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Licensing process for Hanhikivi 1 project

26.10.2016

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Fennovoima in brief

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- **Project company and future plant operator,** founded in **2007** to build a nuclear power plant (NPP) at a greenfield site in **Pyhäjoki**
- Currently employs approximately 300 people, in operation phase approximately 500 people
- The total cost of the project € 6,5 – 7 billion, Equity 25%, debt 75%, Equity € 1,7 billion
- Will operate according to the “Mankala principle” whereby the owners receive electricity at cost price
- **Commercial operation** in **2024**

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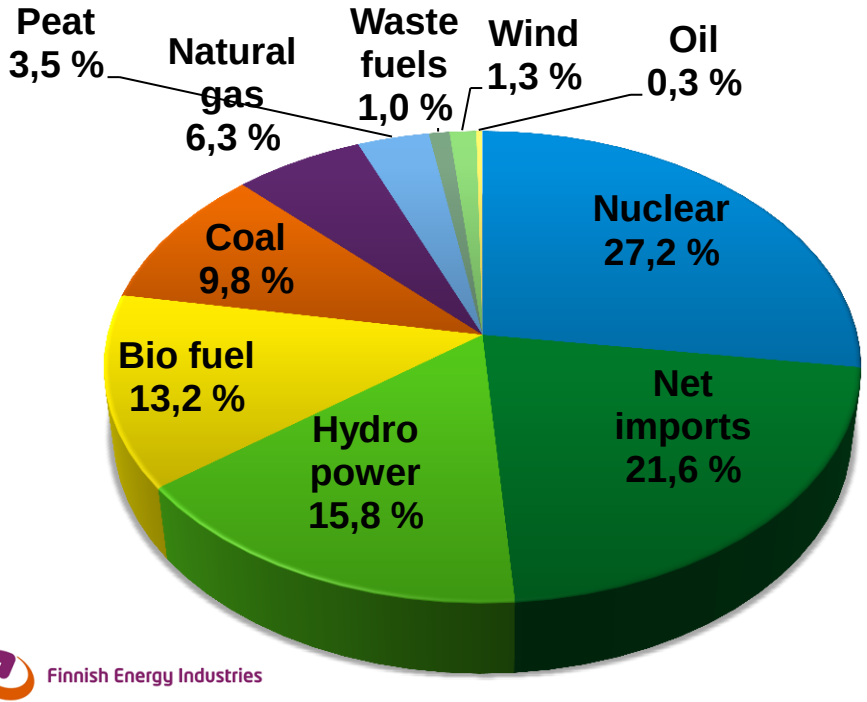
Need for new power in Finland

Electricity supply by energy sources in 2014 (83,3TWh):

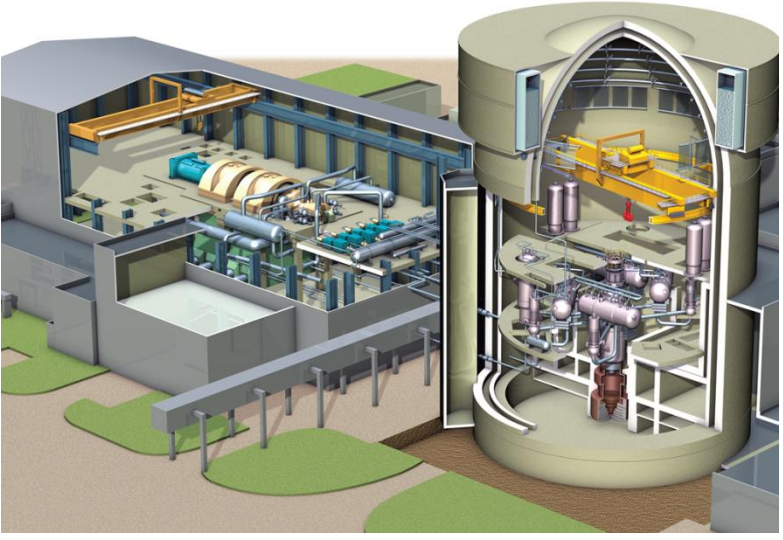


Objectives for the future:

- The **aging capacity** needs to be replaced
  → Up to 5000MW by 2030, including Loviisa NPP (2x VVER 440)
- There needs to be a reduction in **greenhouse gas emissions**
- There needs to be an increase in the **self-sufficiency of electricity supply**
- Securing the **competitiveness of Finnish industry** by offering reasonably priced electricity for a long period of time

Finnish Energy Industries

Hanhikivi 1



- Plant supplier is RAOS Project Oy, subsidiary of Rosatom Corporation
- Pressurized water reactor (PWR / VVER)
- Electric / thermal power **1200 / 3200 MW**
- Commercial operation for **60** years
- In Finland, VVER units in Loviisa operate since 1978

9 TWh

Annual energy production of Hanhikivi 1 is 9 TWh. The net import of electricity in Finland was nearly 18 TWh in 2014.

Reference design:
Leningrad NPP II 1: AES2006/V491

Source: Titan 2
26.5.2015

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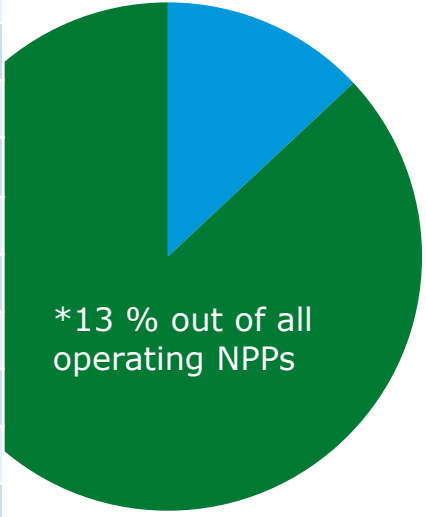
VVER units worldwide

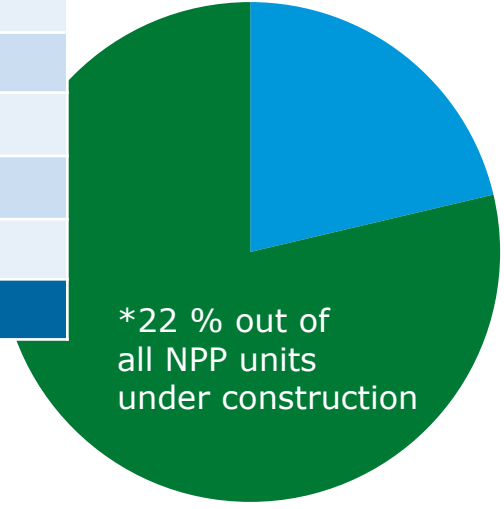
In operation

Country	Number
Russia	19
Ukraine	15
Czech	6
Slovakia	4
Hungary	4
China	3
Finland	2
Bulgaria	2
Armenia	1
Iran	1
India	1
Total	**58***



Under construction

Country	Number
Russia	5
Slovakia	2
Ukraine	2
Belarus	2
China	2
India	1
Total	**14***



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VVER – Years of Operating Experience

Type	2015 (a)	Estimated 2024 (a)
VVER all	1 500	2 300
VVER-1000 (3000 MWt or more)	600	1 000
VVER 3200 MWt*	48	170
AES-2006**	0	60
AES-2006 /V491***	0	>10

*Balakov 4, Leningrad II 1&2, Novovoronezh II 1&2, Rostov 1-4, Khmelnitski 3&4, Ostrovets 1&2, Akkuyu 1-4, Kalinin 3 & 4
**Leningrad II 1&2, Novovoronezh II 1&2, Khmelnitski 3&4, Ostrovets 1&2, Akkuyu 1-4
***Leningrad II 1&2, Ostrovets 1&2, Akkuyu 1-4

Image: Rosatom

Nuclear safety authorities in Finland

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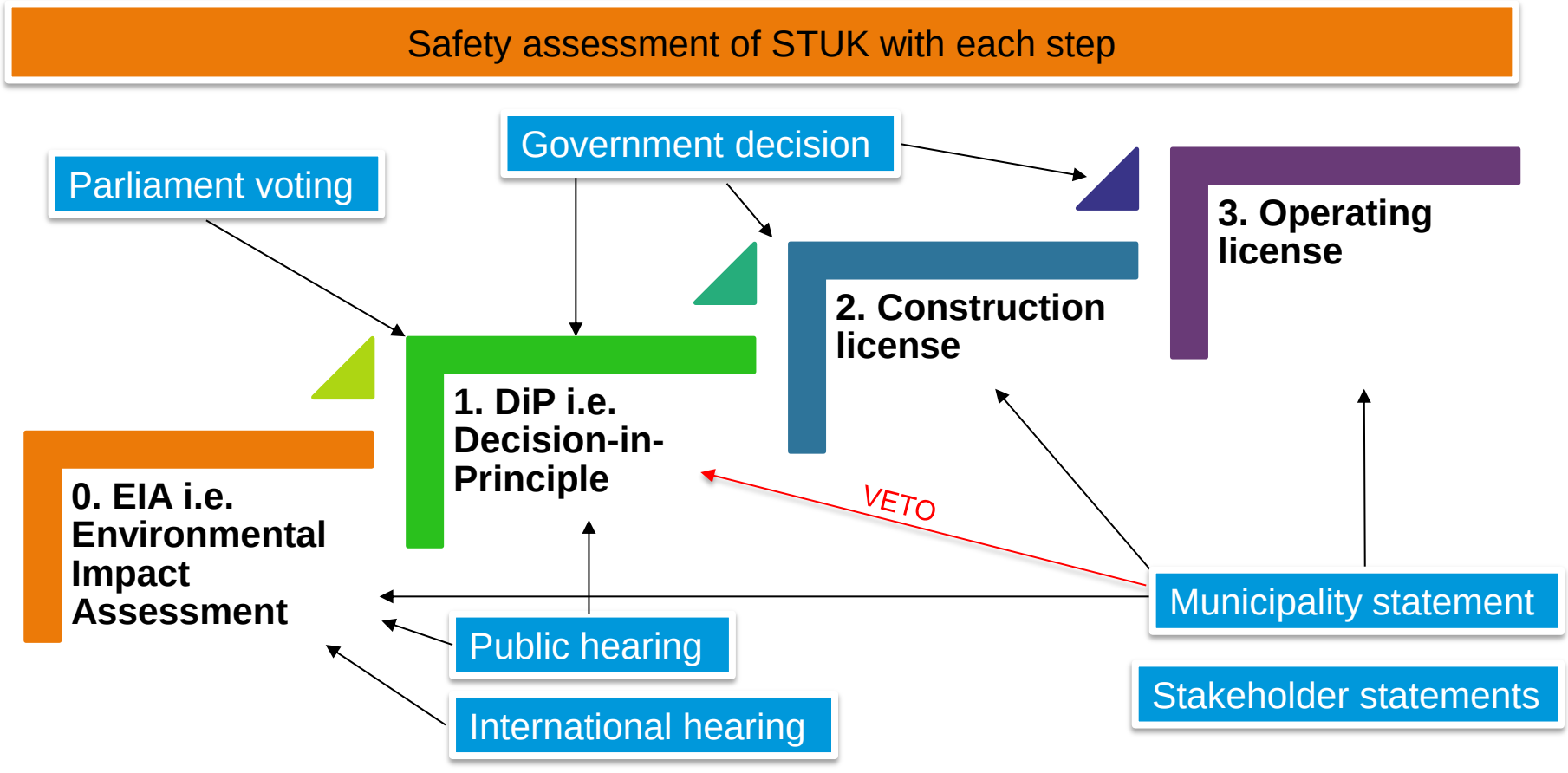
- MEE (Ministry of Employment and the Economy)
  - Administrative support for processing license applications
- MI (Ministry of the Interior)
  - Rescue and emergency preparedness operations, physical protection arrangements
- MFA (Ministry for Foreign Affairs of Finland)
  - Nuclear safety of neighboring countries, prevention of proliferation of nuclear weapons (safeguards)
- STUK (Finnish Radiation and Nuclear Safety Authority, subordinate to Ministry of Social Affairs and Health)
  - Established in 1958 for overseeing the safe use of radiation in medicine
  - Expanded to nuclear energy sector in the 1970's when the construction of Finland's first nuclear power plants began
  - Preparation of national nuclear safety legislation (STUK regulations) and issuing of regulatory guides (YVL Guides)
  - Safety evaluations, inspections and reviews

Main Licensing Steps of an NPP in Finland



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Hanhikivi 1: 10-year project

Preparation phase

- Rosatom chosen as the plant supplier
- Environmental Impact Assessment EIA
- Application for the Decision-in-Principle DIP
- Preparatory works at the site began

Infrastructure and licensing

- Construction License Application
- Extensive construction work of infrastructure and support buildings
- Development of the organization, project-specific management and processes

Construction phase

- Construction License
- Construction of the nuclear power plant begins
- Development of the organization, project-specific management and processes
- Installation works
- Operating License

Commissioning

- Fuel loading
- Electricity production begins

2013–2014 | **2015–2017** | **2018–2023** | **2022–2024**

- Decision-in-principle
- Construction license
- Operating license

A Hierarchical and Stepwise Proceeding Process for the Plant Licensing

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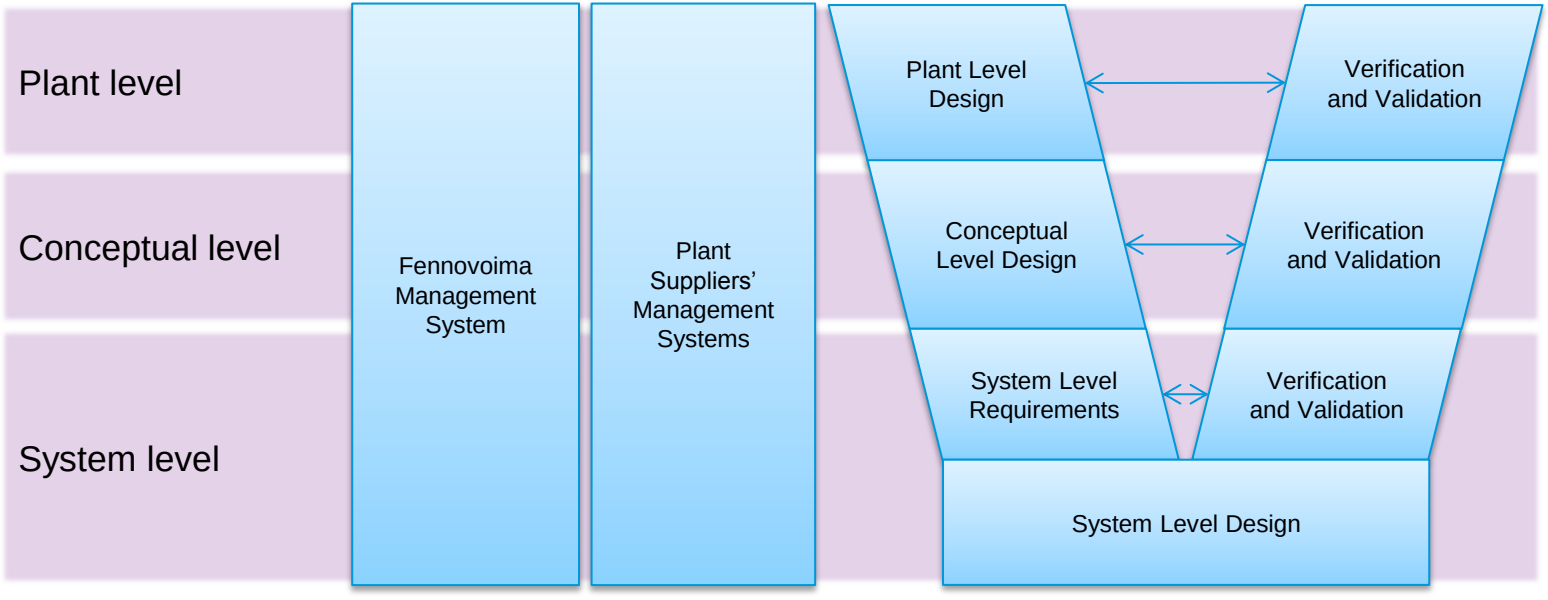

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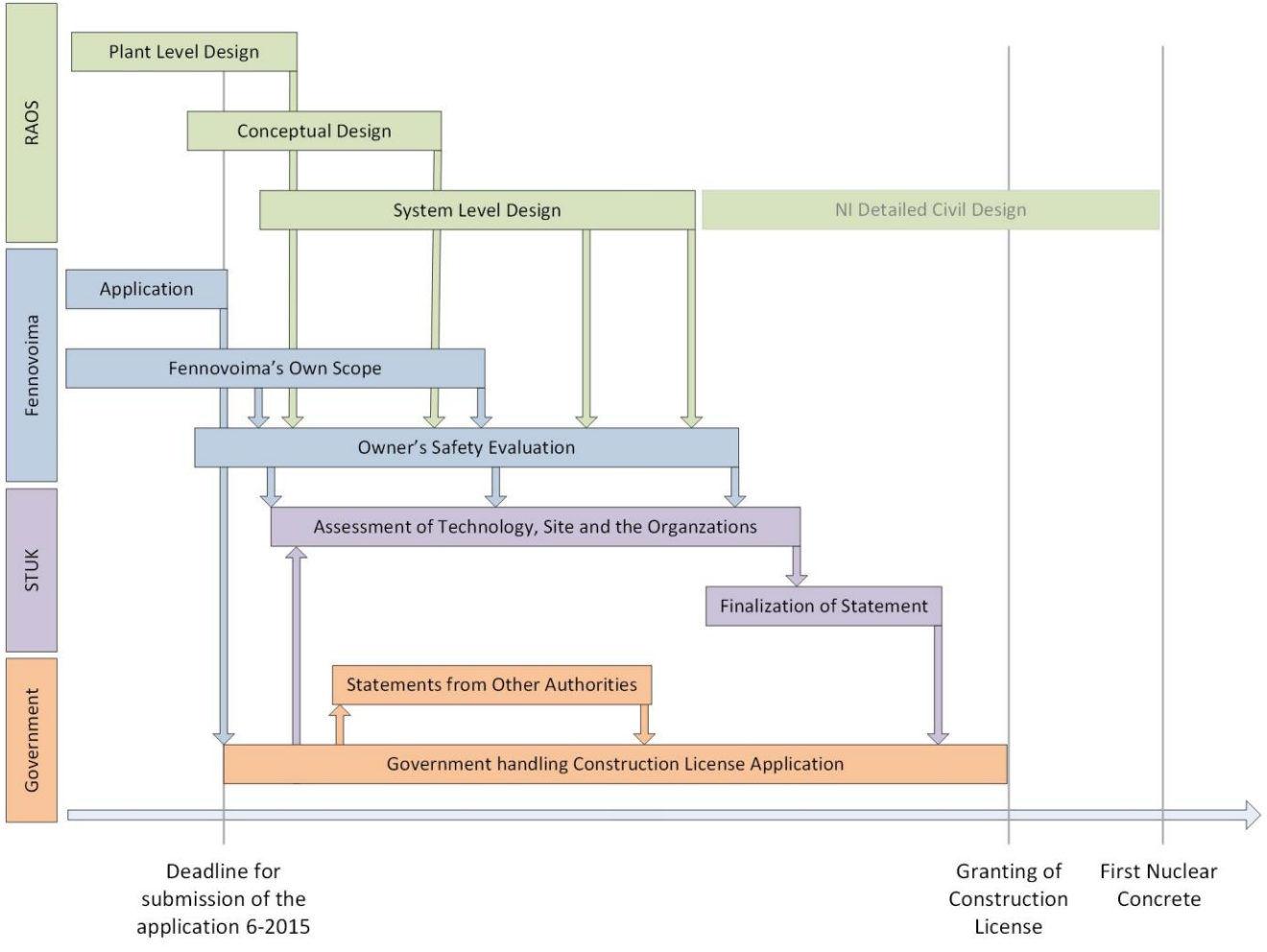
Construction License Process



Thank you!

Read more:
fennonen.fi/en