

**HEALTH & SAFETY EXECUTIVE
NUCLEAR DIRECTORATE
ASSESSMENT REPORT**

New Reactor Build

GEH ESBWR Step 2 ALARP Assessment

HM Nuclear Installations Inspectorate
Redgrave Court
Merton Road
Bootle
Merseyside L20 7HS

1. Introduction

This report deals with assessment of the ALARP approach detailed in the Submission (Ref 1) provided by GEH for the ESBWR and concludes that the requirements of GDA Step 2 have been met in this respect.

2. ND Assessment

Requesting Party's Case

GEH's case is outlined in the PSR (Ref 1) and the major supporting document is the Design Control Document (DCD) (Ref 2) compiled to meet USNRC requirements. The DCD contains a large amount of information relevant to the UK, but there is not a one to one correspondence with ND requirements noted in the GDA guide (Ref 3) and our Technical Assessment Guide (TAG) on safety reports (Ref 4). The PSR is intended to bridge these gaps.

GEH addresses ALARP in section 2.2 of the PSR, describing a process of progressive safety improvement with the evolution of the ESBWR, claiming significant reduction in risk from the baseline plant, the ABWR. They also deal with both worker and public safety for accidents and normal operation and go on to report CBA which indicates that only trivial amounts would be worth spending, given the already low risks for both accidents and operational doses.

The argument is not based solely on low numerical risk estimates. Real safety improvements for operational dose – such as materials selection and equipment design to minimise radiation levels – are included. For accident risk, GEH reference their consideration of a large number of design alternatives to reduce the impact of severe accidents and the design includes positive improvements (compare with the baseline) in this respect (e.g. the core catcher).

2.2 Standards and Criteria

In respect of ALARP, Step 2 of the GDA guidance (Ref 3) requires the Requesting Party (RP), in section 2.2, to provide “A description of the process being adopted by the applicant to demonstrate compliance with the UK legal duty to reduce risks to workers and the public SFAIRP”. The GDA guide goes on to say that HSE will undertake “an assessment directed at reviewing the design concepts and claims” and specifically in point 2.2 “the approach to ALARP”.

Hence whether or not ALARP has been demonstrated is not being assessed in Step 2; rather we are looking at high level claims on how ALARP will be shown to be met by the RP. Based on ND's ALARP guide (Ref 5) the following assessment points were identified for Step 2:

1. An awareness of the HSW act, particularly sections 2 and 3 and confirmation that the RP recognises the duty to comply with the law.
2. Understanding of the concept of ALARP – i.e. a balance between risk averted and the sacrifice, in terms of money, time, trouble etc, to avert the risk.
3. Understanding that gross disproportion between risk averted and the cost of averting the risk is the test of reasonable practicability.

4. Low numerical risk figures are not the sole support for the risk being claimed ALARP.
5. Options for improvement have been considered; the designs are all evolutionary, so they have clearly built on lessons from the past and from earlier variants. Hence we would expect to see: - a rationale for the safety improvements they have adopted and the proposed improvements (i.e. options) that were rejected during the design process. This would include outline information on how the various options were identified, analysed and sentenced. (For Step 2 existence of the approach is sufficient).
6. That there is a claim that the standards used represent Relevant Good Practice (we will test that justification in Step 3 or 4).
7. There is a clear conclusion that there are no further “reasonably practicable” improvements that could be implemented – this could use a T/AST/005 section 6.21 argument (see below).

2.3 ND Assessment

The table below contains a judgement on how well GEH’s PSR addresses the demonstration of ALARP against each of the Step 2 criteria listed in the previous section.

Assessment point	Comment
1	2.2.1 of the PSR shows an awareness of the HSW act and the duty to meet SFAIRP.
2	2.2.3 and 2.2.4 clearly shows that GEH understands that there is a balance to be struck between the risk to be averted and the “cost” of doing so.
3	There is no explicit mention of the term “gross disproportion” in the PSR. In both 2.2.3 and 2.2.4 GEH talk about aversion factors used to compare risk and measures to avert the risk and certainly describe their use in the CBA carried out in support of their case. We will need to explore this issue more fully in Step 3 and beyond to ensure that its implicit inclusion is borne out in fact.
4	Numerical results are quoted in support of the argument but GEH does not rely on this alone. There is lots of discussion of practical measures implemented in the design (over those in the baseline) and consideration of risk reduction measures.
5	Section 2.2.4 in particular references out to a “large list” of design alternatives considered to mitigate severe accidents
6	The standards used are identified in section 2.8 of the PSR which references out to the DCD for justification. The merits of the justification of codes and standards will be the subject of ND’s individual assessment topic reports.
7	The introduction to section 2.2 claims the design is ALARP. In sections 2.2.3 and 2.2.4 GEH estimate that it is not worth spending more than £30-50K to reduce worker dose or £2-20K for public safety. These are largely US based costing and will need to be confirmed for the UK. Generally the

claim that little, in terms of design, could be done for such amounts is accepted.
--

Overall the PSR indicates that GEH has a reasonable grasp of the ALARP concept and has presented sufficient material for a detailed assessment to begin in Step 3.

Points for ND to follow up include:

- More clarity on gross disproportion
- Updating of the CBA results for UK costs/conditions
- Justification of codes and standards will be ongoing, led by the individual topic assessors.

3. Conclusions

GEH has provided an adequate description of the approach to ALARP for Step 2.

Some detailed points for further consideration have arisen during this high level review and these will be followed up during Step 3 and beyond. We do expect further points to arise as the assessment intensifies in Step 3.

4. Recommendations

HSE should accept that GEH has provided sufficient information on the approach to ALARP for Step 2 of GDA.

5. References

1. ESBWR –UK. Preliminary Safety Report. Step 2. 26A7403AA. Rev 0 August 2007
2. ESBWR Design Control Document. Rev 3. Feb 2007
3. HSE Nuclear Power Station Generic Design Assessment – Guidance to Requesting Parties, Version 2, 16 July 2007.
4. T/AST/051 Guidance on the purpose scope and content of Nuclear Safety Cases.
http://www.hse.gov.uk/foi/internalops/nsd/tech_asst_guides/index.htm
5. T/AST/005 Demonstration of ALARP
http://www.hse.gov.uk/foi/internalops/nsd/tech_asst_guides/index.htm

