

**GENERIC DESIGN ASSESSMENT
PROGRESS REPORT
REPORTING PERIOD 1 July 2012 – 30 September 2012**

FOREWORD

During this quarter our work has continued to focus on assessing EDF and AREVA's responses to the GDA Issues that we published in July 2011 for their UK EPR™ reactor.

EDF and AREVA have continued to deliver submissions to us in accordance with their [revised resolution plans](#). We have now received almost all of the key documentation that we need to assess and we are finding that these submissions are of improved technical content and this is helping with closure of the Issues.

We are continuing to make good progress on the assessment of this documentation and a further six GDA Issues have been closed bringing the total closed to nine. This leaves 22 on which work is progressing.

The level of ONR assessment and interaction with EDF and AREVA has been intensive throughout the last quarter. We now have technical agreement on the route to completion of almost all of the GDA Issues, and the remaining areas of discussion are receiving significant attention with a view to agreeing a way forward. When EDF and AREVA deliver all the necessary documents, and if we are satisfied by the safety, security and environmental arguments they put forward, then we will close the remaining GDA Issues. Given the improvements in the quality and timeliness of the submissions we have received in the last six months, and our ongoing discussions, closure of all Issues should be achievable before the end of the year. This would enable us to consider whether we should issue a final Design Acceptance Confirmation and a final Statement of Design Acceptability for the UK EPR.

We remain convinced that a process of seeking to close-out GDA Issues, and thus resolving key safety and environmental issues, ahead of any regulatory permissions to commence nuclear island construction should lead to more predictable and achievable schedules for the safe construction of such reactors.

If you have comments on any aspect of this report then please send them to us at: new.reactor.build@hse.gsi.gov.uk.

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INTRODUCTION

- 1 Our work to assess EDF and AREVA's UK EPR™ began in 2007, as part of our Generic Design Assessment programme. Since then we have expended tens of thousands of staff hours on our assessment and EDF and AREVA have submitted thousands of documents for our examination. In 2011 we completed the assessments we had set out to do. ONR published its Step 4 assessment reports and the Environment Agency published its decision documents. These identified 31 remaining Issues that must be resolved before we will consider issuing a final Design Acceptance Confirmation (DAC, issued by ONR) and final Statement of Design Acceptability (SoDA, issued by the Environment Agency). Since 2011, we have been focussed on our assessment of EDF and AREVA's responses to these GDA Issues. We are now at the point where they are in the final stages of information delivery, and where we are coming to the end of our assessment. When we are satisfied with the GDA Issue responses, we are closing-out the Issues. Once all the Issues are closed, we can then consider whether to grant a final DAC and SoDA.

CLOSURE OF A FURTHER SIX GDA ISSUES

- 2 During this last quarter we have advised EDF and AREVA that we are satisfied with their responses to a further six GDA Issues and that we now consider these closed. This brings the total closed to-date to nine. The closure letters have been published on our website, alongside the original GDA Issues at

<http://www.hse.gov.uk/newreactors/gda-issue-close-out-uk-epr.htm#close-out-reports>

Significantly, this includes the first Issue to be closed in the topic area of control and instrumentation. The Issues closed are listed below.

- 3 GI-UKEPR-CE-03 – Justification of the Beyond Design Basis Behaviour of the UK EPR Containment Structure. The containment structure is an important part of the UK EPR design that prevents release of radioactivity in accident conditions. It is important that its structural performance is demonstrated for a range of conditions to which it might be exposed (for example internal pressure, seismic events) including extreme events that go beyond the design basis. In response to this issue, EDF and AREVA submitted revised and additional safety case supporting documents. ONR's assessment has concluded that the additional information provides a much greater level of detail and justification for the approach used. In particular, the overpressure case is much more clearly presented and the summary of the beyond design basis assessment of the inner containment wall is satisfactory. ONR concludes that there is sufficient margin in the analyses for containment loads and that there is no disproportionate increase in risk when considering beyond design basis scenarios. The response to the GDA Issue is therefore considered acceptable.
- 4 GI-UKEPR-CE-04 – Analysis of the UK EPR Containment Structure. (This Issue is closely related to GI-UKEPR-CE-03 above). As the containment structure has a key safety role, it is important that the overall design is demonstrated to a high level of reliability. ONR was not satisfied that the analysis had been shown to capture the behaviour in a sufficiently accurate manner, nor that it necessarily reflected current good practice. In response to this issue, EDF and AREVA submitted revised and additional safety case supporting documents. ONR's assessment concluded that these documents adequately justify the finite element analyses carried out for the design of the Inner Containment for the reference design of the Flamanville 3 plant. EDF and AREVA recognise that the reference design is specific to a site with very hard ground and based on modelling techniques that were developed over the last decade. Therefore, the methodology documents have also confirmed how future UK site-specific analysis models will benefit from up to date software and current good practice, and which factors are generic and which are site specific. ONR is satisfied that the form of the analysis models,

proposed will be sufficiently accurate to model the structural behaviour and the response to the GDA Issue is therefore considered acceptable.

- 5 GI-UKEPR-CE-06 – Justification of the Methodologies proposed for the Seismic Analysis of the UK EPR. This Issue sought improved justification for the methodology for the seismic analysis of the raft foundation and nuclear island superstructures. In response, EDF and AREVA submitted revised and additional safety case supporting documents. Additionally, as the generic design eventually needs to be applied to specific sites, the documents identify where the generic methodologies need to be expanded or adjusted for the site-specific design. ONR has assessed this additional information and concluded that it adequately justifies the methodologies that EDF and AREVA propose to use for the UKEPR seismic analysis.
- 6 GI-UKEPR-IH-01 – Substantiation and Analysis of the Consequences of Dropped Loads and Impact from Lifting Equipment. The aim of this Issue was to seek additional assurance that the nuclear safety consequences of dropped loads and impact from lifting equipment were acceptable. In response, EDF and AREVA provided additional documentation including a demonstration that the design of the lifting equipment is to a high standard and consistent with international good practice, and they provided a detailed consequence analyses for a number of potential lifting operations with a view to demonstrating that the risk to nuclear safety from a dropped load or impact was as low as reasonably practicable (ALARP). EDF and AREVA also proposed design changes as a result of their analyses which will improve the protection against a dropped load or impact. ONR has assessed this additional information and has found that the analyses provided are comprehensive and the consequences of a dropped load or impact from lifting equipment proposed are acceptable to nuclear safety. ONR therefore concluded that the safety case for dropped loads and impact for the UK EPR is now adequate.
- 7 GI-UKEPR-IH-04 – Consequences of Missile Generation arising from failure of Pressurised Components. In nuclear power station design it is normal practice to take account of the potential effects of energetic failure of pressurised components, both due to the loss of that component and also due to the damage that can be caused to neighbouring equipments by ‘flying’ debris (called ‘missiles’). The aim of this Issue was to seek additional assurance that the nuclear safety consequences of missile generation arising from failure of pressure boundary components were acceptable. In response to this Issue, EDF and AREVA provided additional documentation including a detailed consequence analyses for a number of potential missiles, which aimed to demonstrate that the nuclear safety risk was ALARP. ONR assessment concluded that the analysis undertaken has considered the most onerous potential missile events and the calculations performed have been comprehensive. We also noted that passive structural barriers are provided within the design to protect against the effects of internal missiles. ONR therefore concluded that the safety case for missile generation arising from failure of pressure boundary components is now adequate.
- 8 GI-UKEPR-CI-02 – Independent Confidence Building Measures (ICBMs) to support the safety case for the Teleperm TXS Protection System. This GDA Issue requires the programme of ICBMs to support the safety case for the main protection system, the so-called Teleperm TXS Protection System (PS), to be fully defined and agreed. In response to this GDA Issue, EDF and AREVA submitted six documents covering the scope of the overall ICBMs including statistical testing (which will involve 50,000 tests in total), compiler validation, and static analysis. EDF and AREVA have also reviewed the feasibility of static analysis of the PS software and confirmed the extent to which they will undertake it. They also committed to undertake additional research in some related areas. ONR assessment of this new information concluded that the

programme of ICBMs to support the safety case for the PS has now been adequately defined

PROGRESS ON REMAINING GDA ISSUES AND RESOLUTION PLANS

- 9 The GDA Issues and Requesting Party resolution plans for both the UK EPR and the AP1000® reactors are published at (<http://www.hse.gov.uk/newreactors/2011-gda-issues-epr.htm>). These show what needs to be done to complete GDA and allow us to consider whether to grant a final Design Acceptance Confirmation (DAC, issued by ONR) and final Statement of Design Acceptability (SoDA, issued by the Environment Agency) for each reactor design. These also include revised resolution plan delivery schedules where these have been updated by EDF and AREVA. The full background to each GDA Issue is detailed in the assessment reports for each technical area, which we published in December 2011. These can all be viewed at <http://www.hse.gov.uk/newreactors/regulators-issue-interim-dac-soda-gda-key-milestone.htm>
- 10 EDF and AREVA's resolution plans identified the details of how they intended to respond to the UK EPR GDA Issues. It should be noted that, during the development of these plans, the regulators took an active role in reviewing them, and asking for amendments or additional information if necessary, before we were able to conclude, in 2011, that the plans were credible. In arriving at this conclusion, we were satisfied that if EDF and AREVA delivered the scheduled documents and scope of work identified in the plans, then this should be sufficient to satisfactorily address the GDA Issue. Since 2011, EDF and AREVA have been working to deliver the documents identified in the resolution plans and the regulators have been assessing them.
- 11 As detailed in the last Quarterly Report, EDF and AREVA have revised their resolution plan timescales and deployed additional resource with a view to improving the timeliness and quality of delivery of their GDA Issue responses. In turn, we have also increased our assessment team resources, and increased the intensity of our reviews and exchanges with EDF and AREVA. These positive actions are helping to achieve technical convergence and close-out of the GDA Issues.
- 12 A further positive step has been the increasing involvement of NNB GenCo in GDA, in their role as the potential future licensee of Hinkley Point C. As well as assuring themselves of the integration of the GDA and site-specific projects, they have contributed to ensuring that the GDA Issue responses appropriately address the regulators' concerns. We have therefore had a number of joint meetings with NNB GenCo, EDF and AREVA, to help development of meaningful and complete GDA Issue responses.
- 13 We are pleased to report that the above initiatives have helped ensure that improvements in quality and delivery performance by EDF and AREVA have continued throughout the last quarter. This has led to an increase the number of 'right first time' submissions that we have received and this in turn allows us to plan our remaining assessment with more confidence and to achieve timely close out of the Issues once we are satisfied with the information provided.
- 14 The metrics at Annex 1 provide a red, amber or green 'traffic light' indication for current and predicted progress and quality of interactions for each of the GDA Issues. In addition, the 'deliverable vs time' graph at Annex 2 illustrates the progress EDF and AREVA are making on sending us the planned submissions as identified in their resolution plans.
- 15 Progress on assessment of the majority of the GDA Issues is good, as indicated by the green metrics in Annex 1 and, as noted above, nine Issues have already been closed – these are shaded-out, in grey. Although we have now reached agreement on the technical solutions for almost all of the GDA Issues, at the end of September there

remain a small number of topics where discussions on the options for solution are continuing. These are highlighted by amber or red metrics, indicating that, if we cannot reach agreement, it is unlikely that the GDA Issues will be closed-out on the timescales indicated in the resolution plans.

- 16 The graph at Annex 2 shows that that the rate of document delivery has increased markedly and that delivery is in-line with the revised resolution plan schedules. During this quarter we received almost all the planned key GDA Issue responses and we have confidence that the remainder should be delivered to programme.
- 17 This improved performance by EDF and AREVA, and the increased focus this work is receiving, have allowed us to progress our assessment of all the remaining GDA Issues. The level of assessment and interaction with EDF and AREVA has been intensive throughout the last quarter. Many technical exchanges and meetings have taken place and we have used these to resolve technical questions and reach agreement on solutions to the GDA Issues. As a result, we have now reached technical agreement on the route to completion of almost all of the GDA Issues. The remaining areas of technical discussion are receiving significant attention and we expect to converge on technical solutions to these during October. However, we will not close the GDA Issues until we are satisfied that the responses provide a robust justification for their closure.
- 18 As our interaction with EDF and AREVA on the GDA Issues draws to a close we are turning our attention to completion of our assessment reports. When they are finalised, these GDA Issue close-out reports are being added to our website at :
<http://www.hse.gov.uk/newreactors/gda-issue-close-out-uk-epr.htm#close-out-reports>
- 19 ONR and Environment Agency assessment is continuing and, given the improvements in the quality and timeliness of the submissions that we have received in the last six months, it now looks possible that closure of all Issues could be achieved before the end of the year, providing we are satisfied by the safety, security and environmental arguments that EDF and AREVA put forward. This would then enable us to consider whether we should issue a final DAC and SoDA for the UK EPR.
- 20 EDF and AREVA continue to propose a number of modifications to the UK EPR design to take account of the solutions they have put forward for some of the GDA Issues. For example, they have recently proposed: to remove or reinforce several penetrations and openings in the spent fuel pool to increase the robustness of the structure; and to diversify the electrical power supply systems to improve the defence in depth. The detailed design of these modifications will be progressed after GDA, during the site-specific detailed design and construction phase.

WESTINGHOUSE PAUSE

- 21 Westinghouse will not address any of the GDA Issues until it secures a UK customer. Accordingly, we have undertaken no work on the AP1000[®] reactor during 2012.

INTERACTIONS WITH WIDER NEW BUILD PLANS

- 22 In parallel with GDA we are assessing the Nuclear Site Licence (NSL) and both the construction and operational environment permit applications for Hinkley Point C (see our websites at <http://www.hse.gov.uk/nuclear/newbuild.htm> and <http://www.environment-agency.gov.uk/hinkleypoint>). It should be noted however, that while granting of a NSL and provision of a DAC and SoDA would be significant steps, they do not themselves permit the start of nuclear safety-related construction. That would require a separate regulatory permission from ONR under a licence condition.

- 23 We have continued to work closely with NNB GenCo, who is now taking a key role in GDA. In particular, it is seeking assurance that the methodologies and strategies for addressing the GDA Issues will help support the Hinkley Point C design engineering and contracting process. We have therefore had a number of joint meetings with NNB GenCo, EDF and AREVA, to ensure that the results of GDA can be integrated within the site-specific plans for the construction of the UK EPR at Hinkley Point C.
- 24 We continue to believe that this additional effort, at an early stage in the overall programme, is helping reinforce the benefits of GDA. We remain convinced that closing out GDA Issues and resolving key safety and environmental issues before the start of nuclear island construction should lead to more predictable and achievable schedules for the proposed construction phase.
- 25 During this quarter the Environment Agency has begun consulting on its draft decisions for three key operational environmental permits for Hinkley Point C. These are for radioactive discharges and disposals of radioactive wastes, discharge of cooling and process waters from the site, and operation of standby power supplies. The consultation, which will close on 9 November, can be found at <http://www.environment-agency.gov.uk/homeandleisure/132474.aspx>

OTHER PRESENTLY DECLARED POTENTIAL OPERATORS

- 26 Our interactions with Horizon Nuclear Power have reduced as it seeks new investors following the announcement that the parent companies RWE and EON are not pursuing the UK build programme for nuclear reactors at Wylfa and Oldbury. We will seek to discuss with Horizon the implications for our work in ONR and the Environment Agency following any announcement it makes regarding new investors.
- 27 NuGen, the UK nuclear company owned by GDF SUEZ and IBERDROLA, who are planning to implement 3.6GW of electricity generation at its Moorside site adjacent to Sellafield, is progressing with its plans. Our interactions remain limited, however, reflecting the early state of development of this project

MORE INFORMATION ON GDA

To find out more about Generic Design Assessment (GDA) - visit: www.hse.gov.uk/newreactors

To receive the latest news and information on GDA, subscribe to our eBulletin by visiting www.hse.gov.uk/newreactors/ebulletin.htm

ANNEX 1
EPR Metrics Trending Summary - July 2012 - September 2012

		Civil Engineering			Control and Instrumentation			Fault Studies			Internal Hazards			Reactor Chemistry			Structural Integrity			Electrical Power Systems			Radiation Protection			Human Factors			Cross Cutting 1			Cross Cutting 2			Cross Cutting 3 Fukushima		
GDA on track?	RP Progress	Green	Green	Green	Orange	Orange	Orange	Orange	Green	Green	Orange	Orange	Orange	Green	Green	Green	Green	Green	Orange	Green	Green	Green	Green	Green	Green	Orange	Orange	Orange	Orange	Orange	Green	Orange	Orange	Green			
	ONR Progress	Orange	Orange	Green	Orange	Orange	Orange	Orange	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Orange	Orange	Orange	Orange	Orange	Green	Green	Green	Green			
EDF/Arava delivery/quality	Predicted	Green	Green	Green	Orange	Orange	Orange	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Orange	Green	Green	Green	Green	Green	Green	Orange	Orange	Orange	Orange	Orange	Green	Orange	Orange	Green			
	Issue 1	Green	Green	Green	Orange	Orange	Orange	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Orange	Orange	Orange	Orange	Orange	Green	Orange	Orange	Green			
Likelihood the Resolution Plan will result in closure of the GDA Issue	Issue 2	Green	Green	Green	Orange	Green	Grey	Orange	Orange	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Orange	Orange	Orange	Orange	Orange	Green	Orange	Orange	Green			
	Issue 3	Green	Green	Grey	Orange	Orange	Green	Orange	Orange	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Orange	Orange	Orange	Orange	Orange	Green	Orange	Orange	Green			
	Issue 4	Green	Green	Grey	Red	Orange	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Orange	Orange	Orange	Orange	Orange	Green	Orange	Orange	Green			
	Issue 5	Green	Green	Grey	Orange	Orange	Green	Red	Red	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Orange	Orange	Orange	Orange	Orange	Green	Orange	Orange	Green			
	Issue 6	Green	Green	Grey	Red	Red	Red	Red	Red	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Orange	Orange	Orange	Orange	Orange	Green	Orange	Orange	Green			
		J	A	S	J	A	S	J	A	S	J	A	S	J	A	S	J	A	S	J	A	S	J	A	S	J	A	S	J	A	S	J	A	S	J	A	S

Process & Progress	
Green	RP generally on plan to deliver GDA Issue Actions in accordance with its Resolution Plan. Any delays capable of being recovered.
Orange	An early warning signalling that significant, prompt action is required to avoid delays to the target closure date of the GDA Issues.
Red	Delays cannot be recovered and will impact on the target closure date for GDA Issues. If this occurs the Resolution Plan will need to be re-baselined and the target dates changed (via Change Order).

Resolution Difficulty	
Green	Green - Closure of the GDA Issue appears highly likely and there are no major risks which at this stage appear to threaten closure of the GDA Issue
Orange	Amber - Closure of the GDA Issue appears feasible but significant risks exist requiring prompt attention. These appear resolvable at this stage and if addressed should enable closure of the GDA Issue. The text accompanying an Amber or Red metric should succinctly describe the rationale for their difficulty of resolution, any planned mitigation and be referenced to associated correspondence/ TQs / additional GDA Issue Actions as appropriate.
Red	Red - Closure of the GDA Issue is in serious doubt with major risks apparent. Resolution of the GDA Issue is unlikely to be achieved by performing the planned safety analysis or changes to the design of the NPP and further GDA Issue Actions and amendments to the Resolution Plan are required. The text accompanying an Amber or Red metric should succinctly describe the rationale for their difficulty of resolution and be referenced to associated correspondence/ TQs / additional GDA Issue Actions as appropriate. If this occurs the Resolution Plan and ONR's GDAI Resolution Baseline Schedule will need to be re-baselined (via Change Order).
Grey	Grey - GDA Issues Closed
Blank	Blank - Judgement on this issue can not be formed as insufficient assessment has been undertaken to date

The topic areas and the GDA Issues are defined in the Step 4 reports, which can be viewed at

<http://www.hse.gov.uk/newreactors/regulators-issue-interim-dac-soda-gda-key-milestone.htm>

The forward work plan for resolution of the GDA Issues for the UK EPR and its timescale is largely dependent on the work programmes of the Requesting Party. The durations for ONR and the Environment Agency's assessment work included in the resolution plans are indicative only. Whilst the regulators will use their best endeavours to assess submissions in accordance with these plans, the time taken to complete our assessments will depend on the quality of the submissions and the extent to which they address the GDA Issues. The regulators' priority will always be to ensure that any new reactor design will be safe, secure and environmentally acceptable

ANNEX 2 – PROGRESS TOWARDS EPR GDA ISSUE CLOSE-OUT

GDA Issue Deliverables vs Time - September 2012

