



Climate Change in Near-Surface Repository Licensing in Finland

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Finnish Nuclear Power Plants (NPP)



Olkiluoto, Eurajoki

Owner: Teollisuuden Voima Oyj (TVO)

OL1 BWR 890 MWe net

OL2 BWR 890 MWe net

OL3 PWR 1600 MWe net

Commercial use: 1979, 1982 and 2023



Hästholmen, Loviisa

Owner : Fortum Oyj

LO1 PWR 507 MWe net

LO2 PWR 507 MWe net

Commercial use: 1977 and 1981



Finnish Legislation

In 1983 Finnish government issued a decision-in-principle

→ *Requires NPP's to construct final repositories for operational waste*

Finnish Nuclear Energy Act

→ *The producer of nuclear waste is responsible for its treatment and final disposal*



Responsible Management of the Entire Lifecycle of Nuclear Power at Olkiluoto



3380 MW

Olkiluoto

Interim storage for
spent fuel

Final repository for operational
LILW and dismantling waste

Designed near surface
disposal facility for very low
level waste

Final repository
for spent nuclear fuel
(ONKALO®)

Very Low Level Waste (VLLW) Handling in Olkiluoto

- Soft VLLW is packed in plastic bags and baled
- VLLW scrap metal is packed in containers
- The bales and containers will be disposed in near surface repository (starting in 2028)

Waste Fraction	Average Activity Level of the Waste
VLLW (very low level waste)	< 100 kBq/kg



STUK* Grants Operating Permit for VLLW** Disposal Facility at Olkiluoto

- STUK issued the operating licence for TVO's near-surface repository in Olkiluoto in January 2026.
- The license is valid until 2095.
- The facility is designed for the final disposal of VLLW.
- First of a kind in Finland.
- The operation will start in 2028.

* STUK= Radiation and Nuclear Safety Authority

** VLLW = Very Low Level Waste

Climate Change in Long-Term Safety Assessment

- Safety assessment covers a 1,000-year period and considers climate change and sea-level changes as key external factors.
- IPCC climate scenarios (RCP2.6, 4.5 and 8.5) were considered to address climate uncertainty
- Climate projections were used to assess future changes in:
 - temperature,
 - precipitation,
 - sea level, and
 - their implications for the performance of the disposal system.

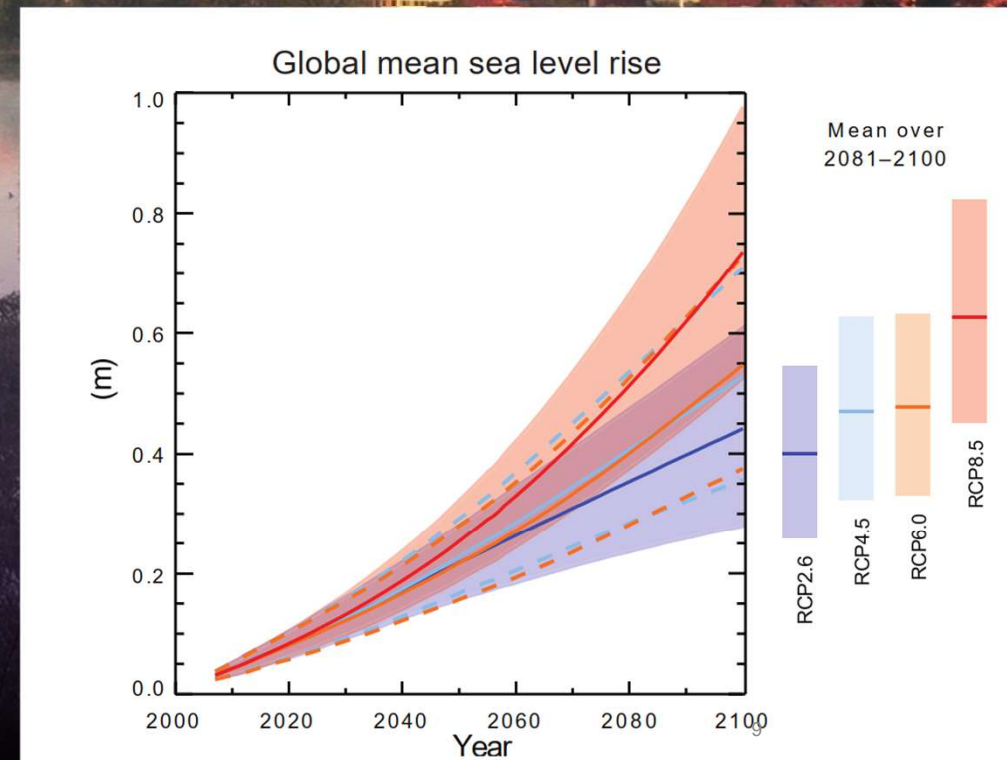
Increased Precipitation Has Been Considered

- The assessment accounts for higher annual precipitation due to climate change.
- Depending on the climate scenario, precipitation could increase significantly over time.
- To address this, the cover structure is designed to limit water infiltration into the waste.
- The target is to limit infiltration into the waste fill to <5% of precipitation

Sea-Level Rise and Coastal Flooding Have Been Assessed

- Future sea-level rise due to climate change was evaluated together with regional land uplift.
- Several sea-level development scenarios were analyzed, including high-end sea-level rise cases.
- The disposal site's location and elevation were selected with consideration of:
 - flood risk,
 - elevation above sea level,
 - storm-wave effects,
 - future sea-level development

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Frost and Erosion Have Been Considered

- Existing climatic conditions, including frost penetration, were characterized as part of the environmental baseline.
- The cover design includes provisions for:
 - erosion resistance,
 - settlement,
 - long-term stability,
 - maintaining protective cover thickness despite environmental degradation processes.
- Disposal system performance analyses consider frost and cover erosion as key factors affecting long-term performance.



Conservative and Uncertainty-Based Approach

- Future climate evolution is uncertain and cannot be predicted with certainty.
- The safety assessment applies a conservative approach using alternative climate and sea-level scenarios.
- Climate change is recognized as a key uncertainty affecting long-term safety.



THANK YOU!