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”

Lovisa NPP (Fortum)
- 2 operating units – VVERs
- Interim Spent Fuel Storage
- LILW repository

FiR research reactor
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
- Operating waste repository

Fortum Power and Heat Oy
- In future
- Interim storage of spent nuclear fuel
- Loviisa power plant
- Operating waste repository

Posiva Oy
- Final disposal of spent nuclear fuel

Fennovoima Oy
- In NPP site:
  - Interim storage of spent nuclear fuel
  - Operating waste Repository
Overall time schedule for decommissioning and waste management

NUCLEAR POWER PLANT UNITS AND RESEARCH REACTOR - OPERATION AND DECOMMISSIONING
LOVIISA 1-2
OLKILUOTO 1-2
OLKILUOTO 3
HANHIKIVI 1
RESEARCH REACTOR (FiR1)
LOW AND INTERMEDIATE LEVEL WASTE DISPOSAL - OPERATION AND CLOSURE
LOVIISA
OLKILUOTO
HANHIKIVI
INTERIM STORAGE FOR SPENT NUCLEAR FUEL - OPERATION AND DECOMMISSIONING
LOVIISA
OLKILUOTO
HANHIKIVI
SPENT NUCLEAR FUEL DISPOSAL - OPERATION AND CLOSURE
POSIVA
LOVIISA 1-2
OLKILUOTO 1-2
OLKILUOTO 3
CLOSURE
HANHIKIVI 1
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

Late 1970’ - 2000

2001 - 2015

2016 - 2022

Test operation, commissioning

Start of disposal around 2020

Application for the operation license (OLA)
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/ajankohtaisla/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