

# Sizewell A Waste Streams Requiring Immobilisation?

Presentation to:

***Radioactive Waste Immobilisation Network***

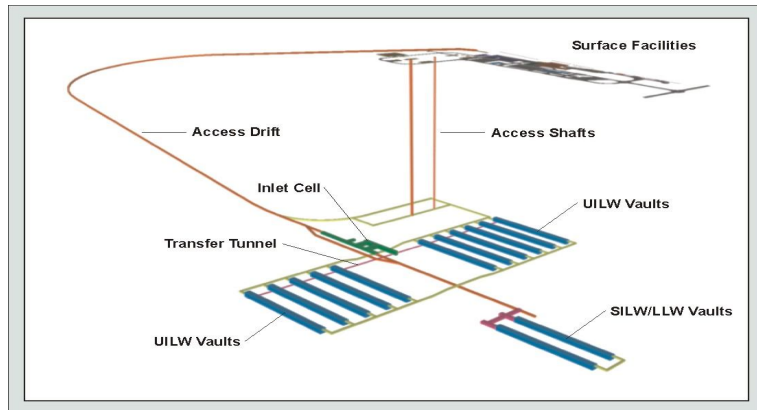
***Meeting: Wednesday 28th May 2008***

*Tim Gifford Nash*

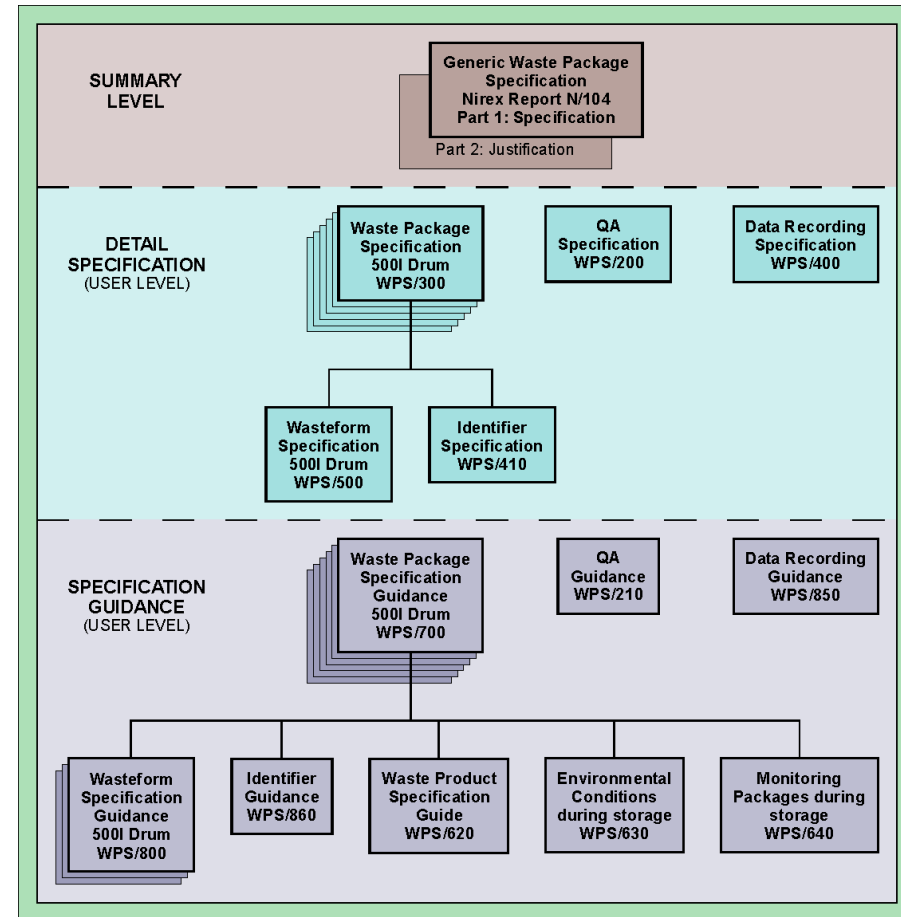
*Waste Management, Sizewell A, Suffolk*

# Nirex Waste Package Specifications

- Nirex = RWMD



- Magnox Guidance: Management of ILW Waste Package Lifetimes



## Desiccant (D) and Catalyst (C)

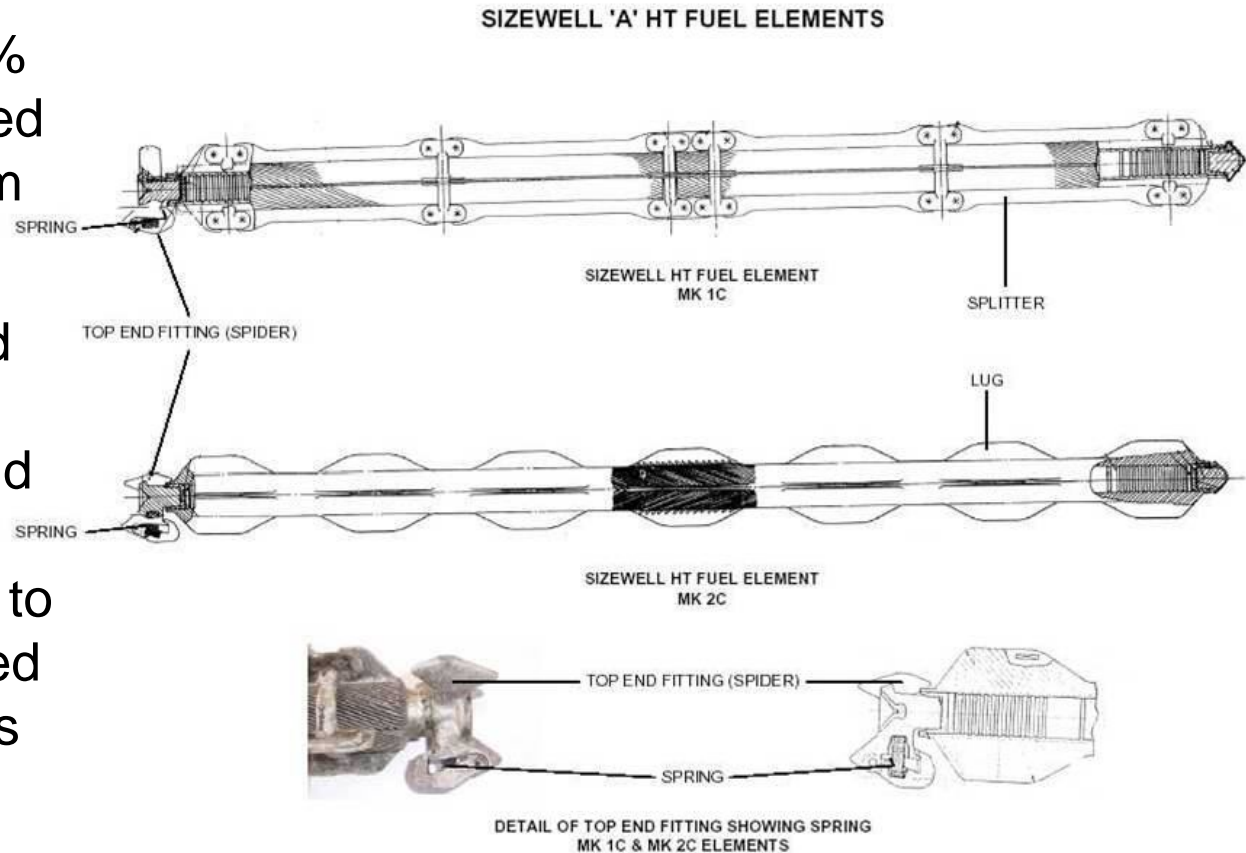
- Currently 5.7 m<sup>3</sup> stored in Store in 200 litre drums.
- 99.9% Tritium based activity: ~ 400 kBq/g (GBq/te)
- Gas Conditioning Plant arisings in 2010 ~ 4.2 m<sup>3</sup>.
- Transfer to Nirex approved 500 litre drums using Bivac unit for encapsulation.
- Alternative treatment options:
  - Detritiation:
  - Washing & Heat treatment
  - Decay to LLW: ~60 years
  - Pharmaceutical S/S drums



# Fuel Element Debris (FED)

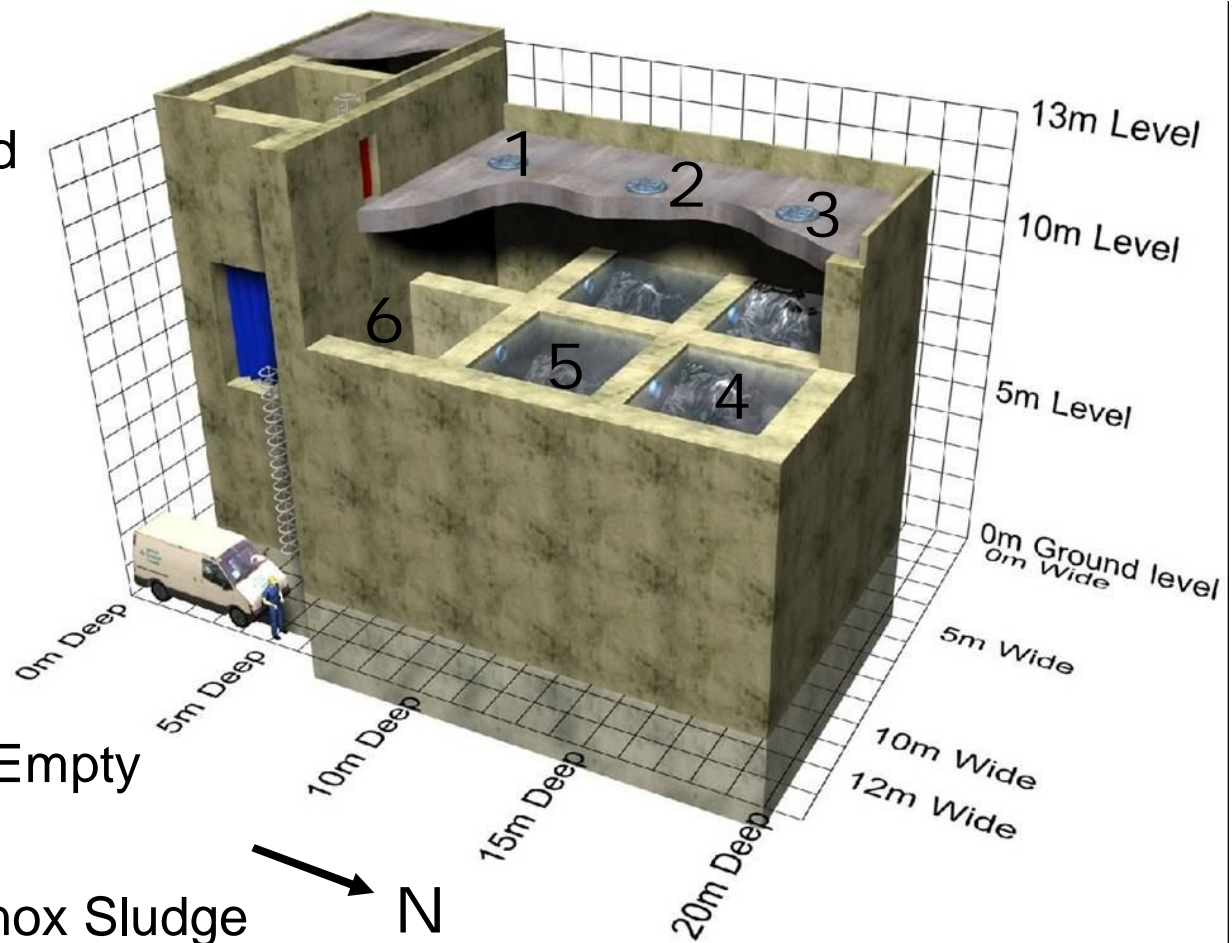
FED is made up of 99% splitters or lugs removed from fuel elements from 1966 to 1996.

Sometimes the top end fitting (spider & spring) were also removed, and are more highly irradiated and so need to be sorted and separated from the splitters & lugs during the retrieval process.



# Sizewell A FED

- 3 Wet Cells above ground
- 3.5 m x 3.5 m square
- 9.75 metres deep
- 289 m<sup>3</sup> FED
- Cell 4: 20 m<sup>3</sup>
- Cell 3: 144 m<sup>3</sup>
- Cell 2: 125 m<sup>3</sup>
- Cell 1, 5 & 6 : Nominally Empty
- < 3000 Nimonic Springs
- Estimated 10 m<sup>3</sup> of Magnox Sludge



## FED SVS cell sampling photos



Cell 2



Cell 3



Cell 4

FED consists of varying lengths of splitters and lugs interwoven together. Due to the depth of the cells, it is uncertain what condition the lower layers of FED is in. It is likely, that due to corrosion of the FED, there will be some sludge present.

# FED Sample Photos



Samples have been taken and have been analysed, indicating that after separation of springs & spiders, the FED may be disposable as Low Level Waste.

Each piece of FED may vary between 2 mm x 25 mm x (50-100) mm for splitters (after cutting) and 4 mm x 15 mm x 100 mm for lugs.

## Baseline for FED

- Fuel Element Debris
  - 2<sup>nd</sup> largest radiological hazard on-site after Irradiated Fuel and not deemed to be passively stored.
- Baseline
  - Safe retrieval and sorting, for containerisation and encapsulation before storage as ILW
  - Hydrogen generation and volume increase



## Why FED Dissolution?

- Conversion of reactive into non-reactive waste
  - Magnesium metal presents fire hazard
- Waste volume reduction (300m<sup>3</sup> FED to 15m<sup>3</sup> Sludge)
- Reduction by more than a factor of 20 of volume of ILW
- Disposal of non radioactive magnesium to sea (15% of Activity)
- Retention of insoluble radioactive residues (85% of Activity)
- Assessed and agreed to be Best Practicable Environmental Option
- Simple, safe process with low capital and operating costs
- Magnox dissolution process is now a proven technically viable process.

# FED Dissolution Sludge

- Sludge Activity ~280 GBq/te
- Previous Trials
  - 9:1 BFS/OPC
  - 57% w/c ratio
- 3 different simulants
  - Filter sand
  - High Mg loading
  - High insoluble loading
- For future retrieval and encapsulation as ILW.



# Sludge Encapsulation Campaign Photos

Final Active Waste Tanks (FAWT) 1 & 2:

Sludge Retrieval Campaign January to May 2006

Sampled in 2005: both tanks LLW (8 kBq/g B/G, 0.6 kBq/g A)

Main Nuclides: Cs-137, Pu-241, Sr-90 (making up 70 % of activity)

Black mobile sludge with some resin beads, hairs and fibres (& filter rings in FAWT 2)



# Sludge Processing

Basic plant and equipment:

- drum with sacrificial paddle,
- submersible macerator pump,
- Recirculation pipework and drum feed,
- screw fed slag/ cement delivery.

Very little working head room above tank



## Sludge Project delivery

The project recovered a total of 19 m<sup>3</sup> of sludge, encapsulated to 35 m<sup>3</sup> with cement (p.f.: 1.86), loaded into 6 HHISO containers.

Acceptance of waste via Drigg D5.

EA authorisation increased for additional activity disposal: September 2006.

Disposal from October 2006 to March 2007.

First site to recover sludge whilst operational.



# Future Sludge Arisings

FAWT 1: 1 m<sup>3</sup>      FAWT 2: 6 m<sup>3</sup>

Future arisings from: FED, Ponds, AETP, Active Drains

– FAWT 1: 17 m<sup>3</sup>

– FAWT 2: 20 m<sup>3</sup>

- AETP Sand Pressure Filter Media:  
Sand Pressure Filters 1 to 10: 15.7 m<sup>3</sup>
- HCE 1 & 2 and DA units: Ion Exchange  
Styrene resins: 3 m<sup>3</sup>

# Ponds Sludge Arisings

- Ponds sludge comprises mainly of silica, graphite and Magnesium Hydroxide & Carbonate and is assumed to total 10 m<sup>3</sup>.
- Main Nuclides Cs-137 & 134 and Sr-90. Will be retrieved using Weda type cleaner, after defuelling and transferred to FAWTs.



## AETP Sands and Gravel

- Currently 15.7 m<sup>3</sup> contained within Sand Pressure Filters 1 to 10.
- Ponds SPF's 1 to 4, AETP SPF's 5 to 7, new SPF's 8 to 10.
- AETP & Ponds decommissioning 2011/12/13.
- Plan to backwash and encapsulate in cement, for disposal as LLW.



# AETP Ion Exchange Resin

- Currently 3 m<sup>3</sup> Purolite within HCE Units 1 & 2 and DA Unit.
- Plan to backwash and encapsulate in cement, for disposal as LLW.
- Packing Factor: 6.5!
- Alternative Baseline: Mix with sludge?
- Polymer Encapsulation.



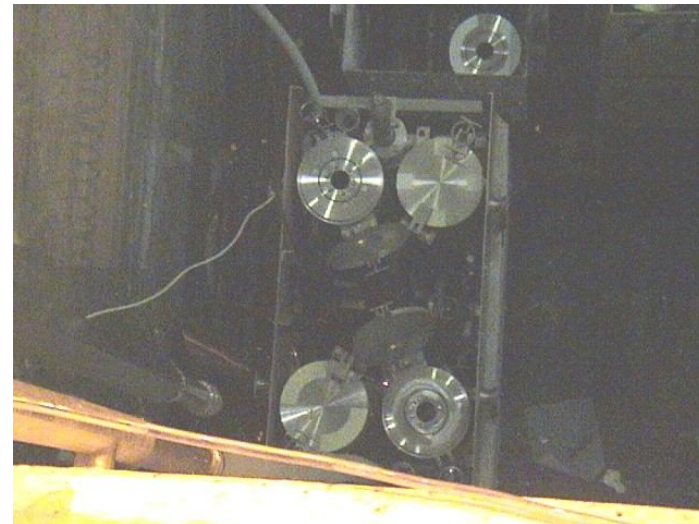
# AETP Sludge Arisings

- Active Effluent Treatment Plant sludges from Monitoring and Delay Tanks, active drains, sumps and Settling Tanks.
- Recently refurbished in AETP project, so tanks are clean. Expected arisings ~ 6m<sup>3</sup>.



## Other Wastes

- Ponds Skips & Furniture: Decontamination & Metal Melt.
- SCRU Filters: Other sites leading the way. Filters encapsulated in sleeves for disposal as LLW.
- IONSIV cartridges: to be processed via Flask Passage after defuelling. Polymer encapsulation of IONSIV cartridges in DCI drums.



# Stakeholder engagement & improvements

- Discussions with Regulators
- BPEO with local stakeholders
  
- Centralised Processing
  - Transport of ILW
  - ILW Containers
  - Regionalised stores

# Thank you

- Any Questions?
  
- For further information:  
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