Enlargement of the Olkiluoto spent fuel interim storage

Spent nuclear fuel management in Finland

SESSION 2: Status and Challenges in an Integrated Approach

International Conference on Management of Spent Fuel from Nuclear Power Reactors - An Integrated Approach to the Back-End of the Fuel Cycle

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Contents

- Spent fuel management in Finland
- Oversight of the spent fuel interim storage enlargement
  - *Safety of the operating spent fuel storage during enlarging constructions*
- The modifications for spent fuel storages due to the Fukushima accident
- Spent nuclear fuel disposal facility (in paper)
- Conclusions

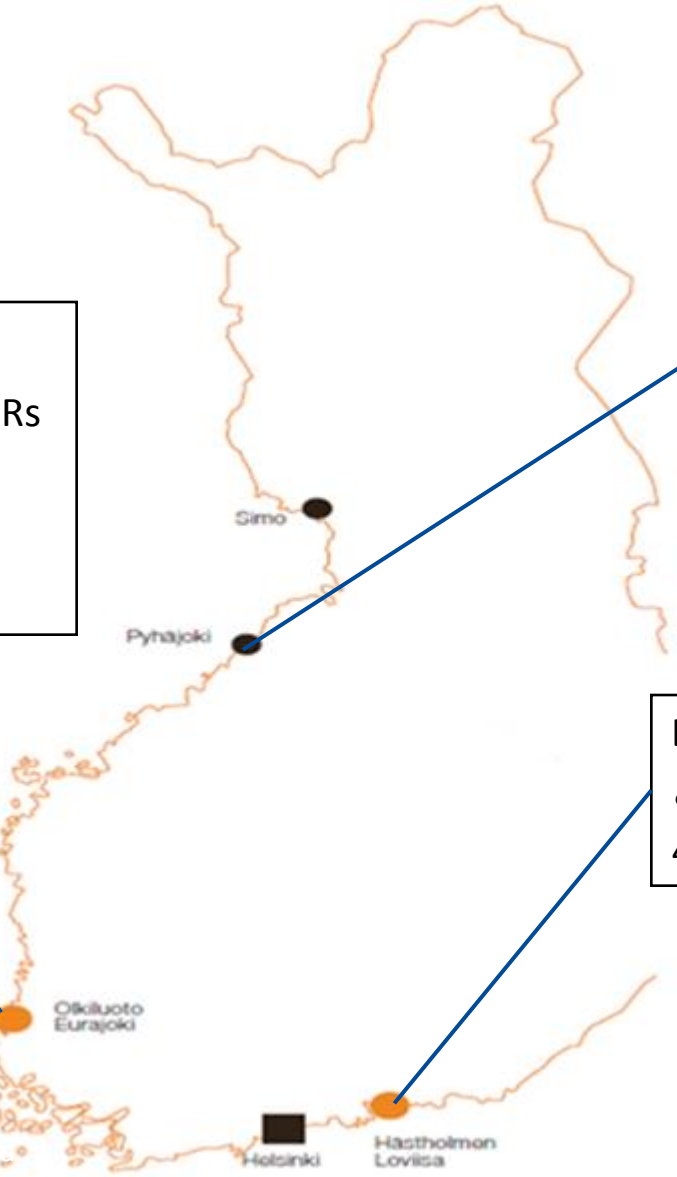
Nuclear power in Finland

Olkiluoto NPP (TVO)

- OL1&2 operating units - BWRs 880 MWe (-78, -80), SF storage
- OL3 under construction
- SNF disposal facility

Hanhikivi NPP (Fennovoima)

- Decision in Principle for FH1, SF storage



Loviisa NPP (Fortum)

- LO1&2 operating units - VVERs 496 MWe (-77, -81) SF storage

Nuclear waste management and disposal in Finland

Olkiluoto

Teollisuuden Voima Oyj

Olkiluoto power plant

Interim storage of spent nuclear fuel

Operating waste repository

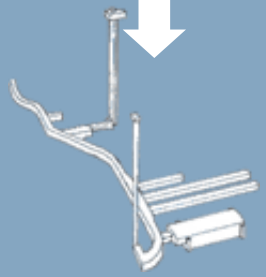
In future

Loviisa

Fortum Power and Heat Oy

Interim storage of spent nuclear fuel

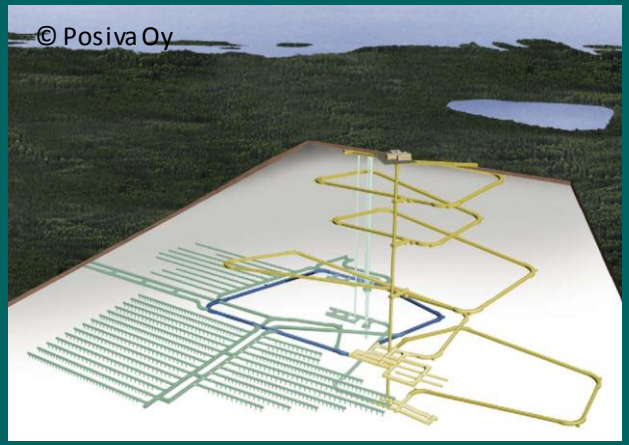
Loviisa power plant



Operating waste repository

Olkiluoto

Posiva Oy



Final disposal of spent nuclear fuel

Hanhikivi

Fennovoima Oy

In NPP site:

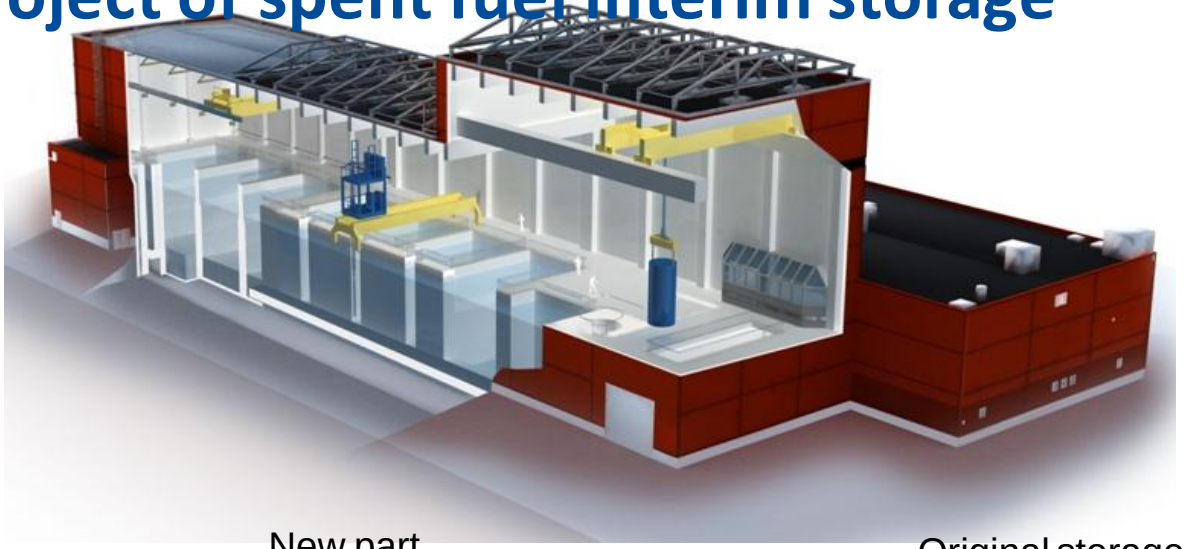
- Interim storage of spent nuclear fuel
- Operatiing waste repository

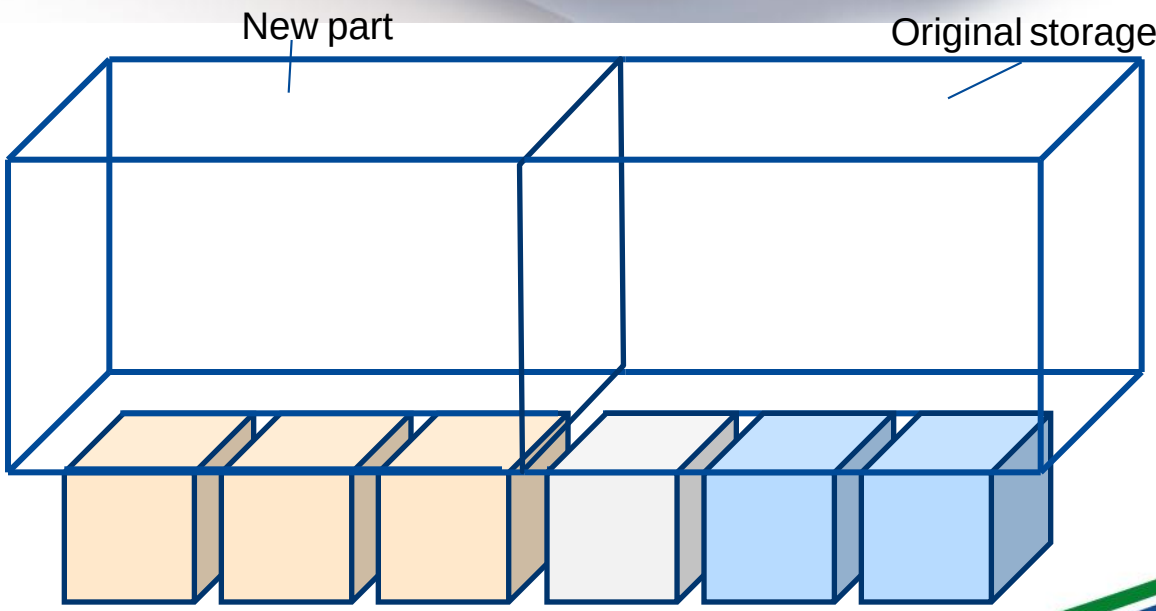
CLA 2015

CLA 2012
CL 2015
Operating ~2022

Enlargement project of spent fuel interim storage

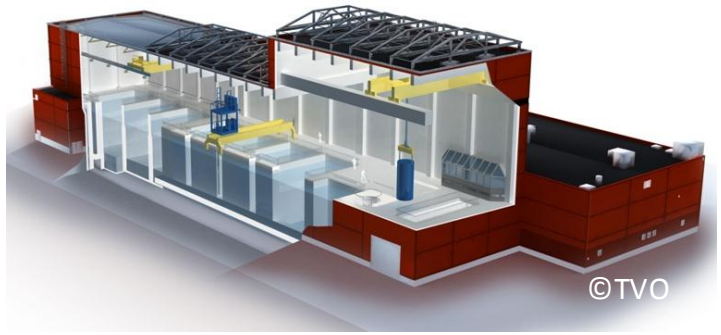
- Olkiluoto SF interim storage:
  - Pool type
  - commissioned 1988
- Spent fuel from OL1 and OL2, in future from OL3:
  - Extra capacity needed: 3 new pools





Enlargement project of spent fuel interim storage (2)

- Enlargement was conducted as a major plant modification. Updated safety requirements were applied
  - To withstand the APC: structural protection



  - Structures outside the building and protective structures inside the pool hall
  - Designing inside structures was an optimization task
    - The protective structures light enough to ease the handling but strong enough to withstand the impacts of APC.
- At the moment: project almost completed. Construction & commissionning of systems.
  - Approval for increased storage capacity will be issued after this week
  - Fuel transfers

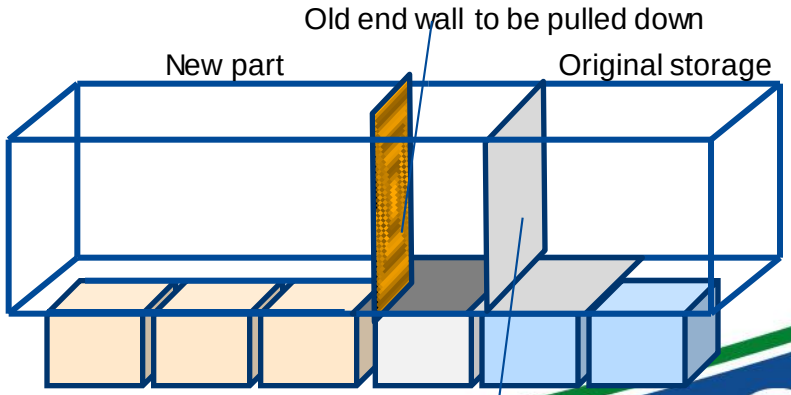
Safety of operating spent fuel storage during the enlargement constructions

- Safety of the stored spent fuel has to be considered during
  - The construction activities in the vicinity of spent fuel pools
  - System modifications for operating systems
- Detailed planning of
  - construction activities,
  - system modifications and
  - their synchronization
- In this project to minimize the disturbances caused by the construction activities for the stored spent fuel
  - Construction of the enlargement part was completed outside the original storage building before the integration of the building parts and systems.

Operational occurrence

- Operational occurrence of the ventilation system:
  - Safety feature compromised: underpressure in the storage pool hall
  - Initiating event: unexpected stopping of supply air ventilation fan
  - Exhaust fan continued functioning normally with new larger fans that were changed before the increase of building volume.
    - → Excessive underpressure inside the original storage building.
    - → Temporary protective wall was built to protect the pools during the pulling down of the old end wall
    - → Temporary wall was damaged
    - → Pressure difference between pool hall and outside air was lost

❖ No serious consequences, because no fuel handled at the time
❖ Proof of importance of the synchronization of work phases



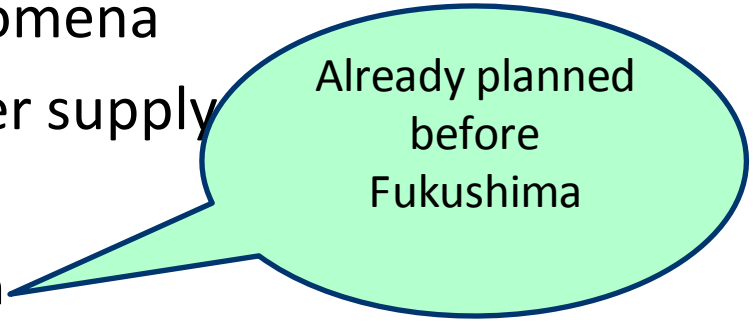
Modifications to spent fuel storages due to Fukushima

STUK required the licensees to investigate how to survive with

- the exceptional natural phenomena
- disturbances in external power supply

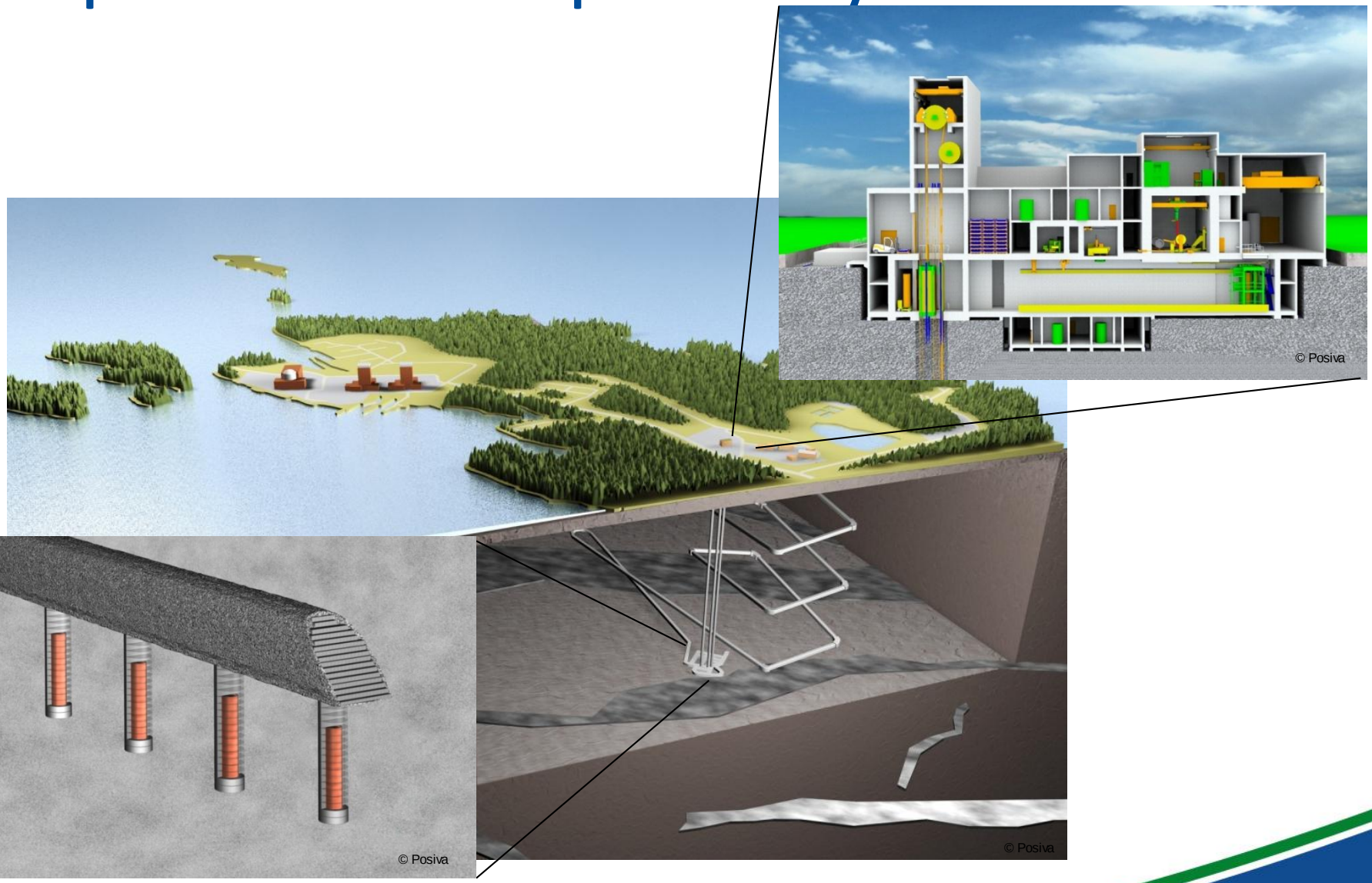
Results for spent fuel storages:

- External cooling water connection



- Water level & temperature monitoring independent from power supply
- Management of steam out flow for the extreme cases when pool cooling is lost for long period of time
- At the site for example
  - transportable fire water pumps
  - improved availability of raw water

Spent nuclear fuel disposal facility



Conclusions

- Enlargement of spent fuel interim storage has been carried out
  - Example of operational occurrence emphasized the importance of detailed planning of the working phases of construction activities and modifications
  - Applying new safety requirements to the modifications of an operating facility can be a challenging task: APC- protection structures
- Overview of the spent fuel management in Finland:
  - Interesting licensing cases goining on:
    - Posiva's construction license
    - Fennovoima spent fuel management