



Progressing the UK ABWR: GDA and progress

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Project Structure



3

The UK ABWR

- BWR technology has since been developed since the 1950s – culminating in the the Advanced Boiling Water Reactor (ABWR). Second most common technology, globally.
- ABWR is the most advanced operational reactor anywhere in the world.
- 4 operational, 3 under construction. All 4 units constructed on time and on budget.

For further detail, visit: www.hitachi-hgne-uk-abwr.com







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A regulatory assessment by Office for Nuclear Regulation (ONR) and the Environment Agency (EA) of whether a proposed reactor design is safe for deployment at a generic site in the UK.

- Early identification of challenges allow these to be addressed in the planning phase – de-risking the overall project.
- Submissions must be suitably tailored to the UK regulators' need – not just showing that the technology is credible, but working to the 'non-prescriptive' style of UK regulators.
- ONR/EA reports are published on their website, along with quarterly progress updates. Hitachi-GE submissions are published on our website









The regulators

The Office for Nuclear Regulation

"The Office for Nuclear Regulation's mission is to provide efficient and effective regulation of the nuclear industry, holding it to account on behalf of the public"

The Environment Agency

"We are involved throughout the entire lifecycle of a nuclear power station ... Assessment of designs ... planning and construction ... Operation ... Decommissioning"

http://www.onr.org.uk/new-reactors/ (Joint regulators)

Natural Resources Wales

"Natural Resources Wales has taken over the functions of the Countryside Council for Wales, Environment Agency Wales and Forestry Commission Wales, as well as some functions of Welsh Government" <u>http://naturalresourceswales.gov.uk</u>









6

Major milestones

- January 2013: Energy Minister asked the regulators to begin GDA of the UK ABWR
- April 2013: Assessment agreements signed between Hitachi-GE and the regulators
- January 2014: Move to Step 2 of the process, and launch the UK ABWR website
- September 2014: Move to Step 3 of the process. Submit and publish PCSR & GEP
- **November 2015:** Move to Step 4 of the process. Submit and publish PCSR
- February 2016: Issued GEP Rev E to Environment Agency

"We remain confident that a DAC and Statement of Design Acceptability (SoDA) are achievable in December 2017, should Hitachi-GE continue with the spirit with which it has started Step 4."

UK Regulators, July 2016





Challenges from the regulator



- Regulatory Issues:
 - 2 received (Source Term and PSA) resolution plans published. First due to be closed imminently.
- Regulatory Observations:
 - 71 received resolution plans provided. 17 closed (and 86 actions closed).
- Regulatory Queries:
 - 1000 RQs received.

Design Changes:

- Some improvements are normal entering a new operating environment. 'UK' ABWR incorporates broadly 2 groups of changes:
 - i. Fukushima countermeasures (retro-fit in Japan) included from design stage
 - ii. Adjustments required for UK operating environment
- Aimed to finalise changes within Step 3, before agreeing Design Reference, for overall project certainty. No fundamental disagreement with regulators.
- Post Step-3 changes managed via a 6-Step change-control process.

7

8

Safety features

- Subject to stringent assessment under GDA
- Defense in depth multiple safety trains
 - Control: control rods are driven into the core to shut down the reactor
 - > Core cooling: diverse methods of cooling water supply
 - Containment: multiple layers fuel cladding, RPV and RCCV
- Lessons learnt from Fukushima include:
 - Site layout: option to site backup buildings on raised ground
 - Protection of core facilities: watertight buildings and doors around backup features
 - Loss of ultimate heatsink and loss of off-site power: diverse and independent methods of power supply and core cooling



Visit our website and view the UK ABWR safety video or Download our severe accidents information sheet:

http://www.hitachi-hgne-ukabwr.co.uk/reactor-safety.html



Post-Fukushima Assessment



- There is greater regulatory attention in this GDA on post Fukushima countermeasures and resilience of the design against Fukushima type initiating events. This has resulted in a number of key activities, including:
 - ALARP justification for the SA mitigation measures [RO-23], e.g. hydrogen management strategy, MCCI mitigation strategy, venting strategy
 - Consideration of national/international post Fukushima learning, including stress tests [RO-39]: Evaluation was made against findings/recommendations from Weightman's report, ENSREG stress tests, IAEA Director General report and evaluations for UK operating plants (SZB, Torness, Wylfa) and new design (HPC).
- Examples of study activities:
 - Development of structured accident management strategy, comprising of symptom based procedures and SAMGs. Guidelines are extended to deal with: (i) monitoring and control of SFP, (ii) prolonged SBO and (iii) shutdown conditions.
 - Extensive supporting SA analysis and SA source term analysis performed using computer codes such as MAAP 4, MAAP5, GOTHIC and AUTODYN. The latter is used for structural performance and response assessment against dynamic events.
 - Impact of SAs is evaluated in Level 2 PSA and off-site radiological consequence assessment in Level 3 PSA (not required in early GDA).
 - Emergency preparedness: Evaluation of requirements, facilities and approach for the response to nuclear emergencies.

Backup Building – Concept Arrangement (design in progress)





Back-up Building design – Design Concept



Post Fukushima Measures





Approach to Accident Management

Operation Procedures in GDA based on J-ABWR



Additional Guidelines	
■Guideline for monitor and control Spent Fuel Pool	Guideline during prolonged Station Black Out

Summary



- Steady progress has been made in UK ABWR GDA and the regulators have been clear that a successful completion in Dec 2017 remains achievable.
- Hitachi-GE has deployed a team of several hundred engineers/ scientists coordinated by its UK based GDA project management team to meet the challenges.
- This capability is supported by additional resource from Horizon Nuclear Power and specialists from Japan/UK/US supply chains. The UK effort provides UK specific regulatory expertise and aids transfer of ABWR knowledge to UK.
- Great effort has also been made in developing a UK Safety Case capability. This effort has included extensive training being provided to Japan/UK personnel. The training is underpinned by a number of key Safety Case guidance documents developed for GDA.
- A Joint Safety Case Office has been formed between Hitachi-GE and Horizon to enable a smooth transition from GDA Safety Case to Site Specific Safety Case.



Questions?

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Transparency and openness



- Hitachi-GE is committed to transparent and open engagement.
- Personalised briefing-letters were sent to some 2,000 stakeholders at launch of Step 2
- UK ABWR technology website and GDA comment process place unprecedented levels of detail at the public's fingertips
- Website hosts technical submissions, as well as lay summaries on topics such as experience, safety, and reactor design
- Received more than 60 public comments

http://www.hitachi-hgne-uk-abwr.co.uk

