PREDEC 2016

International Symposium on PREparation for DECommissioning

Preparation for future defuelling and decommissioning works on EDF Energy's UK fleet of Advanced Gas Cooled Reactors

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The presentation covers:

- broad outline of the technical strategy and arrangements for future defuelling and decommissioning works on the UK AGR fleet

- high level strategic drivers and alignment with wider UK nuclear policy

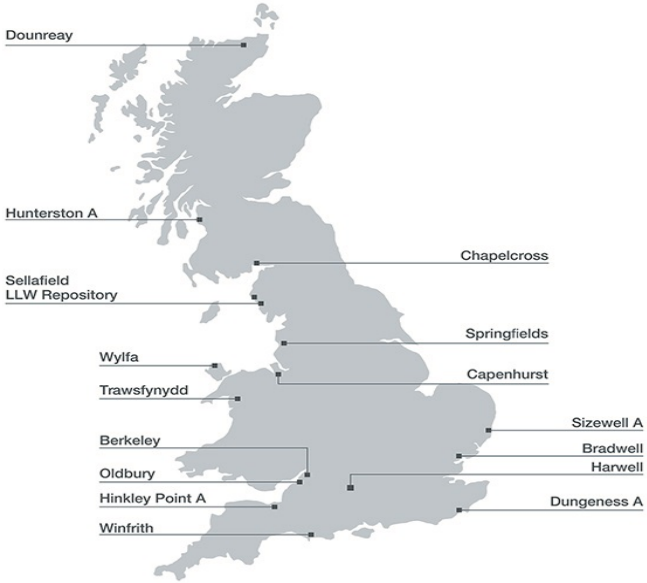
- overall programme of preparation and initial works

- technical approaches to be adopted during decommissioning

The Decommissioning Context in the UK

EDFE UK

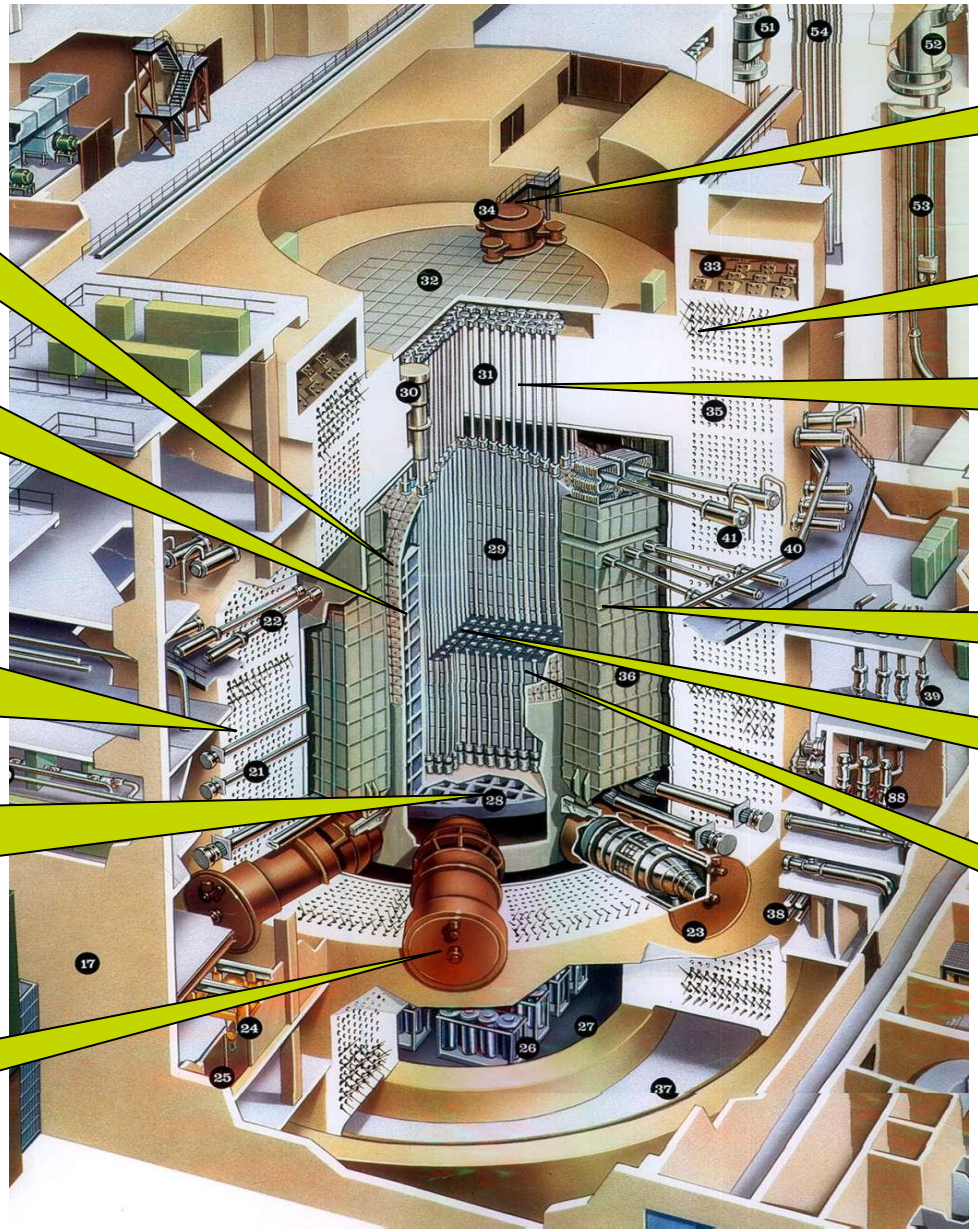
UK (NDA Estate)



- 7 AGR stations and 1 PWR all operating
- D+D is funded by NLF backed by UK Government
- EDF Energy responsible for D+D though the government has an option to take ownership of stations
- Strategy in UK is safestore for graphite reactors (but prompt site clearance for SZB) followed by final deconstruction on ALARP grounds to GDF
- AGR sites will start to close 2023 – all in decomm by 2030

- Magnox fleet has 11 stations, all of which are now decommissioning. Owned by NDA. Also follows safestore strategy
- 8 of 11 Magnox stations have been defuelled to date with an average defuel time of 6 years
- No stations are yet into their care and maintenance period (safestore) but two are planned to be by end 2016. The rest will not be in care and maintenance until the 2020's
- Magnox uses the Parent Body Organisation (PBO) model (Cavendish/Fluor)

Anatomy of an AGR



Gas Baffle

Core Restraint Structure

Steam & Feed Penetrations

Core Support Structure

Gas Circulator

Pile Cap

Pressure Vessel

Standpipes

Boiler

Graphite Core

Boiler Shield wall

Decommissioning Strategic Drivers

- Legal and moral responsibility for decommissioning and discharging the associated nuclear liabilities continues to rest with EDF Energy
- EDF Energy is committed to returning the existing power station sites to a state suitable for alternative uses and delicenced
- EDF Energy Power Station Decommissioning funding comes from Nuclear Liabilities Fund (NLF)
- The NLF is underpinned by Government- any shortfall met by Government (UK taxpayer).

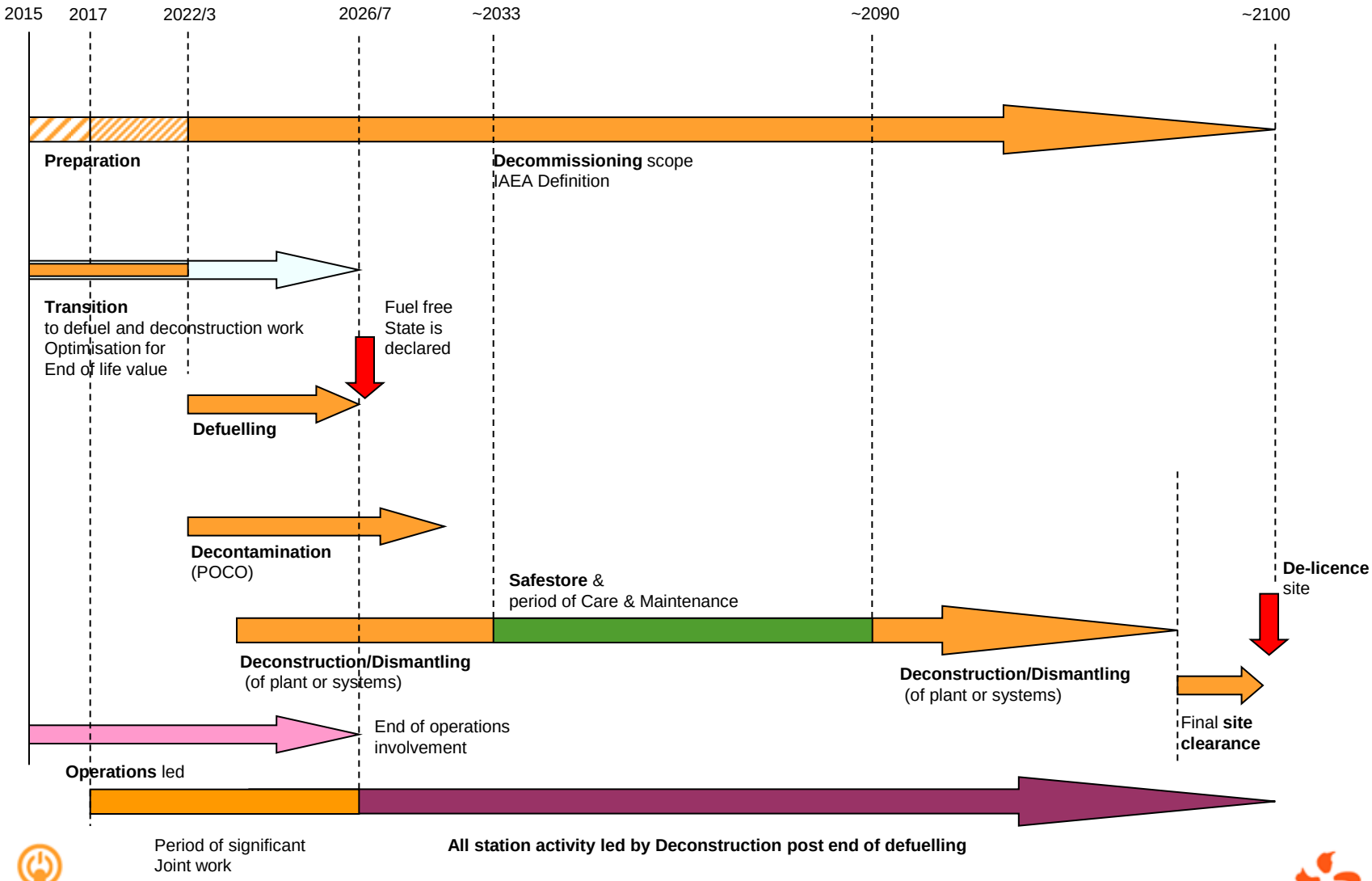
Decommissioning Strategy - Key Phases

The Decommissioning process for an AGR site can be considered in three main phases of work:

Key Phase 1—Pre Closure Transition & Defuelling
Key Phase 2—Site Surveillance, Care & Maintenance
Key Phase 3—Reactor Building Decommissioning & Final Site Clearance

- EDF Energy and its precursor organisations developed what became a decommissioning strategy with a common strand. This common strand involved some form of Safestore to allow a deferral of reactor dismantling, thus allowing for radioactive decay of the reactor structures and materials.
- Decommissioning Timescales are long – circa 100yrs for AGR

Typical timeline for 1st AGR station

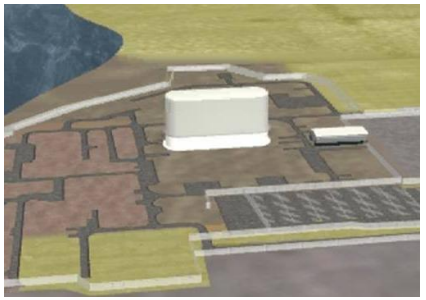


AGR Decommissioning Strategy – Early Safestore
eg Hinkley Point B / Hunterston B

Current Site Layout

Plant Dismantling Complete

Safestore Construction Complete



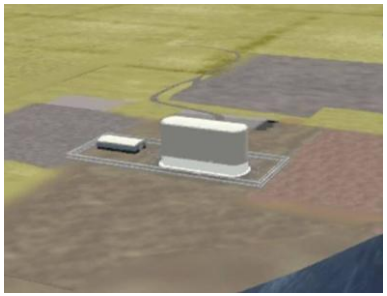
Preparatory Work

Defuelling, Plant & Building Dismantling, Waste Management & Safestore Construction

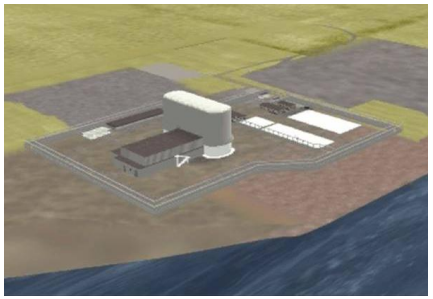
Site Surveillance

2017 **2023** **2033**

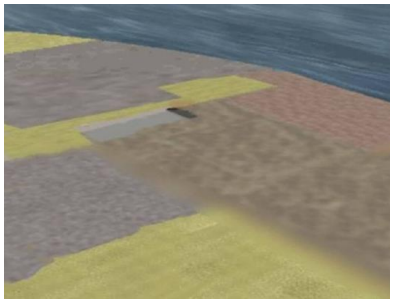
Site Layout During Surveillance



Reactor Dismantling in Progress



Site Cleared for Re-use



Care & Maintenance

Site Re-establishment, Reactor & Reactor Building Dismantling, Site Monitoring & Clearance

2108 **2118**

Conclusions – Key points

- The first AGR planned closure will occur around 2023 and the whole AGR fleet will be closed by circa 2030
- The first planned station closure dates are now within 10 years.
- Circa 6 years pre closure preparation is required to ensure that a smooth transition to defuelling and deconstruction occurs and costs are minimised during this period
- Under the current legal obligations agreed between EDF Energy and UK Government, EDF Energy is responsible for the defuelling and deconstruction of the nuclear fleet once generation ceases.
- Funding for this work is provisioned within the Nuclear Liabilities Fund.
- EDF Energy needs to prepare for this transition and to manage this in an appropriate way (as per a reasonable and prudent operator).
- EDF Energy has a well developed prudent and approved basis for AGR decommissioning
- Work has commenced to ensure the seamless transition from operation to defuelling for EDF Energy AGR sites.
- Opportunities exist for further optimisation of the decommissioning strategy and plan – with associated business opportunities.

Conclusions – Key points

- A range of factors are taken into account when determining the most appropriate decommissioning strategy

- The current AGR Strategy of Early Safestore (with deferred reactor dismantling) and PWR (Sizewell B) strategy of Prompt Decommissioning (with reactor dismantling commencing within 10 years of end of generation) are both robust, underpinned and approved

- There are benefits of an AGR Early Safestore strategy with reactor dismantling deferred for a period of 85 years after end-of-generation;
  - Allows for a significant period of radioactive decay
  - Reduces radiation exposure levels for workers- ALARP
  - Provides a significant reduction in radioactive waste quantities, greater volumes of inactive material available for recycle and re-use
  - Allows for simpler dismantling methods, less reliance on remote operations
  - Allows significant NPV cost benefit from deferral
  - Aligns with the availability of permanent waste disposal facilities (GDF)

- Early Safestore is considered the most appropriate decommissioning strategy for EDF Energy, NG AGR stations taking account of all relevant factors (note that this is a similar approach to that being taken forward for UK Magnox stations)

- EDF Energy decommissioning strategy will continue to be kept under review taking account of updated information, including any changes to relevant government policy / legislation

Thank You

Questions ?