Hunterston B reactors

1. Are they safe?
2. Who is responsible for dealing with a nuclear emergency at HNB?
3. Local authority plans
4. Evacuations? KIO₄?

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Hunterston B
Reactor Age = 44 years old

(but initial design life in 1976 = 30 years)

In 2006 extended to 2011

and in 2011 = extended again to 2023
Graphite “Brick” x 3,000
Figure 46: Illustrative example of brick cracking
5 new ONR reports – issued after R4 restarted

- Project Assessment Report - 19-004: Agreement to NP/SC 7785 Hunterston B Power Station - Return to service safety case for Reactor 4 following core inspection results in 2018
- Assessment report - 18-085: Hunterston B - Return to service safety case for Reactor 4 following core inspection results in 2018 - NP/SC 7785 - Civil engineering assessment
- Assessment report - 19-003: Return to service safety case for Reactor 4 following core inspection results in 2018 - NP/SC 7785 - Seismic Assessment for Diverse Hold Down System
- Assessment report - 19-007: Return to service safety case for Reactor 4 following core inspection results in 2018 (NP/SC 7785), Graphite structural integrity assessment
- Assessment report - 19-029: Fault Studies Assessment of the Hunterston B R4 Return to Service Safety Case Following Core Inspection Results in 2018
New ONR quotes 1

re more cracking concerns

- “crack opening of fuel bricks was causing other (adjacent) fuel bricks to crack”
- ONR expressed concern about the risk of “fuel snagging” from “multiply-cracked bricks”

- Assessment report - 19-007: Return to service safety case for Reactor 4 following core inspection results in 2018 (NP/SC 7785), Graphite structural integrity assessment
New ONR quotes 2 re graphite loss

- ONR Technical Assessment Guide 2018, page 8 section 5.22 says
  “Graphite weight loss will affect reactivity and ... erode margins for shutdown, hold-down and for reactivity control.”
New ONR quotes 3
re graphite debris

- at least 7 fragments and 51 smaller pieces broken off from cracked graphite bricks
- “significant uncertainty” exists about the risks of this debris blocking cooling channels ... thus causing fuel cladding to melt

New ONR quotes 4 re fuel melting

ONR's recommendation No 1 in Inspection report 029 (para 187)

- EDF “should perform further analysis of the effects of a blockage ...in order to establish the point at which fuel clad melt temperatures would be reached”
- Ie ONR pointing to possible melting of fuel cladding
- melting point of magnesium oxide (ie cladding) is 2,850 °C
- uranium oxide fuel inside it would also melt at these temperatures as its melting point is lower
- therefore ONR is entering even more dangerous area

Assessment report - 19-029: Fault Studies Assessment of the Hunterston B R4 Return to Service Safety Case Following Core Inspection Results in 2018
New ONR quotes 5

- ONR warned previous EDF model predictions underestimated extent of cracking
- ONR warned that it will require “more robust arguments” before it agrees to allow the two reactors to restart in 2020
- EDF Energy did not demonstrate that “all barriers to a radiological release were preserved”. Sept 2019

- Assessment report - 19-007: Return to service safety case for Reactor 4 following core inspection results in 2018 (NP/SC 7785). Graphite structural integrity assessment
What could go wrong?
- worst case scenarios

- Cracked bricks reduce stability of reactor core
- if sudden outages, eg 1998 severe winds
- Or earth tremors - could result in releases of radioactive gases
- If $\text{N}_2$ purging failed at same time - could be a catastrophic accident - ie Chernobyl
- Severe weather? see next slide
Storm at Hunterston Dec 26 1998 : INES 2 incident

1. high winds and sea-spray disabled all four power lines to the site.
2. emergency diesel generators failed to start.
3. emergency control system failed, as not re-set.
4. delay in restoring power, as security systems inoperable due to lack of electrical power...

Reactor cooling re-instated after 4 frantic hours.

- this was not an earthquake, just a storm
Hunterston B: prevailing wind directions – from WSW to ENE
Glasgow Metropolitan Area
Population = ~1,800,000

City of Edinburgh Region
Population = ~1,340,000
2. Who is responsible?

“In the event of an emergency resulting from an accident at a civil nuclear site in Scotland, the governmental lead for coordinating the main national response would fall to the Scottish Government.”

Ie not local authorities

From

Japanese Earthquake and Tsunami: Update on UK ‘National Action Plan’
Issued by Office for Nuclear Regulation 2017 See Para 129 on Page 35
2020 Offsite Contingency Plan

Offsite Contingency Plan for HNB was prepared by Ayrshire Civil Contingencies Team - on behalf of North Ayrshire Council for the West of Scotland Regional Resilience Partnership


139 pages
3. Nuclear Emergency Procedures

Under REPPIR Regs 2018, three zones

- Detailed Emergency Plan Zone = ~2 km
- Outline Emergency Planning Zone = 30 km
- Food / water restriction zone = 42 km
2 km DEPZ
42 km zone

42.07 km  26.14 miles
1 = West Dunbartonshire 2 = East Dunbartonshire
3 = North Lanarkshire 4 = Glasgow City
5 = East Renfrewshire
6 = Renfrewshire 7 = Inverclyde
Potassium Iodate Tablets

- Should be pre-distributed
- Why? Because if an accident occurs, people will be told to stay indoors
- How can they then get the iodate pills?
- Many countries in Europe and Canada already pre-distribute them
Evacuations?

- They are impractical for many reasons, the main one being monster traffic jams. Chaos rules.
- My advice is to forget about evacuations and close the reactors instead
Chernobyl USSR 1986
What should be done?

- should not permit R3, R4 to be restarted
- but strong pressure by EDF and quietly by both Westminster and Holyrood Govt’s to restart them
- major problems: politics and money
- Scotland does not need the electricity
- Jobs? Is a myth. Need a just transition
Nuclear Power?

- Nuclear catastrophes at Chernobyl 1986 and Fukushima 2011
- Extremely expensive - HPC £24 billion
- Implicated in nearby childhood leukemias
- Nuclear wastes? No definite solution despite 50 years’ R&D
- Nuclear weapons proliferation
- Poor way to tackle climate change
- Ethical? Sustainable?
Thanks for your attention!
EDF (Energy)  

ie UK subsidiary of EDF in France

- In 2018 lost £382m, in 2017 lost £217m
- 27% of UK elec gen market ↓
- 11% of UK retail market ↓

- Plus EDF in France is itself in € serious financial difficulties