

Experience of waste management and long term disposal

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Nuclear facilities in Finland



Fennovoima Ltd

- New utility, no operating reactors
- Decision in Principle (DiP) for FH1 (Hanhikivi Site), SF storage, LILW repository
- Planned reactor type VVER (AES-2006)

Olkiluoto NPP (TVO)

- 2 operating units - ABB BWRs
- OL3 (EPR) under construction
- Interim Spent Fuel Storage
- LILW repository
- Posiva SF repository site "Onkalo"



FiR research reactor



Loviisa NPP (Fortum)

- 2 operating units – VVERs
- Interim Spent Fuel Storage
- LILW repository



Waste management policy and strategy

- Spent fuel is defined as nuclear waste (once-through option)
- Nuclear waste producers are responsible for waste management and disposal – no joint national programme
 - Government decision on waste management principles in 1978 (responsibility of waste producer, funding, regulation of R&D work)
- Government's Decision 1983 set time schedule for disposal of spent nuclear fuel and radioactive waste
 - Development of LILW disposal facilities
 - Search for international solutions for spent fuel management but also preparation of domestic solution (Disposal site selection 2000 and operation 2020)
- Government has required Fennovoima to submit at latest June 2016
 - An agreement of spent fuel disposal to Olkiluoto repository **OR**
 - A programme for environmental impact assessment for its own repository.
- Spent fuel from the research reactor is planned to be repatriated to USA

Nuclear waste management and disposal in Finland

Teollisuuden Voima Oyj



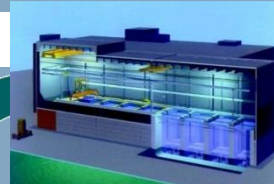
Olkiluoto power plant



Interim storage of spent nuclear fuel

In future

Fortum Power and Heat Oy



Interim storage of spent nuclear fuel



Loviisa power plant

Fennovoima Oy

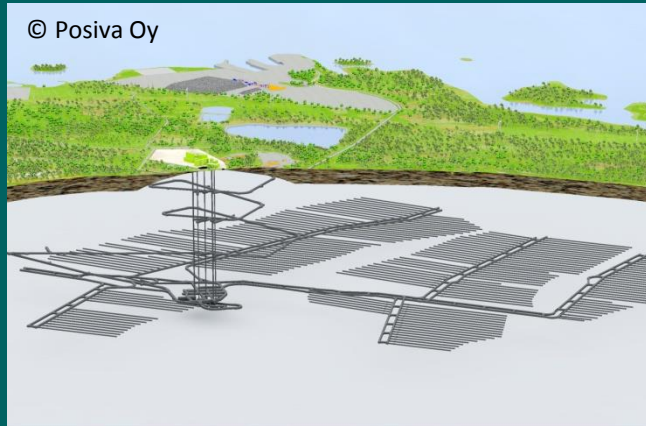


In NPP site:

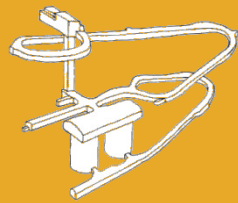
- Interim storage of spent nuclear fuel
- Operating waste Repository

Posiva Oy

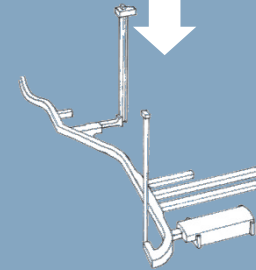
© Posiva Oy



Final disposal of spent nuclear fuel

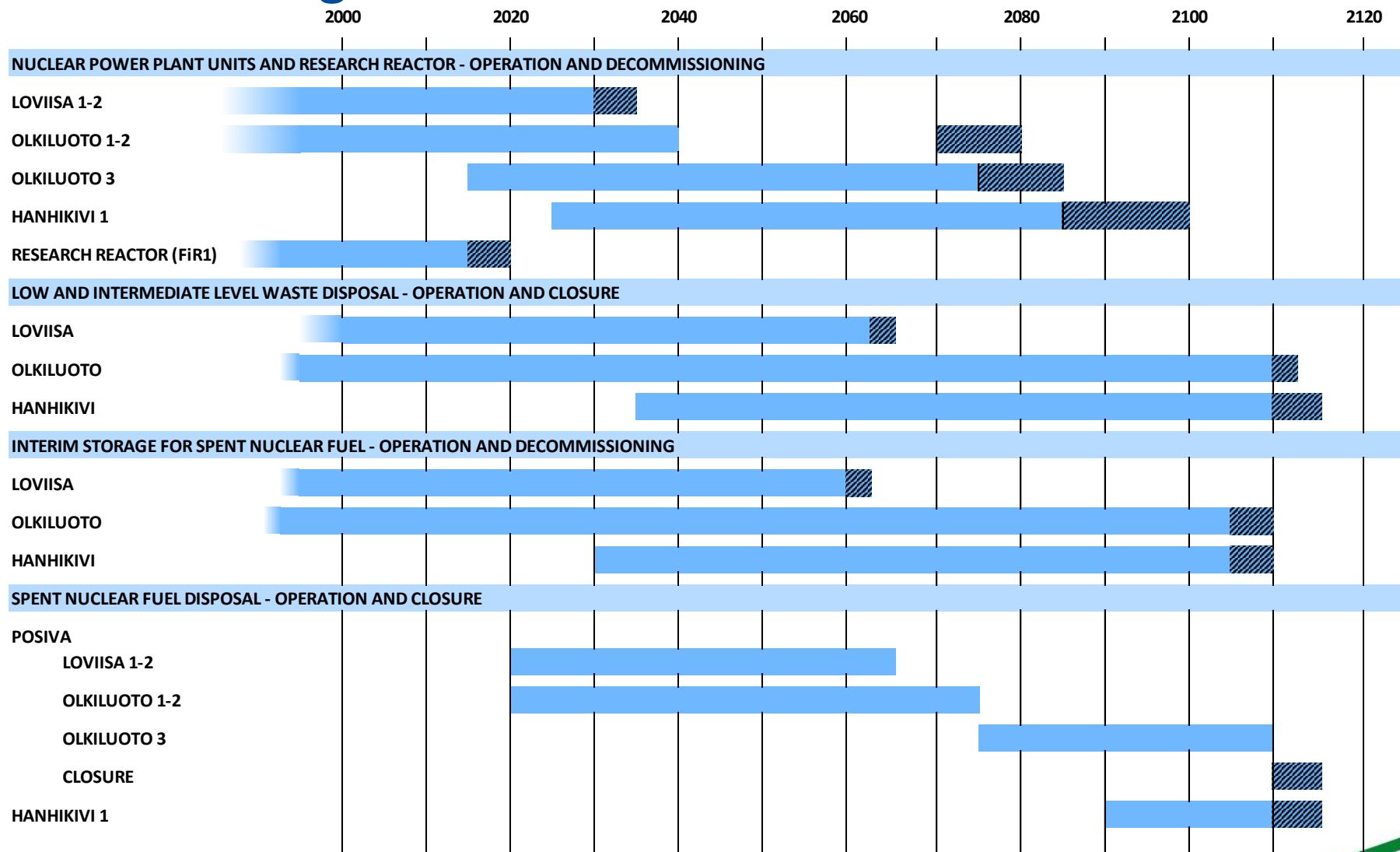


Operating waste repository

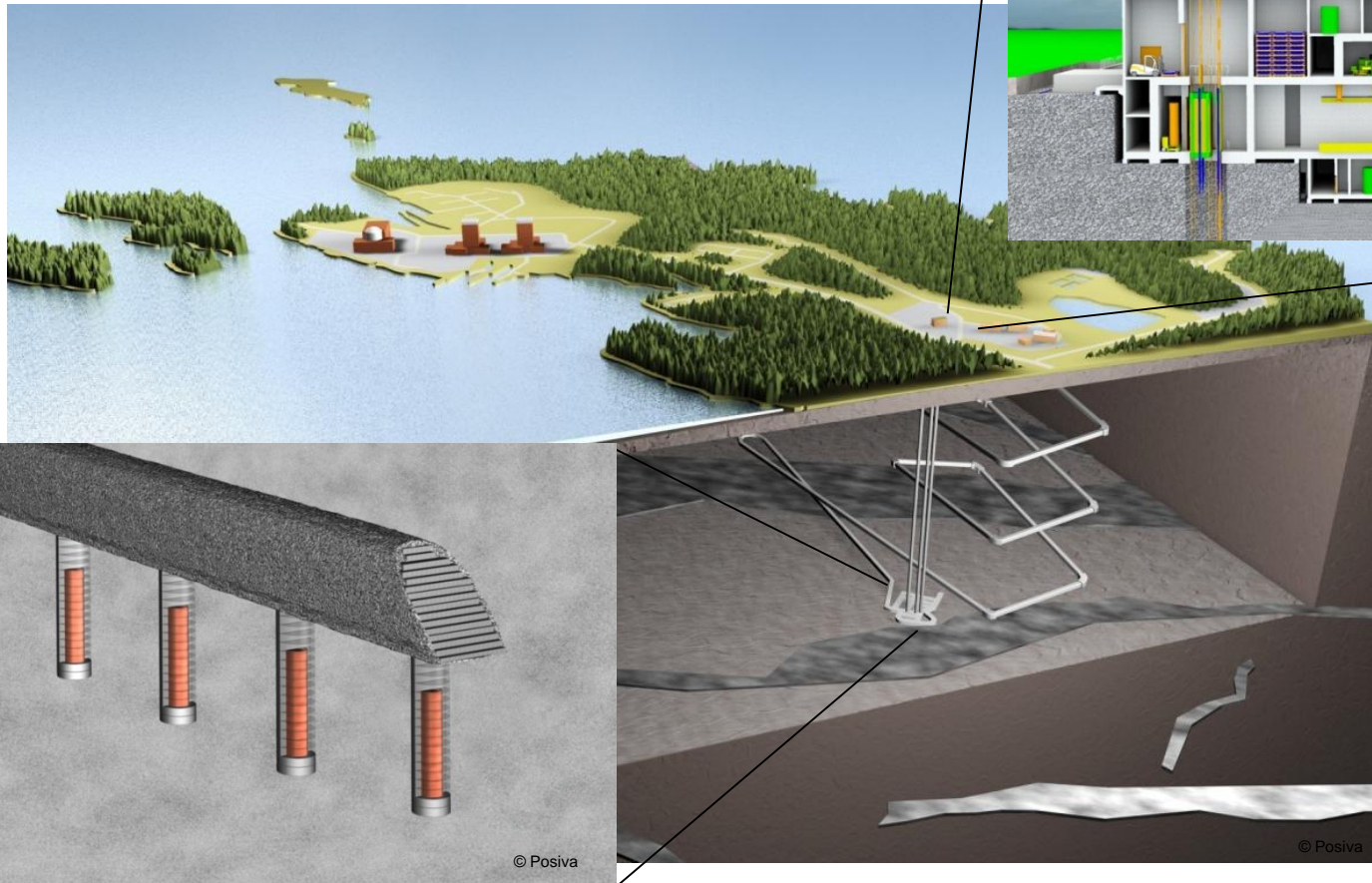


Operating waste repository

Overall time schedule for decommissioning and waste management



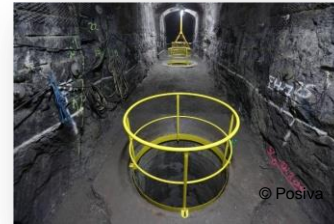
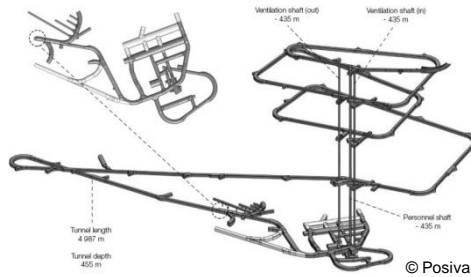
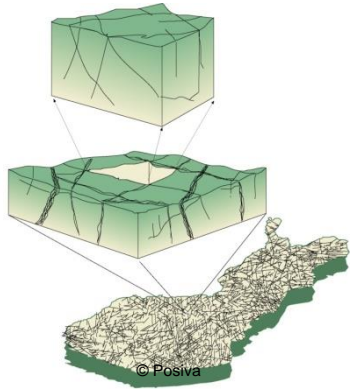
Spent fuel geological disposal in Olkiluoto



Steps in licensing of spent fuel repository

- 2000/2001 **Decision-in-Principle** was made. Political and societal acceptance of the Olkiluoto Repository
 - STUK's Preliminary Safety evaluation followed by municipal acceptance, Government Approval and Parliament's ratification,
 - The Finnish regulation requires that the bedrock shall be characterized from disposal depth before submitting construction licence application
 - Authorization to construct underground rock characterization facility (Onkalo URCF)
- 2012-2015 **Construction License**
 - Posiva submitted construction licence application (CLA) 28th December 2012
 - Authorization to construct encapsulation plant and underground disposal rooms and operational systems
 - No nuclear waste to be introduced into repository
- 2020 -2022 **Operating License**
 - Authorization to introduce nuclear waste into encapsulation and repository
- 2022- 2120 **Operating phase**
 - Fixed period with full safety review at 15 y intervals (or as specified in license)
 - Authorization of disposal facility step-wise construction

40 years' of development and oversight



Test operation, commissioning

Start of disposal around 2020

2016- 2022

Application for the operation license (OLA)

Late 1970' - 2000

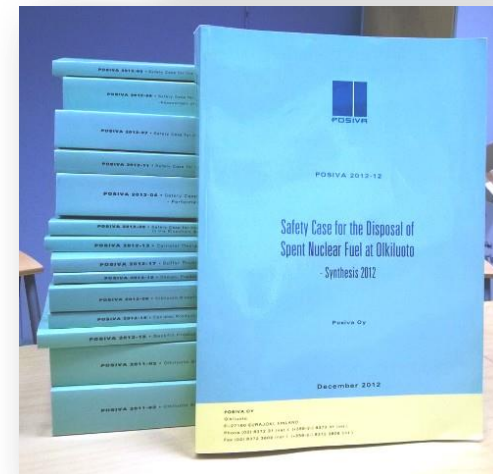
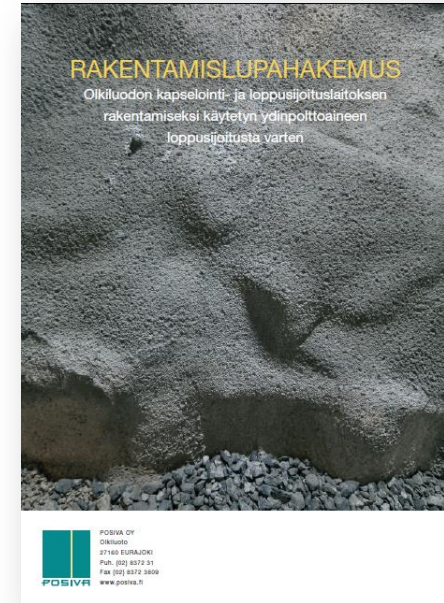


2001 - 2015



Construction license application for spent fuel repository

- Posiva submitted construction license application (CLA) to Ministry of Employment and Economy (MEE) in the end of 2012
- CLA covers both encapsulation facility and underground disposal facility
- Amount of SNF 9000 tU (NPPs OL 1-4 and LO 1-2)
- License application was supported with comprehensive operational and post-closure safety demonstration



STUK conclusions of Posiva's construction license application

- STUK gave statement and safety assessment report to Ministry of Employment and Economy 11th February 2015
- Main conclusion: **Encapsulation plant and disposal facility can be built to be safe**
- STUK emphasized in its statement to the Government that:
 - Level of safety and facility design is satisfactory for the construction license stage
 - Further work needed in facility detailed design, tunnel location criteria and selection process, demonstration of engineered barrier component installation and performance and post-closure safety case for Operating license application.
- Translations are also available in English and Swedish at STUK website (www.stuk.fi/ajankohtaista/tiedotteet/en_GB/news_941/?t=2015-3-15-18-6)

Summary

Key elements supporting the concrete progress in spent fuel disposal

Early establishment of **national framework**

- Well defined liabilities and roles
- Early on established funding system
- National policy and strategy (Government decision 1983)
- Long term political commitment to resolve the nuclear waste issue

Clear **licensing process**

- Stepwise licensing and implementation including veto-right for the local community regarding hosting the repository
- Timely and focused communication to public

Active **regulatory work**

- Development of regulatory approach parallel with R&D and in analogy with nuclear plant safety regulations
- Regular regulatory follow-up of progress in spent fuel disposal program