Developing and Delivering an Optimised End State for Trawsfynydd

Progress and Learning to date

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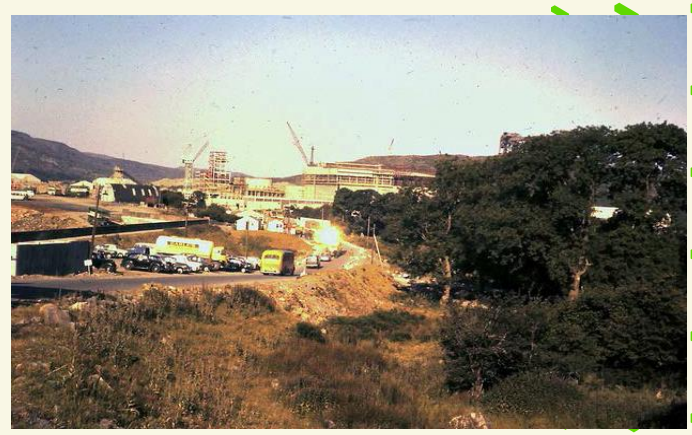
NDA | NRS Nuclear Restoration Services

Content

- Overview of Trawsfynydd site
- Regulatory context
- End State Strategy Development
- Key technical challenges
- Forward actions

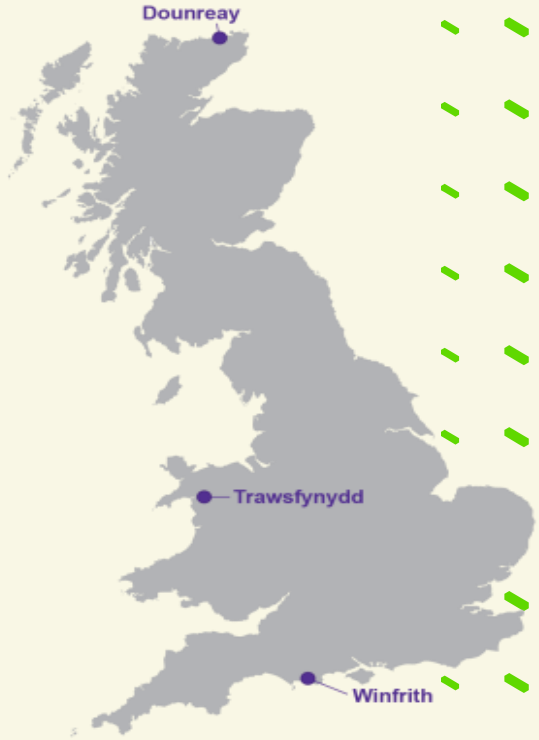
Trawsfynydd – History and Current Status

- Twin Magnox reactors 470 MW
- Construction started 1959
- Commissioned 1965
- Ceased operation 1991
- Only Magnox station located in a National Park
- Only inland Magnox station, water taken from adjacent lake
- A number of features already decommissioned/demolished
- Work on-going to develop design for reactor dismantling
- Currently progressing the permissions required to deliver site End State

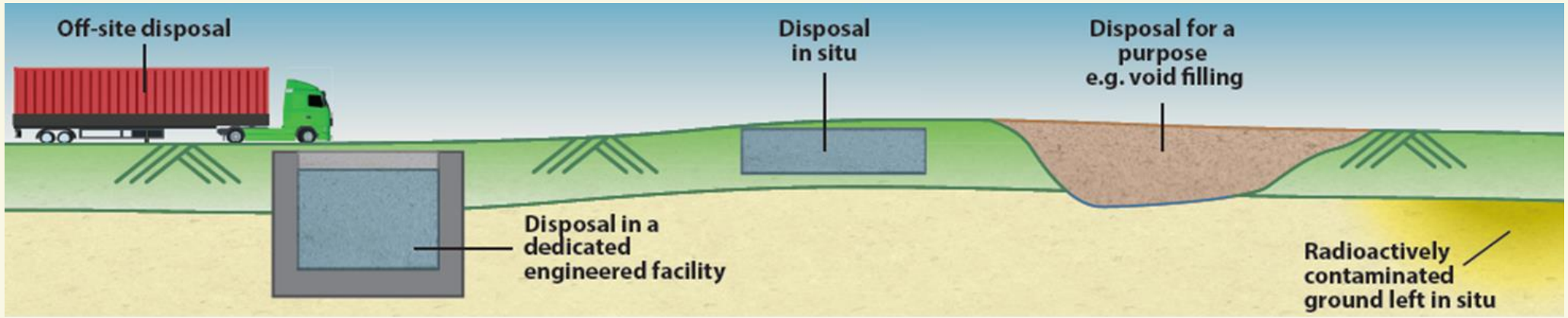


End state development - Lead and Learn

- Draft regulatory guidance (2016) from UK environment Agencies'-The "GRR"
- Trialled at 3 UK Nuclear sites
    - Trawsfynydd in Wales
    - Winfrith in England
    - Dounreay in Scotland
- Guidance published in 2018 and supported by new permit requirements:
    - Waste management plan (optimised)
    - Site wide environmental safety case
- Allows for the consideration of On Site Disposal (OSD) of suitable wastes (must be optimised) as part of End State if a safety case can be developed

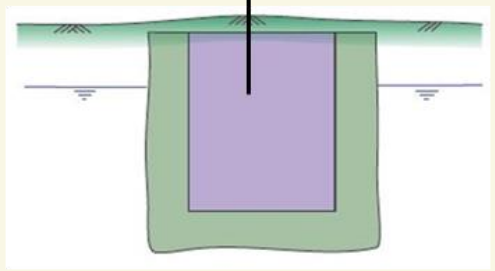


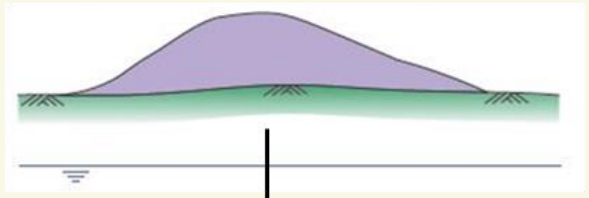
Generic Disposal Options



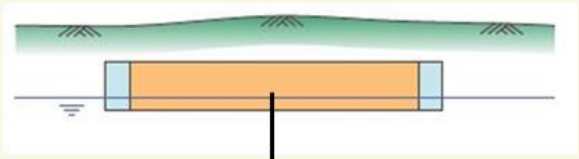
(Not waste unless dug up)

Radioactive waste disposal for filling an existing structure





Radioactive waste disposal for screening bund



Radioactive waste disposed of in-situ with engineered closure

OSD Candidate Features

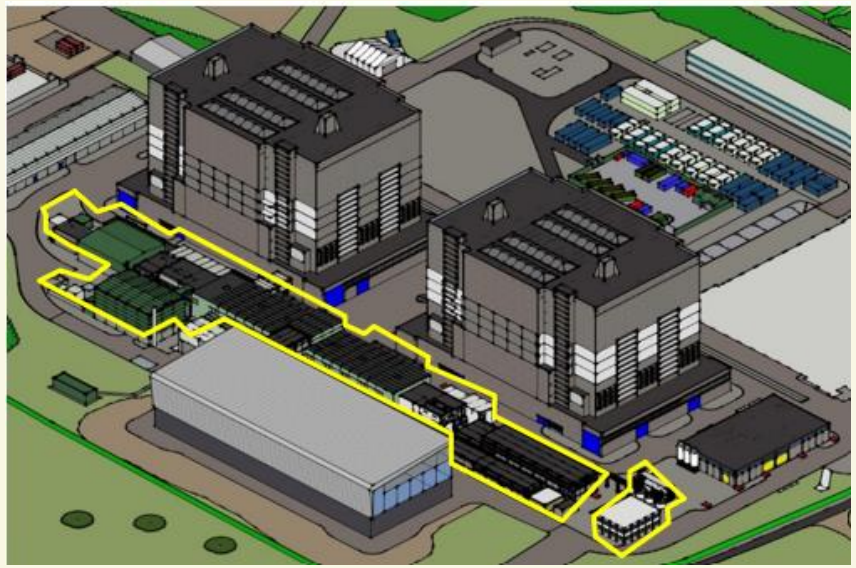
- Site broken down into zones and feature types
- Candidate features for OSD established by assessing:
  - Rad and non rad inventory
  - Environmental setting
  - Site evolution
  - Future land use requirements
- Ponds complex and reactor bioshields identified as candidates for OSD

Trawsfynydd – a revised end state strategy

- Previous site baseline:
    - All residual radioactivity removed (2085)
    - Site released for next planned use ~2100
- End state strategy review (2018)
    - Extensive stakeholder engagement
    - Initial safety case/optimisation development:
- Strategy for an End State with a component of OSD
    - Cooling ponds complex (~2025)
    - Reactor bioshields (~2035)
- Ponds complex demolition required to create space for reactor dismantling
- OSD avoids ~100k m3 of off-site disposal, minimises worker risk, site released for next planned use sooner

Site Orientation

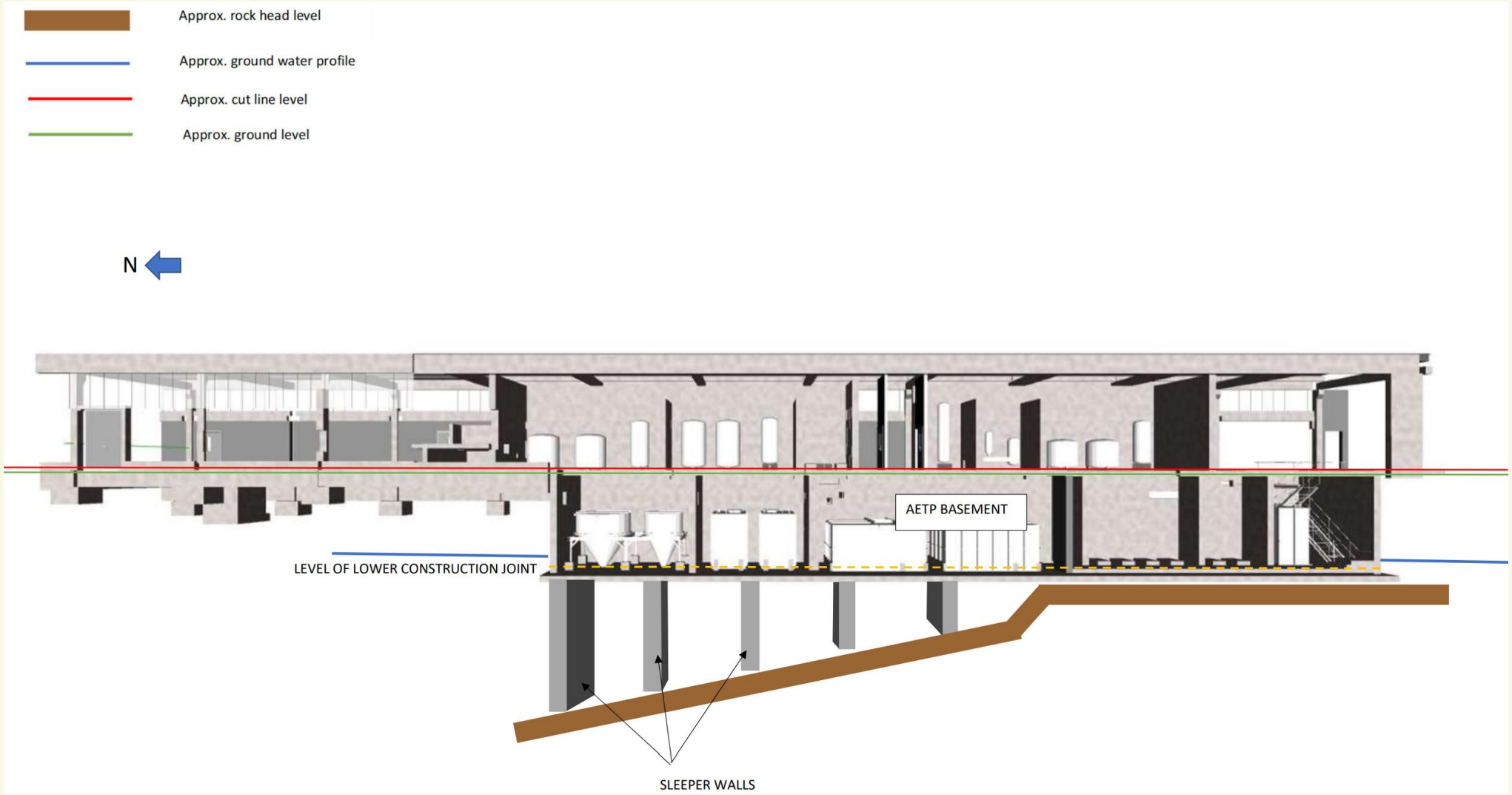
The Ponds Complex – Proposed End State



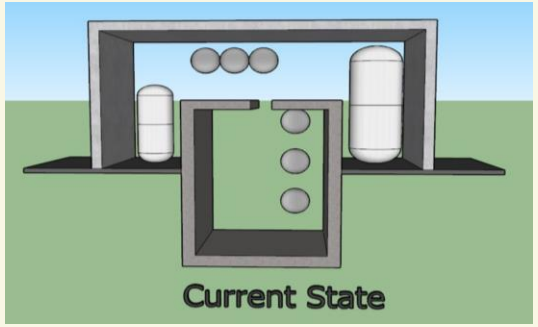
- Former underground cooling ponds, primarily for spent fuel rods. 185m x 25m
- Sandwiched between reactor buildings and ILW store therefore very limited space
- 30+ associated buildings and storage areas.

- Above ground structures will be demolished and suitable material (concrete and brick) disposed of into the underground voids (principally the former cooling ponds)
- The area will then be capped with concrete to allow reuse of footprint

Ponds Complex Construction

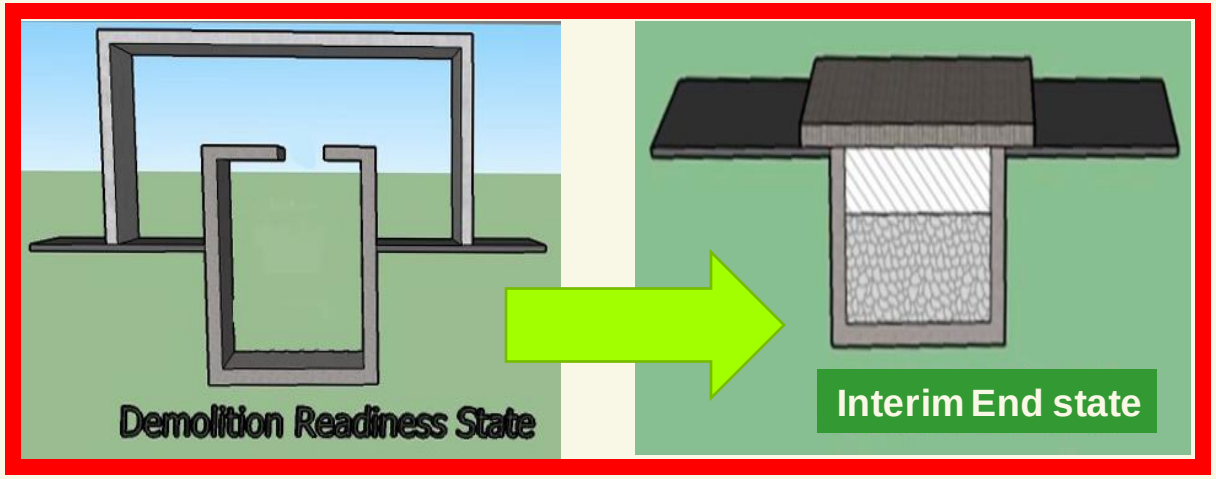


Project Scope



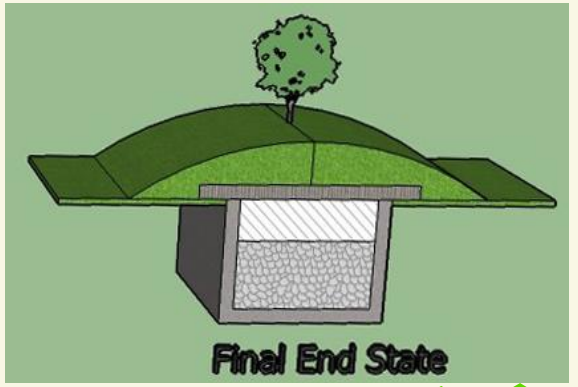
Interim End State

Buildings demolished and placed within the voids, capped in accordance with disposal permit



Demolition Readiness State

The buildings are ready for demolition following de-planting back to bare shell



Technical challenge - Groundwater

- Need to be able to demonstrate compliance with groundwater regulatory regime
- Need to show how site evolution is accommodated by the end state
- Complexity of characterising and substantiating in situ structures
- Data requirements:
  - 20+ years of G/W monitoring (best understood of all of the NRS reactor sites), 13 new boreholes planned for next year (3+ years of new data)
- Mitigations available:
  - Nature of emplaced waste – blocks or crush
  - Grout to create a monolith
  - Enhance capping design
  - Avoid waste disposals in parts of complex below groundwater level

Technical Challenge – Characterisation

- Ponds Complex comprises some 38 separate structures
- 350 distinct spaces (some with significant below-ground extent ~5m depth)
- ~1650 distinct surfaces (floors, walls etc)
- Sandwiched between reactor buildings and ILW store therefore very limited space
- Predominately Cs contaminated. Subjected to aggressive surface decontamination and ongoing de-planting
- 8 distinct fingerprints identified

Forward action plan – Ponds Complex

- Preparing the structures for demolition and infill
- Ongoing development of safety case
    - Compliance with groundwater requirements
    - Characterisation
    - Inventory/performance assessment
    - Detailed design for the disposal configuration
- Ongoing stakeholder engagement
- Application for permissions late 2023
- Implementation ~2027 (interim state)

Reactor bioshields

- Cylindrical in shape with 25% below ground
- ~50,000 m^3 of concrete
- Inner surface activated ~300mm (Eu-152)
- Activation modelling used to develop initial inventory
- Through cores taken for calibration purposes
- Above ground portion will fit into below ground void
- Permissioning for OSD of bioshields will commence after Ponds permissions are in place

Summary

- Trawsfynydd used as a lead and learn sites for new guidance
- End State strategy includes significant elements of OSD
- Ponds Complex OSD proposal represents the ‘first of a kind’ for NRS
- Significant challenges in demonstrating that OSD is compatible with groundwater protection requirements
- Complicated characterisation
- Permissions to be sought from Regulators in the coming year….
- Work will then commence on bioshields
- Ponds demolition work to commence in 2027
- Bioshield demolition to commence ~2035

Questions