



UK EPR	UK EPR GDA PROJECT			
	Title: Resolution Plan for GI-UKEPR-IH-01			
	RP unique number: GI-UKEPR-IH-01-RP	Revision No.: 0	Effective Date: 30/06/2011	Page No.: 1 of 10
Approved for EDF by: A. PETIT Name/Initials  Date 30/06/2011		Approved for AREVA by: C. WOOLDRIDGE Name/Initials  Date 30/06/2011		

Resolution Plan Revision History

Rev.	Description of update	Date issued
Revision 0	First Issue	30/06/2011

1.0 GDA ISSUE

GDA Issue Title	Main Assessment Area	Related Assessment Area
Substantiation and Analysis of the Consequences of Dropped Loads and Impact from Lifting Equipment Included within the EPR Design	Internal Hazards	Mechanical Engineering Civil Engineering

GDA Issue	Substantiation and analysis of the consequences of dropped loads and impact from lifting equipment included within the EPR design.
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2.0 OVERVIEW OF SCOPE OF WORK

A safety case for some representative RS1 and RS2 load drops will be provided addressing all applicable NII SAPs. An ALARP justification will be given to show that all reasonably practicable steps have been taken in the UK EPR design for reducing risks to nuclear safety due to postulated load drops.

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3.0 GDA ISSUE ACTIONS AND RESOLUTION PLAN DELIVERABLES

3.1 Action GI-UKEPR-IH-01.A1

Action I/D	Action Description
GI-UKEPR-IH-01.A1	<p>Provide substantiation of the nuclear safety significant structures, systems and components vulnerable to dropped load and impact from RS1 and RS2 lifting equipment.</p> <p>It is the expectation of ONR that dropped loads be considered for lifts that may result in nuclear significant consequences. The response should include detailed assessment of potential loads that could be dropped under such conditions and demonstrate that the provisions in place to ensure that the risk to nuclear safety of a load drop or impact is ALARP. Such assessment may include a multi-legged arguments which consider the following:</p> <ul style="list-style-type: none"> • Claims on civil structures. • Additional physical protection. • Limits and conditions on the use of the RS1 and RS2 lifting equipment. • Provision of detailed load path routes avoiding areas of highest nuclear significance. • Measures (both system based and administratively controlled) in place to ensure the potential for impact of the load is minimised. • Any further defence in depth and ALARP measures that could be implemented into the design. • The impact of the changes made to the PCSR relating to the outcome of this substantiation on other safety case submissions. <p>The list above should not be considered to be exhaustive and the items detailed above are provided as a means to inform EDF and AREVA of my expectations.</p> <p>With agreement from the Regulator this action may be completed by alternative means.</p>

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3.1.1 Planned submissions in response to GI-UKEPR-IH-01.A1

3.1.1.1 Description of Scope of Work

EDF/AREVA will provide substantiation of the nuclear safety significant structures, systems and components vulnerable to dropped load and impact from RS1 and RS2 lifting equipments.

EDF/AREVA will develop a safety case covering representative potential drop loads and demonstrate that the provisions in place to ensure that the risk to nuclear safety of a load drop or impact, is ALARP. The case will consider:

- Claims on civil structures and additional physical protection.
- Limits and conditions on the use of the RS1 and RS2 lifting equipment.
- Provision of detailed load path routes.
- Measures in place to ensure that the potential for impact of the load is minimised.
- Any identified design changes
- Any further defence in depth and ALARP measures that could be implemented into the design.

3.1.1.2 Description of Methodology to be employed

A safety case will be developed covering representative load drops of potential significance to nuclear safety in UK EPR taking into account all plant states. The following will be included:

Task 1 for GI-UKEPR-IH-01.A1: Design Basis & Principles document with:

- Description of classification principles for Lifting Devices
- Description of RS1/RS2 lifting devices & Load path routes
- Review of operating feedback experience
- Presentation of acceptance criteria for load drop events in terms of frequency versus radiological consequences
- Identification of existing prevention measures (design, administrative ...)

Task 2 for GI-UKEPR-IH-01.A1 : Dropped Loads Safety Case document

A dedicated dropped load case will be developed and will include:

- An analysis of four representative load drops from the individual RS1 Lifting Devices
 - The representative cases which have been selected are the drop of the RPV closure head on the reactor vessel, the drop of a concrete missile slab on the RPV closure head, the drop of a concrete missile slab on the reactor cavity floor slab and the drop of the Multistud tensioning machine on the reactor cavity floor slab. These cases have been selected considering the weight and drop heights of the loads handled by the RS1 lifting devices and this selection will be justified as part of the analysis. An intermediate deliverable will provide the justification for the choice of these representative cases.

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- For these cases, EDF/AREVA will perform a deterministic analysis of impact on Systems, Structures and Components (SSCs), taking into account all plant states during which lifts are performed, and will describe the necessary additional prevention/protection measures. For this study, the calculation code which will be used to determine the potential impact on the civil works is NONDYN. This calculation code has been assessed by another regulator in the frame of a similar drop load study. The calculation code which will be used for the mechanical analysis is ANSYS.
- An analysis of four representative load drops from individual RS2 Lifting Devices.
 - EDF/AREVA will select the representative load drops from RS2 lifting devices that will be studied in detail. An intermediate deliverable will provide the justification for the choice of these representative cases
 - EDF/AREVA will perform a deterministic analysis of impact in Systems, Structures and Components (SSCs) and describe the necessary additional prevention/protection measures. For this study, the methodology which will be used to determine the potential impact on the civil works is the methodology developed in the frame of the action GI-UKEPR-IH-01.A2 of the present resolution plan.

The selection of the 8 load drops from individual RS1 and RS2 Lifting Devices will be presented with their justification as an intermediate deliverable and will be presented at a dedicated meeting with the ONR.

A technical report will be provided that will provide a summary of the assessment confirming that all reasonably practicable steps have been taken to reduce the risk due to load drops and summarizing the developments of the safety case for load drops, that will be required during NSL phase.

This technical report will be provided together with all the supporting reports prepared in the frame of the RS1 and RS2 cases. It has to be noted that the information and results that come from these dedicated studies on dropped loads, will be used as an input to the resolution of the Human Factors GDA issue (GI-UKEPR-HF-01).

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3.1.1.3 Deliverable description

Submission date to HSE/EA

Summary of Design Basis & Principles - Report	16/09/2011
Justification of the Dropped Load Cases selected for detailed Study	30/09/2011
Dropped Loads Safety Case – Summary report and supporting documents	30/12/2011
PCSR – Sub-chapter 13.2 – Internal Hazards Protection - Update (Advance copy)	30/12/2011
PCSR – Sub-chapter 13.2 – Internal Hazards Protection – Update (Final)	28/02/2012

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3.2 Action GI-UKEPR-IH-01.A2

Action I/D	Action Description
GI-UKEPR-IH-01.A2	<p>Provide a description of the approach taken to treat dropped loads on civil structures, including consideration of the following:</p> <ul style="list-style-type: none"> • Derivation of design loads. • Analysis methods. • Design rules. • Reliability expectations. • Consistency between ECEIG070272 REV A1 “EPR- Load Drops - Methodology for risk analysis in civil engineering and building installations - Design review preparation conditions” and ETC-C in relation to consideration of Global stability. <p>The list above should not be considered to be exhaustive and the items detailed above are provided as a means to inform EDF and AREVA of my expectations.</p> <p>With agreement from the Regulator this action may be completed by alternative means.</p>

3.2.1 Planned submissions in response to GI-UKEPR-IH-01.A2

3.2.1.1 Description of Scope of Work

A methodology report will be produced defining the approach for evaluating the dropped loads consequences on Civil Structures and Steel Structures. The methodology will be consistent with requirements of ETC-C AFCEN.

3.2.1.2 Description of Methodology to be employed

EDF/AREVA will develop a methodology to treat dropped loads impacts on civil structures, including consideration of

- Derivation of design loads.
- Analysis methods.
- Design rules.
- Reliability expectations.
- Global stability considerations.

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3.2.2.2 Deliverable description

Submission date to HSE/EA

ENGSGC100483 A “Methods with regard to the risk of dropped loads for EPR UK for concrete structure”	10/06/2011
PCSR – Sub-chapter 13.2 – Internal Hazards Protection – Update (Advance copy)	30/12/2011
PCSR – Sub-chapter 13.2 – Internal Hazards Protection – Update (Final)	28/02/2012

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4.0 SUMMARY OF IMPACT ON GDA SUBMISSION DOCUMENTATION

4.1 GDA submission documents impacted by GDA Issue and scheduled to be created (C) or updated (U) within GDA

GDA Submission Documents	C/U	Related GDA Issue Action(s)	Submission Date to HSE/EA
SSER sub-chapters			
PCSR – Sub-chapter 13.2 – Internal Hazards Protection – Update (Final)	U	GI UKEPR-IH-01-A1 GI UKEPR-IH-01-A2	28/02/2012
GDA reference design documents (SDM in UKEPR-I-002)			
Not Applicable		Not Applicable	Not Applicable
Other GDA submission supporting documents			
Summary of Design Basis & Principles - Report	C	GI UKEPR-IH-01-A1	16/09/2011
Justification of the Dropped Load Cases selected for detailed Study	C	GI UKEPR-IH-01.A1	30/09/2011
Dropped Loads Safety Case – Summary report and supporting documents	C	GI UKEPR-IH-01-A1	30/12/2011
ENGSGC100483 A “Methods with regard to the risk of dropped loads for EPR UK for concrete structure”	C	GI UKEPR-IH-01-A2	10/06/2011

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5.0 JUSTIFICATION OF ADEQUACY

EDF/AREVA will provide substantiation of the nuclear safety significant structures, systems and components vulnerable to dropped load and impact from RS1 and RS2 lifting equipment.

EDF/AREVA will develop a case on four representative potential drop loads for RS1 lifting equipment and four representative potential drop loads for RS2 lifting equipment. The case will demonstrate that the provisions in place to ensure that the risk to nuclear safety of a load drop or impact are ALARP

The case will consider:

- the claims on civil structures and additional physical protection,
- the limits and conditions on the use of the RS1 and RS2 lifting equipment,
- the provision of detailed load path routes,
- the reactor state and conditions,
- the measures in place to ensure that the potential for impact of the load is minimised,
- any identified design changes,
- any further defence in depth and ALARP measures that could be implemented into the design.

A technical report will be provided and will include the following:

- Summary of Design Basis & Principles
 - Methodology for evaluating RS1/RS2 dropped load impacts including impacts on civil works and steel structures
 - Analysis of representative Load Drops from individual RS1 Lifting Devices
 - Analysis of representative Load Drops from individual RS2 Lifting Devices
- Summary of assessment & further NSL developments

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6.0 TIMETABLE AND MILESTONE PROGRAMME LEADING TO THE DELIVERABLES

Consult the following page for the associated timetable and milestone programme.

GI-UKEPR-IH01-RP Schedule.mpp

ID	Task Name	Duration	Start	Finish	'11	Apr '11	May '11	Jun '11	Jul '11	Aug '11	Sep '11	Oct '11	Nov '11	Dec '11	Jan '12	Feb '12	Mar '12													
					1	2	4	1	1	2	2	9	1	2	3	6	1	2	2	4	1	1	2	2	9	1	2	3	6	1
1	GI-UKEPR-IH01 - Substantiation and Analysis of the Consequences of Dropped Loads	238 days	Fri Apr 1, '11	Tue Feb 28, '12																										
2	Action 1	195 days	Wed Jun 1, '11	Tue Feb 28, '12																										
3	Task 1 for GI-UKEPR-IH-01.A1	108 days	Wed Jun 1, '11	Fri Oct 28, '11																										
4	Summary of Design Basis & Principles - Report (Prel)	78 days	Wed Jun 1, '11	Fri Sep 16, '11																										
5	Transmission to ONR	0 days	Fri Sep 16, '11	Fri Sep 16, '11																										
6	ONR Assessment	15 days	Mon Sep 19, '11	Fri Oct 7, '11																										
7	Update following resolution of ONR comments (if applicable)	15 days	Mon Oct 10, '11	Fri Oct 28, '11																										
8	Submission of finalised report	0 days	Fri Oct 28, '11	Fri Oct 28, '11																										
9	Task 2 for GI-UKEPR-IH-01.A1	96 days	Fri Jul 1, '11	Fri Nov 11, '11																										
10	Justification of the Dropped Load Cases selected for detailed Study	66 days	Fri Jul 1, '11	Fri Sep 30, '11																										
11	Transmission to ONR	0 days	Fri Sep 30, '11	Fri Sep 30, '11																										
12	ONR Assessment	15 days	Mon Oct 3, '11	Fri Oct 21, '11																										
13	Update following resolution of ONR comments (if applicable)	15 days	Mon Oct 24, '11	Fri Nov 11, '11																										
14	Submission of finalised report	0 days	Fri Nov 11, '11	Fri Nov 11, '11																										
15	Task 3 for GI-UKEPR-IH-01.A1	152 days	Mon Aug 1, '11	Tue Feb 28, '12																										
16	Analysis of Load Drops from individual RS1 Lifting Devices	77 days	Mon Aug 1, '11	Tue Nov 15, '11																										
17	Analysis of Load Drops from individual RS2 Lifting Devices	77 days	Mon Aug 1, '11	Tue Nov 15, '11																										
18	Dropped Loads Safety Case – Summary report and supporting documents	33 days	Wed Nov 16, '11	Fri Dec 30, '11																										
19	Transmission to ONR	0 days	Fri Dec 30, '11	Fri Dec 30, '11																										
20	ONR Assessment	21 days	Tue Jan 3, '12	Tue Jan 31, '12																										
21	Update following resolution of ONR comments (if applicable)	20 days	Wed Feb 1, '12	Tue Feb 28, '12																										
22	Submission of finalised report and documents (if applicable)	0 days	Tue Feb 28, '12	Tue Feb 28, '12																										
23	Action A2	111 days	Fri Apr 1, '11	Fri Sep 2, '11																										
24	Task 1 for GI-UKEPR-IH-01.A2	111 days	Fri Apr 1, '11	Fri Sep 2, '11																										
25	Preparation of report ENGSGC100483 A "Methods with regard to the risk of dropped loads for EPR UK for concrete structure"	51 days	Fri Apr 1, '11	Fri Jun 10, '11																										
26	Transmission to ONR	0 days	Fri Jun 10, '11	Fri Jun 10, '11																										
27	ONR Assessment	20 days	Mon Jul 18, '11	Fri Aug 12, '11																										
28	Update following resolution of ONR comments (if applicable)	15 days	Mon Aug 15, '11	Fri Sep 2, '11																										
29	Submission of finalised report (if applicable)	0 days	Fri Sep 2, '11	Fri Sep 2, '11																										
30	PCSR Update for A1 and A2	53 days	Fri Dec 16, '11	Tue Feb 28, '12																										
31	PCSR – Sub-chapter 13.2 – Internal Hazards Protection – Update (Advanced copy)	11 days	Fri Dec 16, '11	Fri Dec 30, '11																										
32	Transmission to ONR	0 days	Fri Dec 30, '11	Fri Dec 30, '11																										
33	ONR Assessment	21 days	Tue Jan 3, '12	Tue Jan 31, '12																										
34	Update following resolution of ONR comments	20 days	Wed Feb 1, '12	Tue Feb 28, '12																										
35	PCSR – Sub-chapter 13.2 – Internal Hazards Protection – Update (Final)	0 days	Tue Feb 28, '12	Tue Feb 28, '12																										

Project: Template - GDAI Resolution P
Date: Thu Jun 30, '11

Task		Progress		Summary		External Tasks		Deadline
Split		Milestone		Project Summary		External Milestone		