

Health and Safety Executive Board Paper		HSE/08/02	
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<b>GENERIC DESIGN ASSESSMENTS OF NEW NUCLEAR REACTORS: END OF STEP 2 REPORTS.</b>			

### Purpose of the paper

1. To update the HSE Board on the progress with the Generic Design Assessments of new nuclear reactors and the progress with the recruitment of Nuclear Directorate staff. The HSE Board are being asked to note the content of this paper.

### Background

2. Paper HSC 07/45 (May 2007) explained HSE's proposed staged approach to undertaking generic design assessments (GDA) for potential new nuclear power station designs. In November 2007, HSC were informed (HSC/07/68) of Nuclear Directorate's (ND) progress with GDA on four proposed designs of nuclear power station. At that meeting the HSC asked ND to report back following the completion of GDA Step 2 and to provide an update on ND recruitment. HSE subsequently completed the Step 2 assessments of all four designs in March and reports were published setting out HSE's findings on March 18<sup>th</sup>.

There are four steps to the GDA process (Annex 1). Step 1 of the GDA was devoted to preparatory work and was completed for each design in August 2007. Step 2 was an overview of the fundamental acceptability of the proposed reactor design concept within the UK regulatory regime. The aim was to identify any fundamental design aspects or safety shortfalls that could prevent the proposed design from being licensed in the UK. It also introduced HSE nuclear safety inspectors to the design and provides a basis for planning subsequent assessment. HSE's Step 2 assessments were completed within the original target of 6 to 8 months. The four designs that have been taken through Steps 1 and 2 of GDA are:

- AREVA/EdF EPR (France)
- AECL – ACR1000 (Canada)
- GE/Hitachi – ESBWR (US/Japan)
- Westinghouse AP1000 (US)

3. The Step 2 assessments focused on the claims of the designer/vendors (the 'Requesting Parties') in the submitted documentation. The objective was to make sure that the claims, if taken at face value, provided sufficient assurance that the design would meet the nuclear safety standards demanded in the UK, taking into account our current understanding of reactor technology. Examination of the detailed arguments and evidence underpinning the claims will come in our assessment during Step 3 and Step 4 of GDA.

4. HSE worked alongside the Environment Agency which undertook a similar depth of assessment, focussing on the environmental aspects of each design. Close working between the regulators was facilitated by a Joint Programme Office (JPO) which has provided a 'one-stop shop' for the requesting parties and has brought efficiency improvements for both the regulators and the industry. The Environment Agency also published its GDA findings on March 18; both regulators' reports are available on the JPO website.

## **Argument**

### (i) GDA Step 2 Reports

5. Both the HSE and the Environment Agency's initial (Step 2) assessments, based on the claims of the vendors, found no shortfall (in terms of safety, security or the environment) that would prevent any of the four designs from ultimately being constructed in the UK. In coming to these conclusions HSE's assessment team drew on technical reviews of each design which HSE had commissioned from the International Atomic Energy Agency (IAEA), and on findings of overseas regulators where these were available.

6. HSE's and the Environment Agency's findings were issued in four summary reports, published on the HSE/Joint Programme Office website. At the same time, HSE published the IAEA technical review along with nearly 50 detailed assessment reports setting out the ND findings for each design. At the same time HSE also published a report by the Independent Process Review Board, and a report on the Public Involvement Process.

7. The Independent Process Review Board was appointed by HSE as part of its GDA governance arrangements (ToR and membership are given in Annex 2). The Board concluded that HSE had adapted its management and decision-making processes for GDA appropriately. The Board made a number of recommendations which should increase the robustness of HSE's arrangements in the later, more detailed stages of GDA. The Board presented its findings to The NII Chief Inspector in the presence of a member of the Health & Safety Commission.

8. The GDA process has also set new, high standards of openness and transparency with the creation of a public involvement process which allows the public to view detailed design information on the web and comment on it, and by the decision to publish all of HSE's and Environment Agency's internal assessment reports. Public comments on each design, along with the designers' responses, have been monitored by the regulators and taken into account, where relevant, in the assessment process.

### (ii) ND Staffing

9. At the May 2007 meeting, HSC was informed that staffing within ND's emerging new build assessment unit was expected to be achieved without detriment to ND's safety critical, higher priority work. Supplemented by the work undertaken by the IAEA and drawing on experience of overseas regulators, that staffing level proved sufficient to complete step 2 assessments for each design within the target timescale. Progressing to full implementation of step 3 (and beyond) entails more detailed assessment of complex system behaviour and design and will necessitate a staffing level considerably higher than that needed for step 2. The projected

timescales for completion of steps 3 and 4 (a further one and then another two years respectively) are predicated on being able to adequately staff up the dedicated ND assessment teams.

10. In November 2007, HSE received agreement from HM Treasury to increase the pay of ND nuclear safety inspectors to facilitate recruitment needed to address ND's staffing needs across the Directorate, including that necessary for the next steps of GDA. A recruitment campaign was subsequently launched in December. By the February closing date HSE had had an encouraging degree of interest in the ND posts, with over 160 applying. Of these, 60 were invited for interview and those interviews have recently been completed. An update on recruitment will be given to the Board at the meeting.

11. In January the Government published its White paper on nuclear power, which gave the green light for industry to come forward with proposals for the construction of new nuclear reactors. HSE will shortly be launching a further recruitment campaign for nuclear inspectors and anticipates that the positive messages coming from the Government along with increasing levels of interest from the industry in new build in the UK, will act as a further stimulus for applications to join an expanding ND. Also, in the White Paper the Government announced a review of the nuclear regulatory system to be led by Dr Tim Stone, an advisor to BERR and the Treasury from KPMG. This review is in part intended to assist in ensuring that HSE's nuclear safety inspector recruitment is successful.

12. The original GDA target completion timescales were additionally predicated on ND being able to draw on a significant level of external support through contracts with Technical Support Organisations (TSOs). ND has been preparing the ground for commissioning this work and is currently seeking agreement to proceed to invitations-to-tender for such contracts through the necessary HSE and DWP channels as the contracts are likely to run to several £M over the next 3 years.

13. Further, HSE is exploring the opportunities for information sharing and staff secondments from regulators from France, the US and Finland which are also engaged in regulatory assessments of each of the three remaining designs.

## **Presentation**

14. In its January 2008 White Paper, the Government announced that to meet its targets for bringing new nuclear power stations online, no more than three designs should proceed to the next steps phase 2 of the GDA process. It had been intended that BERR would run a prioritisation process, drawing on the advice of vendors and potential operators to determine which designs were the most capable of being licensed and operational in the UK within 2016-2022 timeframe. However, on April 4<sup>th</sup>, Atomic Energy of Canada Ltd (AECL) announced that it was withdrawing its ACR1000 design from the GDA process in order to focus on new build initiatives in Canada. Subsequently BERR notified HSE and the Environment Agency that the prioritisation process would not run, and recommended that Step 3 assessments on all three remaining designs should continue as soon as the necessary regulatory resources could be allocated.

## **Financial/Resource Implications for HSE**

15. The Health & Safety (Fees) (Amendment) Regulations 2007 provided HSE with the means to recover all of its costs for step 1 and step 2 GDA work from the

requesting parties. The Fees Regulations 2008 will allow HSE to continue to recover the cost for this work.

### **Action**

16. That the HSE Board notes that:

- Step 2 generic design assessments were completed for all four designs within the original target timeframe;
- The Independent Process Review Board found that ND had appropriately adapted its management and decision-making processes for GDA, but made a number of recommendations which should increase the robustness of HSE's arrangements in the later, more detailed stages of GDA;
- The GDA process has also set high standards of openness and transparency with the creation of a public involvement process which allows the public to view detailed design information on the web and comment on it, and by the decision to publish all of HSE's and Environment Agency's internal assessment reports;
- HSE is preparing for the start of Step 3 assessments of the remaining three designs. Progress on this will depend on the build up of the necessary staffing levels as recruitment proceeds;
- A good response has been received to the December 2007 recruitment campaign for new nuclear safety inspectors. A second campaign is underway;
- The Board will be kept informed routinely of the results of HSE's nuclear inspector recruitment. A further paper on GDA progress will be presented to the Board at the end of Step 3, currently anticipated being around the middle of 2009.

### **Paper clearance**

20. This paper was produced by Colin Potter in consultation with ND staff, Finance and Communications colleagues and was cleared by Mike Weightman and Geoffrey Podger on 9<sup>th</sup> April 2008.

## Annex 1 SUMMARY OF GENERIC DESIGN ASSESSMENT PROCESS

1. HSE's expert report to the Government's 2006 Energy Review proposed that it would revise and update its procedures for granting a licence for the start of construction. HSE proposed a two-phase process: the first phase would be a review of the safety features and ultimate acceptability of a nuclear reactor design as the basis for granting a nuclear site licence. If successful, this would lead to the issuing of a statement of 'Design Acceptance' by HSE, which would remain valid for a number of years. The second phase would involve an applicant seeking a nuclear site licence to construct such a reactor at a specific site.

2. The Government's Energy Review report, published in July 2006, welcomed HSE's proposals, and asked HSE to develop a system for assessing nuclear reactor designs, and to publish guidance early in 2007. That guidance was published in January 2007.

3. Proposals for building new power reactors in the UK would be subject to a 2 phase process:

- Phase One, Design Acceptance, is HSE's assessment of the safety case for a generic design, leading to issue of Design Acceptance Confirmation if the outcome is positive.
- Phase Two, Nuclear site licensing, is HSE's assessment of the application for a nuclear site licence and is thus site, reactor type and operator specific.

4. This process is presented in the table with approximate timescales. Phase One is divided into 4 steps. These steps, which culminate in the issuing of a Design Acceptance Confirmation.

Phase One: Design Acceptance		Approx Timescale
Step	Process	
1	Design and safety case preparation based on generic site envelope	Requesting party is responsible
2	Fundamental safety overview	6-8 months
3	Overall design safety review	6-12 months
4	Design Acceptance Assessment	Up to 2 years
Phase Two: Nuclear Site Licensing		
	Site licence assessment, with subsequent issue of site licence if application is judged to be acceptable	6-12 months

## KEY FEATURES OF THE PROCESS

### Step 1 – Design and Safety Case Submission Preparation

Step 1 is the preparatory part of the design assessment process. The bulk of the work will be undertaken by the requesting party in assembling the safety submissions for Step 2. It also involves discussions between the requesting party and HSE to ensure a full understanding of the requirements and processes that will be applied.

### Step 2 – Fundamental safety overview

Step 2 is an overview of the fundamental acceptability of the proposed reactor design concept within the UK regulatory regime. This step is expected to take from 6 to 8 months. The aim is to identify any fundamental design aspects or safety shortfalls that could prevent the proposed design from being licensed in the UK. It will also introduce HSE inspectors to the fundamentals of the design and provide a basis for planning subsequent assessment.

#### *Step 2 – HSE Output*

- A public HSE statement on whether any fundamental safety issues had been identified that might prevent Design Acceptance in the UK or that have to be addressed to secure acceptance.
- A short report to support this statement.
- Confirmation that HSE will move to Step 3.

### Step 3 – Design Safety Overview

Step 3 is a broad HSE review of the safety aspects of the proposed reactor design. This step may take from 6 to 12 months. The general intention will be to move from the fundamentals of the previous step to an analysis of the design, primarily by examination at the system level and by analysis of the requesting party's supporting arguments. The specific aims of this step are:

- To improve HSE knowledge of the design.
- To identify all significant issues.
- To identify whether any significant design or safety case changes may be needed.
- To identify major issues that may affect design acceptance and attempt to resolve them.
- To achieve a significant reduction in regulatory uncertainty.

The exact scope and focus will depend on the design and on the outcome of Step 2.

#### *Step 3 – HSE Output*

- A public HSE statement on the adequacy of the assessed safety features of the design, including safety issues with the potential to lead to significant design or safety case changes, or to prevent successful Design Acceptance.
- A report to support this statement.
- Confirmation that HSE will move to Step 4.

## **Step 4 – Design Acceptance Assessment**

Step 4 is an in-depth HSE assessment of the safety case and generic site envelope submitted. This step may take about 2 years.

The general intention of this step is to move from the system level assessment of Step 3 to a fully detailed examination of the evidence, on a sampling basis, given by the safety analyses.

The aim of this step is:

- To confirm that the higher level claims such as system functionality are properly justified.
- To complete sufficient detailed assessment to allow HSE to come to a judgment on if a Design Acceptance Confirmation can be issued.

The exact scope and focus will depend on the design and on the outcome of Step 3.

### *Step 4 – HSE Output*

- A public HSE statement providing a Design Acceptance Confirmation (if the design is judged to be acceptable).
- A report to support this statement.

## **Annex 2. HSE GDA Process Review Board**

The terms of reference for the GDA Process Review Board are:

To carry out periodic reviews of HSE's activities during the assessment of generic designs, as requested by the Chief Inspector of Nuclear Installations. Specifically the primary tasks we were asked to address were to:

- confirm that the public involvement process is operating effectively
- examine whether the arrangements made to co-ordinate the activities of the separate regulators are appropriate and effective
- consider whether the processes, practices and procedures associated with the Generic Design Assessment are appropriate
- consider whether the decision-making process is operating effectively
- determine the extent to which HSE is following the processes and procedures set out in its guidance and in agreements with requesting parties.

Members:

**Professor David Hughes** – Consultant specializing in innovation strategy and is a visiting Professor of Engineering Management at City University.

**Professor John Raine** - Professor of Management in Criminal Justice in the School of Public Policy at the University of Birmingham.

**Bernard Whittle** - Chairman of Springfield's Site Stakeholder Group and an elected member of Lancashire County Council.

**Phillip Woodward** - Chief Executive of Fylde Borough Council in Lancashire