Progress in Geological Disposal Programme in Finland

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Posiva Oy
Management of LILW and Spent Fuel

Teollisuuden Voima Oyj
- Olkiluoto power plant
- Interim storage of spent nuclear fuel
- Operating waste repository

Now and in the future

Posiva Oy
- Disposal of spent nuclear fuel

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

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Geological Disposal in Olkiluoto
40 years’ effort

Studies into geologic disposal started
Site selection research
Selection of Olkiluoto
Construction of ONKALO and site confirmation studies in Olkiluoto
Construction of disposal facilities
Test operation, commissioning
Application for the operation license (OLA)
Application for the construction license (CLA)
Decision in principle by the Government and the Parliament
Government’s decision on time table

Start of disposal around 2020
Application for the Construction Licence of the Encapsulation Plant and the Repository

- In 2012 Posiva submitted the application for construction license for the encapsulation plant and the repository
- It presents the requirements and solutions for safe disposal
- In addition, an extensive amount of material including the safety case has been submitted to the STUK
- Posiva’s conclusion: the disposal can be done safely presumed that it is done according to the assumptions used in the safety case
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 repository for SNF can be built to be safe
- STUK emphasized in statement to the Government that:
  - Level of safety and facility design is acceptable for the construction license stage
  - Further work needed in facility detailed design, RSC 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 (http://www.stuk.fi/ajankohtaista/tiedotteet/en_GB/news_941/?t=2015-4-26-16-21)
Safety Assessment and Inspections

- During the review of the application and assessment of safety, STUK has asked for several fulfilling documents from Posiva dealing with
  - design and safety principles
  - preparing for various situations including incidents and accidents
  - system descriptions for technical systems
  - long-term properties of the engineered barrier system

- STUK has done and will still do inspections on Posiva’s readiness to start the construction
Handling of the Application by the Ministry

- The Ministry of Employment and the Economy, MEE, received statements from almost 30 groups of interest
  - Statements pointed out for example safety of transportation
  - For the assessment of long-term safety STUK was strongly leaned on – one strength of Finland’s nuclear energy policy!
- The MEE will present the application and the statements to the new Government
  - The Parliament was elected in April the 19th and the forming of the Government is on-going
  - Posiva is expecting license for new government in the autumn 2015
Underground Rock Characterization Facility ONKALO

Construction work started in 2004
Work performed in accordance with the requirements of a nuclear facility and in supervision of STUK
Study of the site details in the bedrock
Development of rock construction methods
Several testings on-going
Will be part of the repository – as an access
Demonstration Tunnel in ONKALO
Floor Levelling Test in the Demonstration Tunnel
Role of ONKALO in Future

- Objective is to take advantage of ONKALO as an access to the repository during the building and use of the disposal facilities
  - Designed and constructed to conform to nuclear facility standards
- ONKALO provides the opportunity to practice the implementation of disposal
  - The technology for disposal can be tested in real conditions
- Contribute to the application for Operation License OLA
  - Provide a possibility to test and demonstrate repository systems for their intended use
  - Make possible a full system test to assess ”initial state”
  - Make possible long-term tests and observations if needed
Demonstrations in ONKALO
Finalizing the Disposal Barrier Design

- During the review, STUK requested Posiva to submit an overall research, development and demonstration (RD&D) programme to describe how Posiva plans to finish the concept development and address its feasibility and performance during construction.

- The RD&D programme includes:
  - activities to solve remaining open issues regarding the properties and the performance of the disposal canister, buffer, backfill, closure and the host rock
  - making decisions between principle alternatives
  - addressing the feasibility of the system by field tests
  - performing a Full Scale In-Situ System Test FISST
  - preparing for the commissioning tests of the facilities

- A lot of the development work is done jointly with the Swedish SKB.
Rock Suitability Classification - RSC

- A transparent and structured method for locating suitable rock volumes for the repository facilities and canister holes
- RSC Programme started 2007: several stages of development, testing and demonstration
- The description and background of the method was published in RSC main report in 2012

- A part of the construction license application
- Used during construction of the demonstration facilities in ONKALO
- The first versions of work instruction for RSC method implementation was accepted at end of 2014
Deposition Tunnel End Plug Test in ONKALO

- Test includes:
  - Characterization of location for tunnels
  - Excavation of tunnels
  - Development of concrete recipe
  - Detailed design of the plug
  - Construction as a nuclear safety classified structure
  - Pressurization test
POPLU Slot Production

[Images of a tunnel and a map with labeled sections such as Deposition tunnel 3, Backfill, Concrete Plug, Container with measurement equipment, Pressurization equipment, and Water tank.]

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Machinery Development and Testing

- Prototype of Bentonite buffer installation machine
  - Machine designed and manufactured in Finland
  - Testing started in testing facility in 2014
  - On-going ONKALO tests are performed as part of the LUCOEX-project

- Prototype of the canister transfer and installation vehicle
  - Machine designed and manufactured in Finland
  - Testing at testing hall on-going
  - Next in ONKALO
Prototype of the Tunnel Backfilling Installation Vehicle
Activities Done to Prepare for the Construction

- The encapsulation plant and the repository projects and project planning was started in mid 2013
- The project organization has been set up meeting the qualitative and quantitative requirements for a personnel of a nuclear facility
- Preparation of exhaustive collection of instructions and method statements is on-going
- Development of the management process to comply with the new STUK YVL Regulatory Guides/Requirements is on-going
- Detailed design of a part of the systems and the construction engineering of the encapsulation plant is on-going
Encapsulation plant

- In the encapsulation plant, the fuel assemblies are sealed inside copper and cast iron canisters.
- The sealing of the canisters is done by welding and the weld is inspected by means of several non-destructive testing methods.
- The accepted canisters are then moved via the shaft to the repository level to be deposited.
The Main Goals for the Coming Years

- Finalizing the disposal barrier design
- Preparing for and constructing the facilities, ie the encapsulation plant and the repository according to accepted schedule and other plans
- Updating the analysis on long-term safety according to accepted plans
- Preparing for the operation of the disposal facility including the facilities and Posiva’s organisation
- Preparing for and submit the Operation License Application
Long term safety assessment

Along with Finalizing the Concept and Constructing the Facilities a new Assessment - Safety Case TURVA-2020 is done for operation license application

Start of disposal around 2020

Application for the operation license

TURVA-2020
Kiitos
Thank you