ADVANCED GAS-COOLED REACTORS (AGRs)

CRACKING UP; CLOSING SOONER THAN EXPECTED?

PETE ROCHE 22ND OCTOBER 2020

AGRs – 7 STATIONS; 14 REACTORS

Station	Location	Date Commissioned	Expected Closure Date	Age at Closure
Hunterston B	Ayrshire	1976	Jan 2022	46
Hinkley Point B	Somerset	1976	Mar 2023	47
Hartlepool	County Durham	1983	Mar 2024	41
Heysham 1	Lancashire	1983	Mar 2024	41
Dungeness B	Kent	1983	2028	45
Torness	East Lothian	1988	2030	42
Heysham 2	Lancashire	1988	2030	42

HUNTERSTON B STATUS

Reactor 3

- **March 2018** closed with estimated 377 cracks (operational allowance 350 cracks)
- 27th August 2020 – ONR gives permission to run for 6 months
- After 6 months estimated 781 cracks
- After 1 year estimated 943
- Major earthquake (expected 1 in 10,000 yrs) could result in 500 additional cracks
- "Currently established damage tolerance level" of 1,331 cracks
- Closure expected no later than 7th Jan 2022

Reactor 4

- Estimated 209 cracks
- Closed 2nd October 2018
- 20th August 2019 to 10th December 2019 allowed to operate
- ONR relaxed limit for number of cracks from 350 to 700.
- Re-started 29th September 2020
- Closure expected no later than 7th Jan 2022

GRAPHITE BRICKS FRAGMENTING

- In Autumn 2019 ONR revealed that at least 58 fragments and pieces of debris have broken off the graphite bricks that make up the reactor cores. According to ONR there is “significant uncertainty” about the risks of debris blocking channels for cooling the reactor and causing fuel cladding to melt.

“GAMBLING WITH PUBLIC SAFETY”

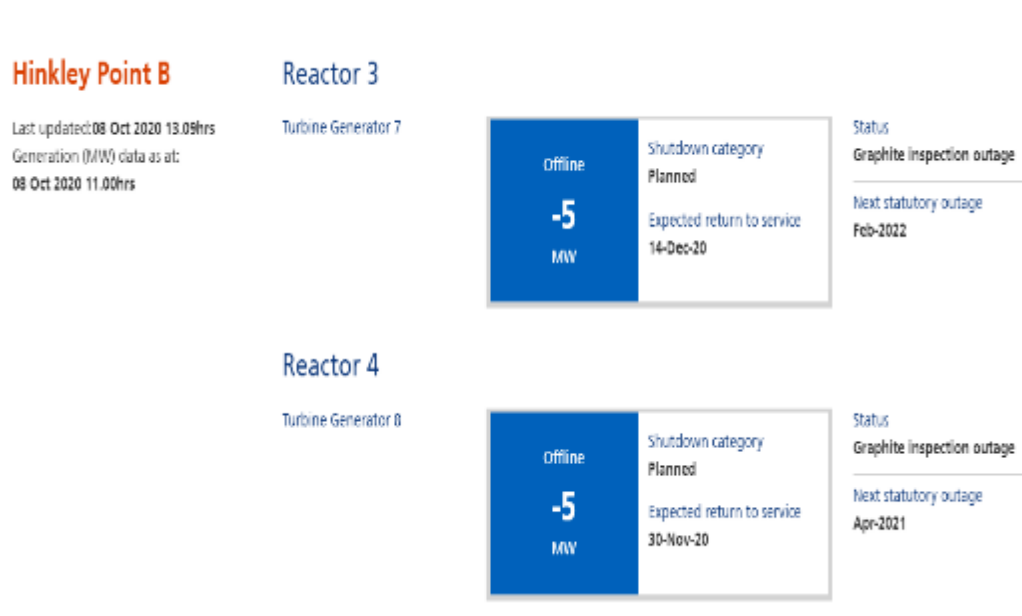
JOHN LARGE 2016

- An incident such as an earth tremor, gas excursion, steam surge, sudden outage, or sudden depressurisation, could cause:
- (a) control rods to be blocked from dropping into the reactor core by displaced graphite blocks
- (b) coolant gas channels could become partly blocked by misaligned blocks, and
- (c) fuel assemblies could become stuck and not be able to be withdrawn.

WORST CASE SCENARIO

- ***In the very worst case scenario, this could lead to radioactive contamination of large areas of central Scotland, including the metropolitan areas of Glasgow and Edinburgh.***

HINKLEY POINT B



- Also due to shut March 2023
- R3 shut fror graphite inspection outage on 8th June;
- Return planned 14th Dec 2020
- R4 shut 21st Feb;
- Return planned 30th Nov 2020

HEYSHAM 1 & HARTLEPOOL

- Due to close March 2024;
- Exited capacity market subsidy competition for Oct 2023 - Sept 2024 because: "*The revenues at the clearing price did not provide sufficient reward to take on the risk of penalties arising from non-delivery.*"

PROBLEMS AT HEYSHAM 1 AND HARTLEPOOL

- 2007: Corrosion of wire winding which helps hold water cooling system in place;
- 2014: Shut because of unexpected cracking in the boiler spine - a forged metal tube which supports the weight of boiler tubes coiled around it;
- Reactors are probably run at less than their usual output in order to prevent high temperatures causing further cracks.

DUNGENESS B

- 27th Aug 2018 Reactor 22 shut; 23rd Sept 2018 Reactor 21 was also shut;
- Inspections identified need for repairs to steam pipes;
- several systems providing a safety function were found to be “corroded to an unacceptable condition”
- Reactors still off – expected return December (R21 20th; R22 10th)

TORNESS & HEYSHAM 2

- Youngest AGRs – not expected to close until 2030;
- Cracks now expected to start appearing in 2022, rather than 2028;
- Different design to Hunterston with seal rings between bricks – cracking could lead to failure and more graphite debris, challenging ability to keep fuel cool.

RENEWABLES 'NO-REGRETS INSURANCE' AGAINST NUCLEAR GAP

- ECIU Report says if AGRs have to close earlier than expected expanding renewable energy capacity would fill the gap more cheaply than gas;
- Not mentioned here but it is quite possible that new renewables could be cheaper than AGR operating costs.

JUST TRANSITION FOR HUNTERSTON WORKFORCE

- EDF employs approximately 580 workers (and around 200 contractors).
- About 125 will lose their jobs in January 2022 with others retained until 2025 for the de-fuelling process.
- After that, there will be the massive task on dismantling the two reactors safely.
- Current plan to prepare reactors for period of care and maintenance. This would take around another 5 years.
- After 40 years final dismantling around 2070.
- Nicola Sturgeon promised to look into job fears. Calls made for the Scottish Government and North Ayrshire Council to create a plan for the workforce.

EARLY DECOMMISSIONING?

- The NDA says it's working with UK government on options relating to decommissioning AGRs;
- Decided deferred decommissioning is not appropriate as a blanket strategy for all Magnox reactors;
- Decommissioning will be brought forward for some. Trawsfynydd to be lead site because external structure has degraded since shut down in 1991;
- A rolling programme of Magnox decommissioning will help avoid skill shortage in 40 years time

CENTRE FOR ROBOTICS?

- Deferred dismantling means radioactive decay allows significant worker access, and reduced dose rates.
- "*…advances in remote decommissioning techniques and international experience demonstrate that nuclear power reactors can be dismantled promptly without the need for significant worker access.*" (NDA 2016)
- The Nuclear Liabilities Fund (NLF) is worth approximately £9bn to meet estimated £19.9bn cost of decommissioning AGRs & the Sizewell PWR. EDF will rely on accrued interest to fund.