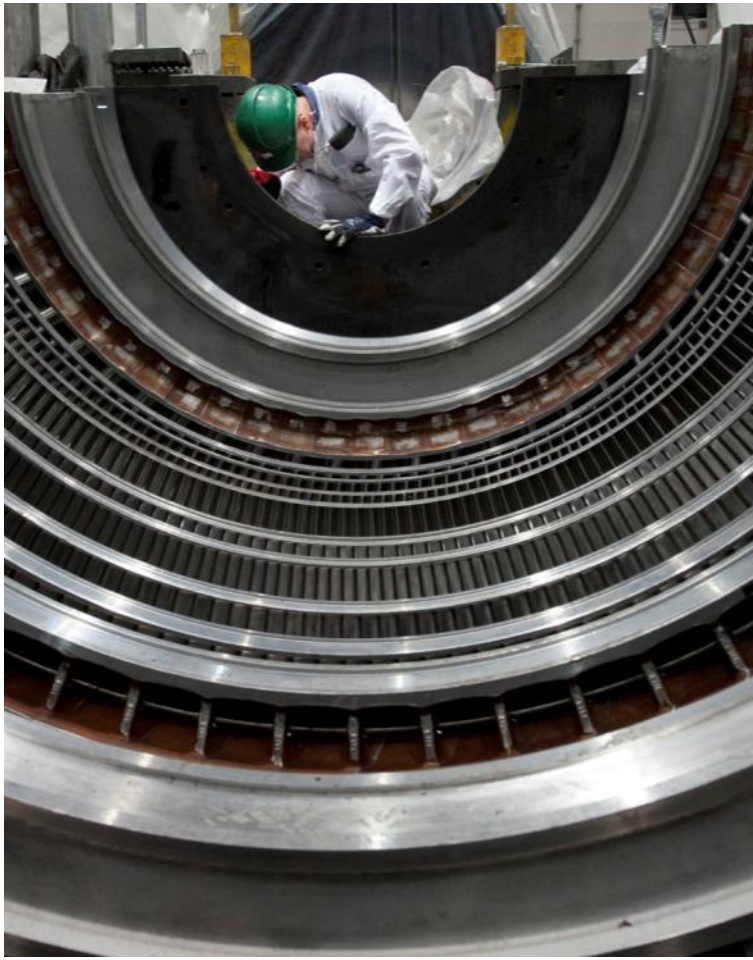
Fortum: 2 x PWR/VVER 488 MW (net)
Loviisa 1 (1977) 4 TWh
Loviisa 2 (1980) 4 TWh

VTT:
Test reactor FiR1, Shut down in 2015

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 nucelar 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 wheter Fortum will apply for a new operating license for over 50 years of operation or start the decommissioning. License applcation 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

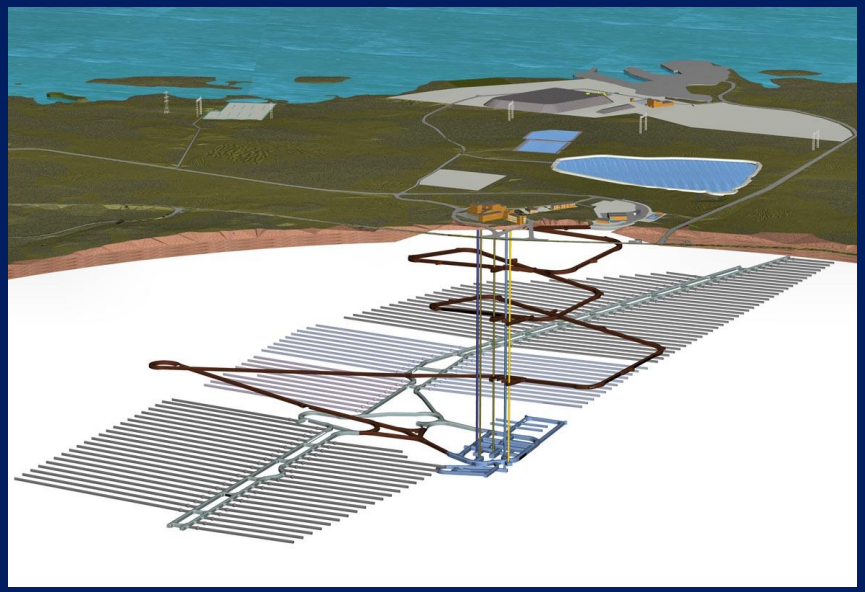
Fennovoima Hanhikivi1

- 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 docments), present schedule till spring 2019.
- Costruction license in 2019
- Open questions in nuclear waste management to be solved. Today a contract with Posiva Solutions for development.
- Automation contract between ROSATOM and Rolls Royce in 2017.
- Fennovoima staff about 350 in 2017, project staff from ROSATOM.

Existing functions for spent fuel

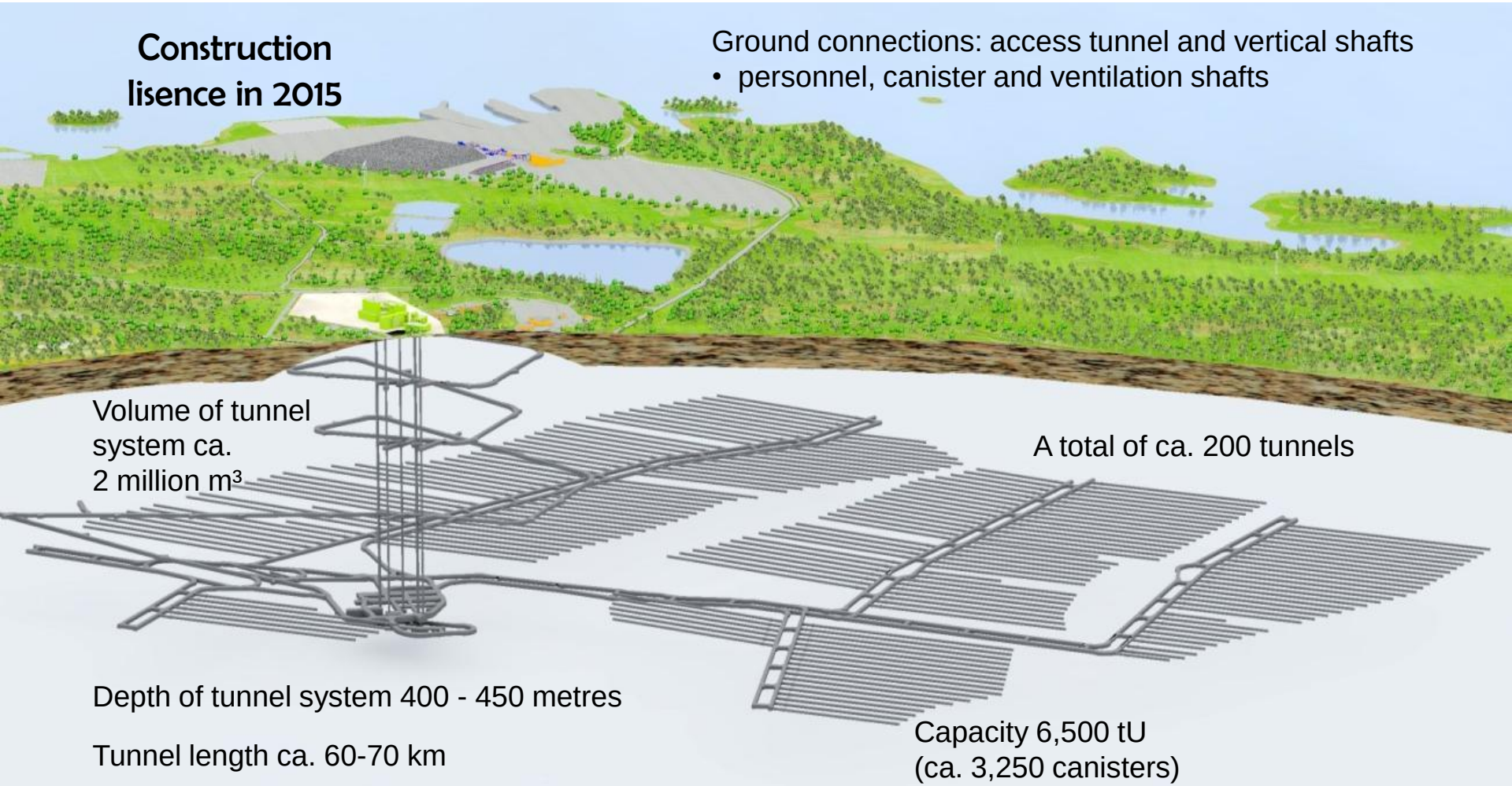
- Storage, transport activities and the research tunnel ONKALO in operation.
- ONKALO final depth of 420 metres and length more than 4000 meters.
- First in the world Construction license in 2015 for the final disposal facility, start of construction in 2017.
- Readiness to start the operation for disposal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

Olkiluoto spent fuel transport



ONKALO, excavation started in 2004

POSIVA - FINAL DISPOSAL FACILITY
ONKALO underground repository for the spent nuclear fuel



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.

Nuclear energy act: lisencing process

Decision by the Governement after preparation of MEAE

Carried out by the applicant

EIA = Environmental Impact Assessment

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

Building, environmental and other permits

Construction of the nuclear plant

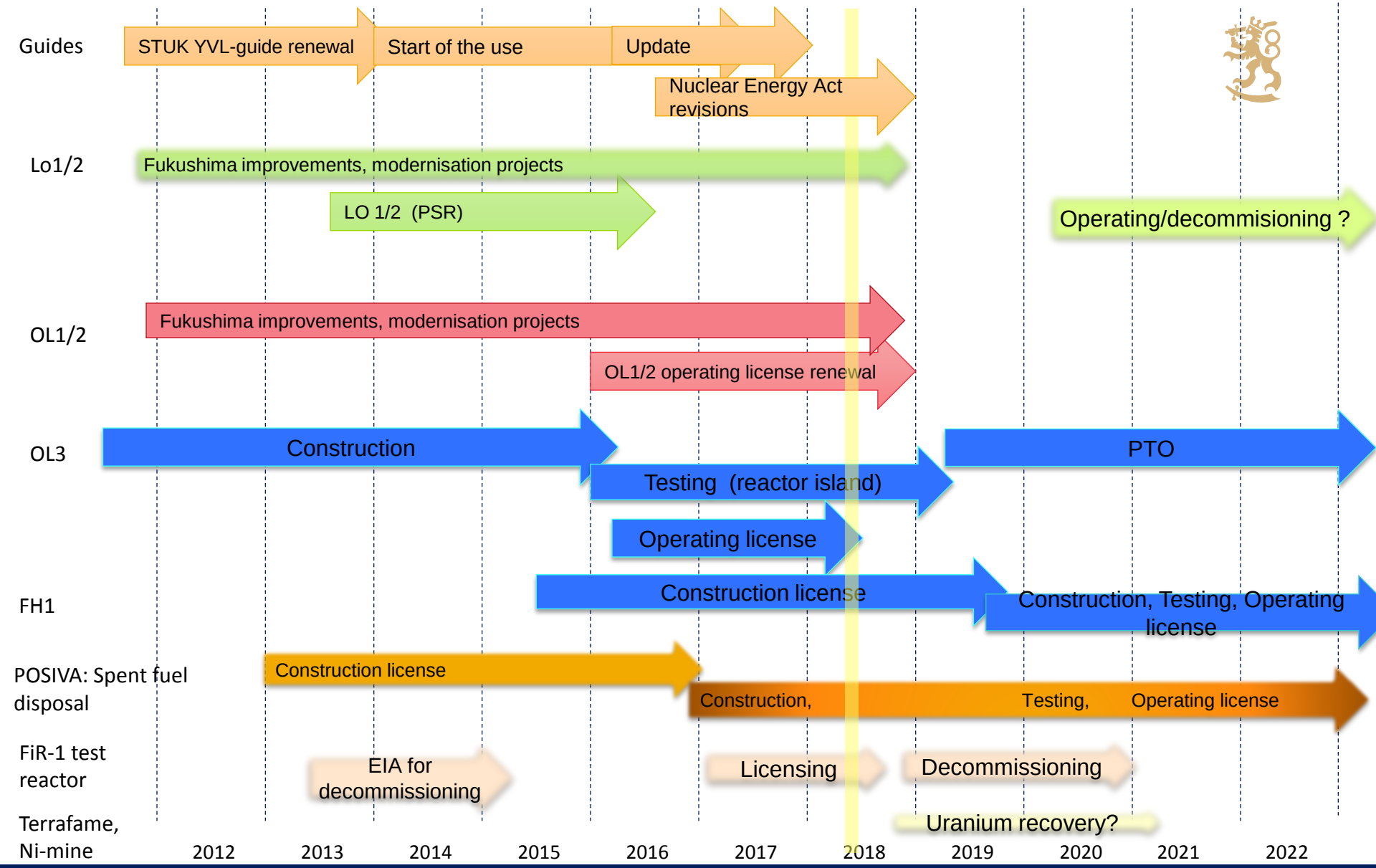
Operating license

Operation of the nuclear plant

Decommissioning license

Decommissioning and final disposal > green field.

Nuclear installations and licensing projects in Finland, MEAE



Thank you!