

UK ABWR

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UK ABWR Generic Design Assessment
Definition of Design Reference Point



UK ABWR

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Abbreviations and Acronyms

Abbreviations and Acronyms	Description
ABWR	Advanced Boiling Water Reactor
DAC	Design Acceptance Confirmation
DR	Design Reference
DRP	Design Reference Point
EA	Environment Agency
GDA	Generic Design Assessment
GEP-RSR	Generic Environmental Permit - Radioactive Substance Regulation
KK-6/7	Kashiwazaki-Kariwa Nuclear Power Station unit 6 and 7
ONR	Office for Nuclear Regulation
PCSR	Pre-Construction Safety Report
PSA	Probabilistic Safety Assessment
RP	Requesting Party
SLA	Site License Application
SoDA	Statement of Design Acceptability
SSCs	Systems, Structures and Components

1. Introduction

The licensing of new nuclear power stations in the UK will be a two phase process (1) a Generic Design Assessment followed by (2) specific Nuclear Site License Applications (SLA).

The United Kingdom Generic Design Assessment (GDA) is detailed examination by the UK Office for Nuclear Regulation (ONR) and UK Environment Agency (EA) of the safety, security and environmental aspects, the generic safety cases and environmental cases for the UK ABWR design leading to the issuance of an ONR Design Acceptance Confirmation (DAC) and an EA Statement of Design Acceptability (SoDA), if the design is considered acceptable.

The GDA process is common to all potential applicants. It has been defined by the ONR, which has issued appropriate guidance documents and supporting protocols (Ref 1-13). The GDA is comprised of four steps, with increasing level of assessment of design detail as it progresses. The nature of details to be assessed is described in “New nuclear reactors: Generic Design Assessment Guidance to Requesting Parties” (Ref-4).

In this report, Hitachi-GE should define the “Design Reference” and “Design Reference Point” these are useful for clarifying the subject to be assessed based on the “Generic Design Assessment Guidance to Requesting Parties”.

Hitachi-GE also defines the design change control for the Design Reference.

2. Purpose of Design Reference and Design Reference Point

The purpose of the Design Reference is to define a known design reference against which the GDA and its safety cases and environmental cases are based. The Design Reference Point (DRP) is a date at which the Design Reference is 'frozen'. The DRP of the UK ABWR will be defined by the end of step 3(end of August, 2015). The aim of the Design Reference is to appropriately identify the revision status of the design documentations pertinent to the issuance of a DAC and a SoDA and thus to facilitate the identification of any significant changes with regard to the application and issuance of any Nuclear Site Licensees for the construction and operation of the UK ABWR.

The Design Reference includes not only safety document, but also environmental document such as radioactive waste disposability evaluation report. The Design Reference will also contain the 3D-CAD model for large diameter pipings to ensure the feasibility of the UK ABWR design. The Design Reference will also provide the SLA conducted by future licensee typical design, safety case, operation procedure, maintenance plan and waste management plan etc.

The documents in the design reference point tables make up all of the design documentation that directly underpins the claims and arguments presented in the safety, security, and environment reports, namely the Pre-Construction Safety Report (PCSR), the Generic Environmental Permit-Radioactive Substance Regulation (GEP-RSR) and the Conceptual Security Arrangement (CSA).

3. Design Reference Point

The Design Reference Point is a revision status (configuration), at a specified moment in time, of the PCSR, the GEP-RSR, the CSA and supporting documents relevant to the GDA application. It includes design criteria and design documentation for systems, structures and components (SSCs) that have been identified as having an effect on safety.

Requesting Parties (RPs) are also required to submit a Design Reference which lists all of the documents that describe the design of the reactor and associated plants that the GDA submissions refer to. ONR/EA will expect this to be 'frozen' at a specific date known as the DRP.

The Design Reference and its DRP will be agreed on a case-by-case basis with each RP. However, in the GDA guidance published by ONR/EA, if the Design Reference is not in place at the start of GDA step 3, this will cause uncertainty, inefficiency and possibly delays to the assessment, as it will not be clear to ONR exactly what the design definition is.

On the other hand, Hitachi-GE plans to set the Design Reference and the DRP for the UK ABWR at the end of GDA step 3 (end of August, 2015) to ensure the design consolidation after PSA for UK ABWR and the feasibility of the design. In order to minimize the possibility of delays, Hitachi-GE plans to discuss well and establish the first Design Reference to be well in accordance with the expectations of UK.

After the DRP, all design changes will go through the full formal design change process and the safety case will be subject to the corresponding document control.

4. Scope of GDA for UK ABWR

By the time of UK ABWR commercial operation, many documents related to engineering and systems (Design Specifications, Piping and Instrumental Diagram, Single Line Diagram, Construction plans and Working instructions etc.) are required to justify the safety of the UK ABWR.

Although ONR/EA requires a certain minimum level of detail to complete the GDA, it recognizes that full engineering details of the design will not be available at the GDA stage, as it is normal to finalize some of these as part of the SLA, procurement, construction, commission or operation phase.

However important function will be selectively assessed in GDA process, shortfall of assessment will be complemented in the SLA, construction phase or later process. Outline of relation among grade of function, depth of detail of assessment and GDA/SLA/other phase is shown in Figure 4-1.

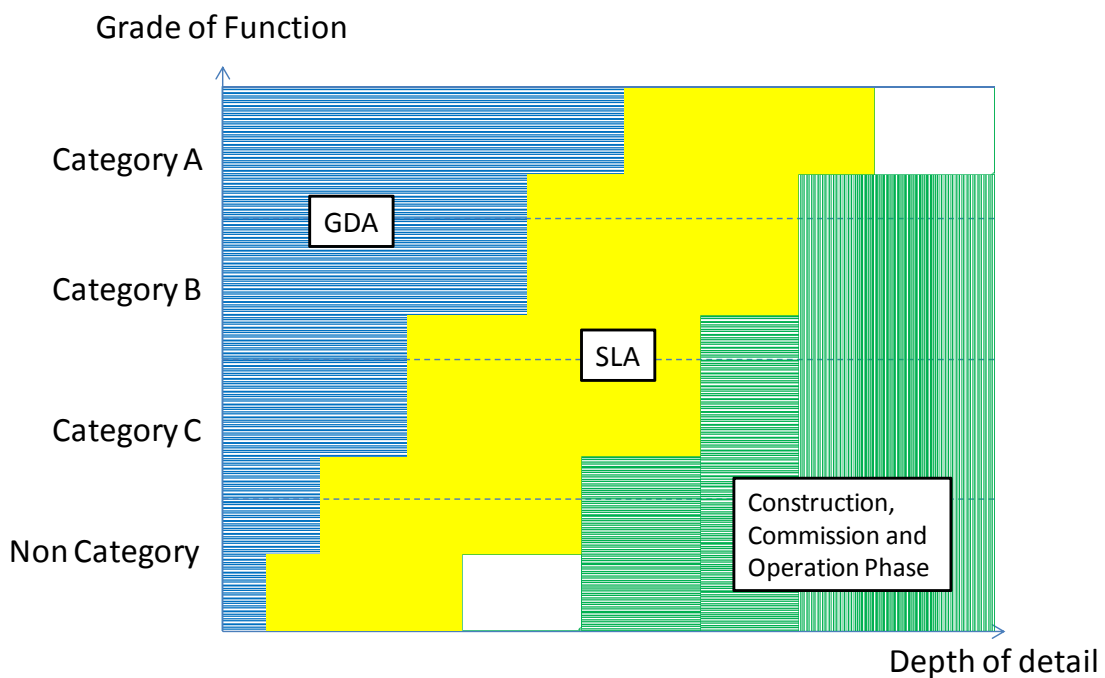


Figure 4-1 Outline of relation between grades of function, depth of detail and GDA/SLA/other phase

The scope of what is included within the GDA depends on the information supplied by the RP (remembering that the GDA is a voluntary process, undertaken at the request of the RP). However, the required information for the GDA needs to be sufficient in scope and detail to underpin the generic safety, environmental and security cases for the design. If there are omissions in that information, then this may jeopardise the completion of a meaningful assessment under the GDA

process. In this case ONR will require the scope of the GDA submissions to be expanded in order to include such essential information. The final GDA scope should be agreed before the end of Step 3.

5. Document Set

It is envisaged that a tiered documentation system will be developed in the GDA to define the extent of design documentations to be listed for the GDA. This for example will include the system description documents and the schematic diagrams for the UK ABWR design. Such a tiered documentation development will be provided in GDA Step 2 and Step 3 following further discussions with regulators.

6. Design Change Control

The UK ABWR design will be based on the original ABWR Kashiwazaki-Kariwa Nuclear Power Station unit 6 and 7 (KK-6/7). However, Hitachi-GE continues to improve and optimize the design of the Japanese ABWRs which designed and constructed after KK-6/7 completion.

In this section, design change control from the KK-6/7 to the first Design Reference and after the DRP is described.

6.1 Design Change Control before the DRP

The UK ABWR is designed based on the original ABWR KK-6/7 which commenced commercial operation in 1996 and 1997 respectively. Hitachi-GE continues to design the UK ABWR reflect on improvement and optimization of other Hitachi-GE's ABWRs which were designed and constructed after the KK-6/7. Hitachi-GE also continues to design, improve, and optimize the UK ABWR to reflect principally on Fukushima countermeasures, new Japanese regulatory requirements and also enhancement to meet UK regulatory expectations. By the time of the DRP, Hitachi-GE will continue to develop the UK ABWR design using inhouse design change control system. Table 6.1-1 shows the main modifications of Japanese ABWR fleets.

Table 6.1-1 Main Modification of Hitachi-GE's ABWR fleets

Plant	Establish permission	Commencement of commercial operation	Main modifications
KK-6	May-1988 to May-1991	Nov-1996	Original ABWR
KK-7		Jul-1997	Original ABWR
Shika unit 2	May-1997 to Apr-1999	Mar-2006	I-Configuration, 60Hz optimization, etc.
Shimane unit 3	Oct-2000 to Apr-2005	Construction is almost completed	High seismic acceleration etc.
Ohma	Mar-2004 to Apr-2008	Under construction	Full MOX and many others
KK-6/7 (design change)	Oct-2013 (under assessment)	-	Coping to Japanese new regulatory requirements as Fukushima Countermeasures

6.2 Design Change Control after the DRP

Hitachi-GE will develop the Design Reference by the DRP. As the GDA progresses it is recognized that design changes may be necessary in response to regulatory assessment during the GDA. It is therefore important that a GDA design change process is implemented by the RP. This design change process after the DRP will be defined by the end of Step 2.

The design change process will also consider: a categorisation system reflecting the potential safety, environmental and security impact of the change; change control committees to oversee the categorisation of the proposed changes and the overall running of the process; a route for alerting ONR/EA to the more significant changes to the design and its impact on the safety and environmental cases and changes to the safety and environmental cases itself.

After the DRP, design documentation is placed under configuration control. Once under configuration control, changes to design documentation can only be made through the design control change process.

After the time when the DRP is accepted by the Regulatory Authority any changes to this Design Reference have to be managed by the relevant design department and the required changes of design basis and design documents have to be executed with the same scrutiny as the original ones. Changes to the reference design shall only be implemented after obtaining ONR/EA agreement in writing in accordance with the six step process.

- (1) Recognition of Change
- (2) RP formally informs about the design change to ONE/EA
- (3) Regulators acknowledgement
- (4) Discussion between ONR/EA and Hitachi-GE
- (5) Formal submission with detail information
- (6) Agreement of change

7. Update/Re-Issue of the Design Reference

Hitachi-GE will revise all submissions if needed and will be updated and re-issued this report in order to constitute the Design Reference for the consolidated safety, environmental and security submission and as a reference for the issuance of a DAC and SoDA. The Design Reference tables will also be updated as documents be submitted and revised according to progress of engineering milestone. When Hitachi-GE updates the Design Reference, configuration control should be adapted appropriately. The configuration control system will be launched by the end of Step 2.

8. Conclusion

This document identifies the approach and components in defining the Design Reference and the DRP for the UK ABWR GDA. This provides the basis for initial definition of the DRP and further development is envisaged following further discussions with Regulators in Step 2.

9. References

Ref-1	Generic Design Assessment Interface Arrangements (rev.0, Office for Nuclear Regulation / Environment Agency and Hitachi-GE Nuclear Energy Ltd, September 2013)
Ref-2	GDA Comments Process (rev.0, Office for Nuclear Regulation / Environmt Agency, September 2013)
Ref-3	A guide to the Regulatory Process (rev.0, Office for Nuclear Regulation / Environmt Agency, September 2013)
Ref-4	New nuclear reactors: Generic Design Assessment Guidance to Requesting Parties (ONR-GDA-GD-003 Revision 0, Office for Nuclear Regulation, August 2013)
Ref-5	Summary of Lessons Learnt during Generic Design Assessment (2007 - 2013) (ONR-GDA-SR-13-001 Revision 0, Office for Nuclear Regulation / Environmt Agency, September 2013)
Ref-6	A guide to the Regulatory Process (Rev.0, Office for Nuclear Regulation / Environmt Agency, September 2013)
Ref-7	Safety Assessment Principles for Nuclear Facilities (rev.1, Health and Safety Executive, February 2008)
Ref-8	Technical Assessment Guides (TAGs) (Office for Nuclear Regulation)
Ref-9	GUIDANCE DOCUMENT FOR GENERIC DESIGN ASSESSMENT ACTIVITIES (rev.2, Office for Civil Nuclear Security, January 2007)
Ref-10	The Management of Sensitive Nuclear Information during the Generic Design Assessment of Nuclear Technologies (rev.2, Office For Civil Nuclear Security, February 2008)
Ref-11	Safety assessment in an international context (rev.3, Health and Safety Executive, March 2009)
Ref-12	Radioactive Substances Regulation - Environmental Principles (rev.2, Regulatory Guidance Series, No RSR 1, Environment Agency, April 2010)
Ref-13	Radioactive Substances Regulation: Environmental Principles and BAT Assessment Guide (Environment Agency)