Environment Agency

Office for Nuclear Regulation

An agency of HSE

Generic Design Assessment – New Civil Reactor Build

GDA Close-out for the EDF and AREVA UK EPR™ Reactor

GDA Issue GI-UKEPR-CC-02 Revision 3 – Consolidated Final GDA Submission including agreed Design Changes for the UK EPR™

Assessment Report: ONR-GDA-AR-12-024
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EXECUTIVE SUMMARY

This report presents the close-out of the Office for Nuclear Regulation (ONR), an agency of the Health and Safety Executive (HSE) and Environment Agency's Generic Design Assessment (GDA) of the cross-cutting GDA Issue **GI-UKEPR-CC-02** and its three actions associated with the control, maintenance and development of the UK EPR™ final consolidated GDA submission documentation. This documentation includes the Safety, Security and Environment Report (SSER), Submission Master List (SML) and Reference Design Configuration as these have been impacted by GDA Issue responses and agreed design changes that have been progressed during the GDA Issue close-out period.

This is particularly important as these documents form the key references to the Design Acceptance Confirmation (DAC) and Statement of Design Acceptability (SoDA) and the Regulators need to be sure that the developments that arose during the GDA Issue close-out period have been appropriately and consistently captured.

The assessment focused on the deliverables identified within the EDF and AREVA Resolution Plan published in response to the GDA Issue, and on inspection of EDF and AREVA's GDA project arrangements for control of GDA submission documentation.

The approach taken by EDF and AREVA for management of these documents was to apply and develop the project procedures, utilised during GDA Step 4. These arrangements cover the control of GDA documentation impacted by GDA Issues, and design changes agreed for inclusion in the GDA reference design.

The Resolution Plan deliverables included design change proposals, handover packages for future UK EPR™ licensees to use to implement agreed GDA design changes, a specification for the update of the GDA EPR™ reference design System Design Manuals (SDMs), final SML and final SSER.

From regulatory assessment, the Regulators are satisfied that the EDF and AREVA arrangements for the control of updates to the final GDA submission documentation including the SSER, SML and reference design for the UK EPR™ are adequate and that these documents are used as the key references to the DAC/SoDA.

The Regulators judgement is based upon the following factors:

- The EDF and AREVA processes for control of updates to the SSER, SML and reference design were confirmed by review and inspection to be robust and this provides confidence in the provenance of these key GDA deliverables.
- EDF and AREVA have completed consistency checks across SSER chapters, reviewed the SML and the final revision of the reference design to ensure consolidation and concurrence across the GDA deliverables.
- Sufficient information was provided by EDF and AREVA for the Regulators to agree that design changes identified through the resolution of GDA Issues could be included within the GDA documentation.
- The specification for update of SDMs post GDA is considered to provide sufficient information to assist a future UK EPR™ licensee in developing site-specific SDMs to include GDA safety function (SF) categorisation and structures, systems and components (SSC) classification methodologies and agreed design changes.

- The handover package documentation provided by EDF and AREVA for agreed design changes was confirmed by review to be sufficient to assist a future licensee with the incorporation of these changes into a site-specific EPR™ design.
- The Regulators completed reviews and sample checks on updated and final GDA key deliverables including the SSER, SML and reference design to confirm their acceptability.

The Regulators are satisfied that EDF and Areva have adequately addressed GDA Issue, **GI-UKEPR-CC-02**.

Our examination has identified four Assessment Findings (AFs) associated with GDA Issue **GI-UKEPR-CC-02** for future UK EPR™ licensees to implement design changes agreed in GDA and to amend and develop supporting documentation impacted by these design changes. The AFs are provided in Annex 2.

LIST OF ABBREVIATIONS

AF	Assessment Finding
ALARP	As Low As Reasonably Practicable
BAT	Best Available Techniques
C&I	Control and Instrumentation
CMF	Change Management Form
DAC	Design Acceptance Confirmation
DF	Design Freeze
EDF and AREVA	Electricité de France SA and AREVA NP SAS
FA3	Flamanville 3, an EPR™ currently being constructed in France.
GDA	Generic Design Assessment
HSE	Health and Safety Executive
IAEA	International Atomic Energy Agency
INSA	Independent Nuclear Safety Assessment
IPR	Independent Peer Review
ONR	Office for Nuclear Regulation (an agency of HSE)
PCER	Pre-Construction Environmental Report
PCSR	Pre-Construction Safety Report
PI	Project Instruction
REP	Radioactive Substances Regulation Environmental Principle(s) (EA)
RO	Regulatory Observation
SAP	Safety Assessment Principle(s) (HSE)
SF	Safety Function
SML	Submission Master List
SDM	System Design Manual
SoDA	Statement of Design Acceptability
SSC	Structures, Systems and Components
SSER	Safety, Security and Environment Report
TAG	Technical Assessment Guide(s) (ONR)
TQ	Technical Query
WENRA	Western European Nuclear Regulators' Association

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1 INTRODUCTION

1.1 BACKGROUND

1 This report presents the close-out of the Office for Nuclear Regulation (ONR), an agency of the Health and Safety Executive (HSE) and Environment Agency's Generic Design Assessment (GDA) within the Cross Cutting area of agreed design change implementation, handover package documentation for incomplete design changes and final consolidation of GDA submission documentation.

2 This report specifically addresses the GDA Issue **GI-UKEPR-CC-02** and associated GDA Issue Actions (Ref. 1) generated as a result of the GDA Step 4[1] Cross Cutting Assessment of the UK EPR™ (Ref. 2, 3, 4). The assessment has focused on the deliverables identified within the EDF and AREVA Resolution Plan (Ref. 5) published in response to the GDA Issue and on further assessment of those deliverables.

3 GDA followed a step-wise approach in a claims-argument-evidence hierarchy. In Step 2 the claims made by EDF and AREVA were examined and in Step 3 the arguments that underpin those claims were examined. The Step 4 assessment reviewed the safety aspects of the UK EPR™ reactor in greater detail, by examining the evidence supporting the claims and arguments made in the safety documentation.

4 The Step 4 Cross Cutting Assessment identified three GDA Issues (two of which were joint ONR and Environment Agency). The Step 4 Assessment Report also identified seven Assessment Findings (AFs) as part of the assessment of the evidence associated with the UK EPR™ reactor design.

5 A GDA Issue is an observation of particular significance that requires resolution before ONR and Environment Agency will agree to the commencement of nuclear safety related construction of the UK EPR™ within the UK. Assessment Findings result from a lack of detailed information and they identify the information that will be required to underpin the safety case and they are carried forward as part of normal regulatory business.

6 The Step 4 Assessment concluded that the UK EPR™ reactor was suitable for construction in the UK subject to resolution of 31 GDA Issues. The purpose of this report is to provide the assessment which underpins the judgement made in closing joint GDA Issue **GI-UKEPR-CC-02**. The other two cross cutting GDA Issues related to classification of structures, systems and components (SSCs) and impact of post Fukushima review on the UK EPR™ design are addressed in the close-out reports for GDA Issues **GI-UKEPR-CC-01** (Ref. 6) and **GI-UKEPR-CC-03** (Ref. 7) respectively.

1.2 SCOPE

7 This report presents only the assessment undertaken as part of the resolution of this GDA Issue and it is recommended that this report be read in conjunction with the Step 4 Cross Cutting Assessment by ONR (Ref. 2) and the management systems Final Assessment Report and Decision Document by the Environment Agency (Ref. 3, 4) of the EDF and AREVA UK EPR™ in order to appreciate the totality of the assessment of the evidence undertaken as part of the GDA process.

[1] Step 4 Assessment refers to ONR's assessment but throughout this document it should be read as including the Environment Agency's equivalent detailed assessment stage.

8 This assessment report is not intended to revisit aspects of assessment already undertaken and confirmed as being adequate during previous stages of the GDA. However, should evidence from the assessment of EDF and AREVA's responses to GDA Issues highlight shortfalls not previously identified during Step 4, there will be a need for these aspects of the assessment to be highlighted and addressed as part of the close-out phase or be identified as Assessment Findings to be taken forward to site licensing / permitting.

1.3 METHODOLOGY

9 ONR's methodology applied to this assessment is identical to the approach taken during Step 4 which followed the ONR HOW2 Business Management System Assessment Process AST/001 (Ref. 8), in relation to the mechanics of assessment within ONR. The Environment Agency's methodology applied to this assessment is identical to the approach taken during the detailed assessment stage.

10 This assessment has been focussed primarily on the submissions relating to resolution of the GDA Issues as well as any further requests for information or justification derived from assessment of those specific deliverables.

11 The aim of this assessment is to provide a comprehensive assessment of the submissions provided in response to the GDA Issue to enable the Regulators to gain confidence that the concerns raised have been resolved sufficiently so that they can be closed with lesser safety significant aspects being carried forward as Assessment Findings.

1.4 STRUCTURE

12 This Assessment Report is a joint report between ONR and Environment Agency. This Assessment Report structure differs slightly from the structure adopted for the previous reports produced within GDA, most notably the ONR Step 4 Cross Cutting Assessment report (Ref. 2) and the Environment Agency management systems final assessment report (Ref. 3). This report has been structured to reflect the assessment of this individual GDA Issue which concerns the arrangements for control of and the update to the final consolidated GDA submission that is the SSER (Ref. 9), SML (Ref. 10) and Reference Design Configuration (Ref. 11).

13 This was the last GDA Issue to be closed as it was linked to the closure of all other GDA Issues. Confirmation was required from Regulators that the final GDA submission, i.e. the SSER (Ref. 9), SML (Ref. 10) and Reference Design Configuration (Ref. 11), had been updated in line with regulatory expectations before this GDA Issue could be closed.

2 THE ASSESSMENT STRATEGY FOR CROSS CUTTING GDA ISSUES

14 The intended assessment strategy for GDA close-out of the three Cross Cutting GDA Issues was set out in an assessment plan that identified the intended scope of the assessment and the standards and criteria that would be applied.

15 The overall basis for the assessment of this Cross Cutting GDA Issue is the following:

- GDA submissions made to the Regulators in accordance with the Resolution Plan.
- Update to the Submission including the Pre-Construction Safety Report (PCSR) (Ref. 12), Pre-Construction Environmental Report (PCER) (Ref. 13) and supporting documentation.
- The Reference Design Configuration for the UK EPR™ GDA Project as described in the EDF and AREVA Project Instruction UKEPR-I-002 (Ref. 11) and supporting references. This document was updated throughout GDA Issue resolution to include design changes agreed within GDA.
- Design Change Submissions – which were proposed by EDF and AREVA and submitted in accordance with UK EPR™ GDA Project Instruction UKEPR-I-003 (Ref. 14).
- Handover package documentation for incomplete design changes as defined in UKEPR-I-003 (Ref. 14) and UK EPR™ Handover Document UKEPR-0020-001 (Ref. 15).
- Specification for update of System Design Manuals (SDMs) post GDA as defined in UKEPR-0019-001 (Ref. 16).

2.1 The Approach to Assessment for GDA Close-out

16 The approach to the closure of GDA Issues for the UK EPR™ Project involved the assessment of submissions made by EDF and AREVA in response to GDA Issues identified through the GDA process. These submissions are detailed within the EDF and AREVA Resolution Plan for the GDA Issue.

17 In the event of requiring further supporting evidence for the assessment, Technical Queries (TQ) were generated and these are identified in Annex 1. Requests for further information were also made through formal letters.

18 Additionally, formal feedback on some draft documentation and regulatory expectations for GDA deliverables including the SSER and Reference Design Configuration was provided as appropriate throughout the assessment.

19 The objective of the Cross Cutting assessment has been to assess submissions made by EDF and AREVA in response to the cross cutting GDA Issues, and the design changes proposed by EDF and AREVA and, if judged acceptable, close the GDA Issues.

2.2 Standards and Criteria

20 The relevant standards and criteria adopted within this assessment are principally the ONR Safety Assessment Principles (SAPs), the Environment Agency's Radioactive Substances Regulation Environmental Principles (REPs), internal ONR Technical Assessment Guides (TAGs), relevant national and international standards and relevant good practice informed from existing practices adopted on UK nuclear licensed sites. The key SAPs and REPs, and relevant TAGs have been referred to in this section. National and international standards and guidance have been referenced where

appropriate within the assessment report. Relevant good practice, where applicable, has also been cited within this GDA Issue close-out report.

2.3 Radioactive Substances Regulation Environmental Principles

21 The key REPs applied within this Cross-Cutting assessment of the EDF and AREVA UK EPR™ are included within Table 1 of this report.

2.4 Safety Assessment Principles

22 The key SAPs applied within this Cross-Cutting assessment of the EDF and AREVA UK EPR™ are referenced from the Technical Assessment Guides in Section 2.4.1.

2.4.1 Technical Assessment Guides

23 The following Technical Assessment Guides have been used as part of this assessment (Ref. 17):

- T/AST/057 – Design Safety Assurance
- T/AST/051 – Guidance on the purpose, scope and content of Nuclear Safety Cases

2.4.2 National and International Standards and Guidance

24 The following international standards and guidance have been used as part of this assessment:

- Design Changes - IAEA Safety Standard: The Management System for Facilities and Activities Safety Requirements, GS-R-3 (Ref. 18).
- Design – ISO 9001:2008 Quality Management System – Requirements (Ref. 19).

2.5 Use of Technical Support Contractors

25 No Technical Support Contractors have been used.

2.6 Out-of-scope Items

26 The following items have been agreed with EDF and AREVA as being outside the scope of GDA:

- Design changes not agreed for inclusion in the UK EPR™ GDA Reference Design Configuration UKEPR-I-002 (Ref. 11).
- Detailed design including supplier specific information.
- Update of SDMs (see section 4.2.1 of this report).

3 EDF AND AREVA DELIVERABLES IN RESPONSE TO THE GDA ISSUE

27 The information provided by EDF and AREVA in response to this GDA Issue, as detailed within their Resolution Plan (Ref. 5), was broken down into the component GDA Issue Actions and then further broken down into eight key deliverables for detailed assessment:

GDA Issue Action	Deliverable	Ref.
GI-UKEPR-CC-02.A1	UKEPR-0019–001 Specification for System Design Manuals Update post GDA	16
GI-UKEPR-CC-02.A1	UKEPR-I-002 Reference Design Configuration	11
GI-UKEPR-CC-02.A1	UKEPR-I-003 Design Change Procedure	14
GI-UKEPR CC-02.A1	CMF submission programme	20
GI-UKEPR-CC-02.A2	UKEPR-0020-001 Handover document for GDA design changes	15
GI-UKEPR-CC-02.A3	UKEPR-I-038 Specification for the Consolidated GDA SSER	21
GI-UKEPR-CC-02.A3	UKEPR-0018-001 Submission Master List	10
GI-UKEPR-CC-02.A3	Consolidated SSER (comprises the PCSR and PCER)	9

28 An overview of each of the deliverables is provided within this section. It is important to note that this information is supplementary to the information provided within the Consolidated Step 4 PCSR (Ref. 22), PCER (Ref. 23) and supporting documents submitted in March 2011, which has already been subject to assessment during earlier stages of GDA. In addition, it is important to note that the deliverables are intended to provide further evidence that EDF and AREVA's arrangements for the control and update of the SSER, SML and Reference Design Configuration are robust and that these are included as key references to the DAC / SoDA.

3.1 UK EPR-0019–001 Specification for System Design Manuals (SDMs) update post GDA

29 This document provides a high level description of the work required to update SDMs after GDA to align with the application of GDA methodologies and design changes agreed for inclusion in GDA. The specification includes generic update requirements for the inclusion of the GDA safety function (SF) categorisation and structures, systems and components (SSC) classification methodologies and where applicable specific design change requirements. This should be used in conjunction with the handover package documentation (Section 3.5) to help the licensee in developing site-specific SDMs.

3.2 UKEPR-I-002 Reference Design Configuration

30 This document defines the UK EPR™ reference design which includes agreed GDA design changes and out of scope items. This document has been updated throughout GDA to reflect the inclusion of agreed design changes.

3.3 UKEPR-I-003 Design Change Procedure

31 This procedure defines the arrangements for the control of design changes for inclusion in GDA. This procedure has been amended to include further details of handover package documentation to assist the implementation of incomplete design changes during site licensing. The procedure was further amended to capture the requirements for inclusion of design change proposals (CMFs) raised towards the end of the GDA process (after 31 May 2012). This included the requirements for enhanced safety justification and a high level impact assessment for these Stage 1 CMFs as no Stage 2 full impact assessments were completed in GDA for CMFs raised after 31st May 2012.

3.4 CMF Submission Programme

32 The CMF submission programme was sent to the Regulators periodically throughout GDA. This provided information on CMFs already agreed within GDA and projected timings for submission of affected GDA documentation.

3.5 UKEPR–0020-001 UK EPR™ Handover document for GDA design changes

33 This handover document for licensees is supported by an Annex containing handover packages for each design change agreed for inclusion in GDA. The individual design change handover forms were assessed for suitability; this is discussed in Section 4.2.2.

3.6 UKEPR-I-038 Specification for Consolidated GDA SSER

34 This procedure specifies the schedule, responsibilities and scope of work for updating the SSER chapters and for undertaking consistency checks throughout the final consolidated GDA SSER.

3.7 UKEPR-0018-001 Submission Master List

35 The totality of the GDA submission, including the SSER, is defined in a list known as the Submission Master List (SML) which includes not only those documents submitted to the Regulators during GDA for assessors to review but also all other documents that collectively constitute the complete GDA submission that were not requested for review by the Regulators.

3.8 UK EPR™ Consolidated SSER

36 The production of the final consolidated SSER, including the final PCSR and PCER, was controlled to ensure consistency of claims, arguments and evidence submitted in GDA. This included responses from EDF and AREVA to comments provided by the Regulators on the Consolidated Step 4 SSER.

4 THE REGULATORS' ASSESSMENT

37 Further to the assessment work undertaken during Step 4 (Ref. 2, 3, 4), and the resulting GDA Issue **GI-UKEPR-CC-02** (Ref. 1), this assessment focused on implementation of GDA agreed design changes (see Table 2), handover packages for the incomplete GDA agreed design changes and the final consolidated GDA safety submission documentation, including the SSER, SML and Reference Design Configuration.

4.1 Scope of Assessment Undertaken

38 The scope of the assessment has been to consider the expectations within the GDA Issue, **GI-UKEPR-CC-02**, and the associated GDA Issue actions. These are detailed within Annex 3 of this report. For each of the following areas further evidence was sought on:

- Application of adequate controls and processes for the identification, categorisation, impact assessment and implementation of design changes agreed for inclusion in the GDA reference design (Ref. 11).
- Application of adequate control arrangements for maintaining and updating the GDA submission documentation to address GDA Issues.

39 The scope of this assessment was not to undertake further assessment of the information already provided in the Step 4 SSER nor was it intended to extend the assessment beyond the expectations stated within the GDA Issue actions.

4.2 Assessment

40 The eight key deliverables provided to support closure of the three associated GDA Issue actions are listed and summarised in Section 3 of this report.

41 The Resolution Plan for this GDA Issue was revised to take account of the change in design scope that was agreed with the Regulators and this is described in more detail in Sections 4.2.1.2 and 4.2.1.4 of this report.

4.2.1 Design changes

42 The sub-sections below summarise the regulatory assessment undertaken in this topic area against the following headings:

- 4.2.1.1 Arrangements for control of update to GDA reference design
- 4.2.1.2 Design changes agreed in GDA
- 4.2.1.3 Design change proposals not agreed in GDA
- 4.2.1.4 Documentation affected by design changes agreed in GDA

4.2.1.1 Arrangements for control of update to GDA reference design

43 The GDA UK EPR™ reference design was frozen in December 2008 based upon the French Flamanville 3 (FA3) EPR™ project design at that time and this was known as Design Freeze 2008 (DF2008). During Step 4 and as detailed in the Step 4 Assessment Report (Ref. 2), the Regulators defined a six step process for the progress and agreement of design changes in GDA to control the update of the GDA design from DF2008 (Ref. 24). This six step process has been incorporated into EDF and AREVA's project design change control procedure UKEPR-I-003 (Ref. 14) and was applied to CMFs raised before 31 May 2012.

44 In order to accommodate design changes submitted after the 31 May 2012 cut-off date, a modified approach to assessment was adopted. EDF and AREVA proposed that CMFs submitted after this date would include an enhanced safety and environmental justification, an initial categorisation and limited impact analysis on the SSER and reference design documents such as SDMs (Ref. 25).

45 As there would be no full impact analysis (Stage 2 form) for CMFs submitted after 31 May 2012, the basis for their inclusion in the GDA reference design would be the information provided in an enhanced Stage 1 CMF and the high level impact assessment included in the CMF submission programme. The Regulators considered and accepted this proposal as it ensured that design changes emerging towards the end of the GDA process that could provide enhancements to safety / environment were included in the GDA reference design (Ref. 26).

46 Given that the impact of design changes proposed after 31 May 2012 and agreed as part of the reference design would not be captured in all cases in the final consolidated SSER, the Regulators agreed with EDF and AREVA that these would be implemented after GDA by any future licensee. Handover documentation produced by EDF and AREVA (described in Section 4.2.1.3) is designed to help future licensees implement such agreed design changes.

47 The process for proposal and assessment of design changes submitted after 31 May 2012 was included in an amendment to the EDF and AREVA procedure UKEPR-I-003 (Ref. 14) for control of GDA design changes.

48 In response to comments provided by the Regulators during the CMF review process, EDF and AREVA revised and resubmitted the Stage 1 forms for several CMFs that were raised after 31 May 2012, to address regulatory comments. These revised CMFs were subsequently agreed for inclusion in the GDA reference design and notification was provided to EDF and AREVA (Ref. 27, 29).

49 For five draft CMFs the Regulators provided comments concerning clarification of terminology and consistency across the proposals. However, when EDF and AREVA submitted the Stage 1 forms for these CMFs, the comments had not been addressed. It was judged that the Regulators comments were not significant enough to reject the CMFs, and instead comments were captured in a tracker which is included in the handover document (see Section 4.2.1.3). This resulted in a further revision to the procedure by EDF and AREVA UKEPR-I-003 (Ref. 14) for control of GDA design changes.

50 For any design change proposals categorised as having significant impact on the GDA submission (categorised as ‘A1’ changes), EDF and AREVA were required to undertake a supporting Independent Nuclear Safety Assessment (INSA) or Independent Peer Review (IPR). This requirement has been included in EDF and AREVA’s GDA change procedure UKEPR-I-003 (Ref. 14) in Step 4.

51 The arrangements for controlling agreed design changes and maintaining the reference design applied in support of GDA close-out have been examined and found to be adequate. All the design changes (CMFs) listed in Table 2 have been agreed by the Regulators for inclusion in the GDA reference design.

52 The Regulators concluded that EDF and AREVA’s arrangements for the control and update of the GDA reference design UKEPR-I-002 (Ref. 11) and for controlling design changes UKEPR-I-003 (Ref. 14) were robust.

4.2.1.2 Design changes agreed in GDA

53 At the end of Step 4, there were 28 design changes that had been agreed for inclusion in the GDA reference design. These design changes arose from proposals from EDF and AREVA to improve the UK EPR™ reactor design, either as a result of experience gained on other EPR™ projects, or as a result of regulatory challenges.

54 During the GDA close-out phase a further 54 design changes were proposed by EDF and AREVA within their responses to the GDA Issues, and accepted by the Regulators. These included design changes covering several GDA technical topics with the majority relating to the following areas:

- C&I,
- Fault Studies,
- Classification,
- Structural Integrity,
- Fukushima.

55 Further details of the design changes associated with these topic areas can be found in the close-out reports for the relevant GDA Issues. The GDA Issues related to design changes are identified in Table 2.

56 Seven of the 54 design changes agreed for inclusion in the GDA reference design during the close-out phase of GDA, were raised as a result of this GDA Issue **GI-UKEPR-CC-02**. All of these originated from consistency checks undertaken by EDF and AREVA across the SSER and reference design.

57 Consistency checks undertaken by EDF and AREVA revealed that several FA3 modifications were only partially implemented in GDA documentation and needed to be fully incorporated into the GDA reference design. The design changes referred to changes made to GDA submission documentation to address GDA Issues and / or Technical Query's (TQ's) or Regulatory Observations (ROs) and to changes that had been partially implemented in the DF2008 System Design Manuals and / or the March 2011 SSER (Ref. 23). These FA3 modifications were grouped in batches and submitted to the Regulators as proposed design changes (CMFs) and are described below.

- **CMF 43**: **Consistency review of the 2008 Design Freeze – Fault Studies**.

  This covers the FA3 modification CANP0028 and concerns the underwater fuel storage arrangements. The underwater fuel storage configuration defined during the early FA3 design identified two storage regions. The change of the storage configuration (from two regions to one region) was part of the initial GDA reference design (DF2008). CMF 43 concerns the impact of the one region fuel storage on the spent fuel pool heat removal system.

- **CMF 44: Consistency review of the 2008 Design Freeze – Reactor Chemistry**. This CMF covers two FA3 modifications:

  - CANP 0047 – This provides for hydrazine injection during plant shutdown to reduce the corrosion risk.
  - CFSE 0207 – This provides for implementation of a zinc injection device in the primary circuit in order to reduce the radiation dose rate from radioactive cobalt.

- **CMF 45: Consistency review of the 2008 Design Freeze – Radiation protection**. This CMF covers three FA3 modifications:
  - CFSE0407 – This concerns the provision of gamma spectrometry devices for measuring noble gases discharged via the main stack.
  - CFSE0437 – This concerns the classification level of Plant Radiation Monitoring System connected to the Containment Sweeping Ventilation System.
  - CFSE0367 – This provides for the addition of a monitoring device in Plant Radiation Monitoring System on the discharge from the Chemical and Volume Control System.
- **CMF 46: Consistency review of the 2008 Design Freeze – Mechanical Engineering**.

  This CMF covers the following FA3 modifications:
  - CFSE0269 – To provide an alternative feed water supply route to Emergency Feed Water System and provision of a make-up route from the spent fuel pool.
  - CFSE0373/CANP0466 – For the addition of four 3-way valves on the Safety Injection System trains 1 and 4.
  - CMA0046 – To improve the Auxiliary Crane controls for handling new fuel containers by provision of automatic control of lifting arrangements.
  - CFSE0445/CANP0896 – Change of the initial position of motorised isolation valves EVU1111VP and EVU4100VP from open to closed in order to prevent draining of the In-containment Refuelling Water Storage Tank to the Safeguards Auxiliary Building.
- **CMF 69: GDA Deliverables Consistency Review.**

  The original version of this CMF presented to the Regulators covered the following FA3 modifications:
  - CANP0352 – The implementation of permanent monitoring of the Safety Injection System line-up for configurations, when operation of this is required.
  - CFSE0336 – Implementation of load shedding for the emergency diesel generators when safety injection is in service which involves adding a new output to the protection system. This will allow for disconnection of some actuators during safety injection.
  - CFSE0244 – Modification of arrangements for disconnection / reconnection of actuators during switchover from Unit Step Down Transformer to Auxiliary Step Down Transformer.
  - CFSE0364 – Implementation of a gully (drain channel) and a line collecting all the floor drains coming from the Fuel Building extension to the sump RPE6601BA in the Nuclear Auxiliary Building.
  - CANP0183 – Modification of vent and drain piping and valves to enable the detection of Residual Heat Removal System breaks in the Safety Auxiliary Building.

- ECNF0481 – Implementation of eight deflectors in the reactor pit to ensure that the airflow coming from the Containment Continuous Ventilation System can reach the lower part of the reactor pit in order to have efficient cooling of the pressure vessel.
- CIG0056 – Establishment of fire sub-divisions for electrical supplies within divisions 1 and 4 to ensure the separation principle claimed in PCSR sub-chapter 13.2 is met.
- CIG0164: Provision of fire zoning of the vertical cable shafts in Fuel Building and Nuclear Auxiliary Building.

The Regulators questioned the basis for inclusion of the FA3 changes CFSE0336 and CFSE0244 which concerned the EPR™ electrical systems and requested EDF and AREVA to provide further clarification on these. EDF and AREVA reviewed the basis for these and confirmed that these changes were not partially implemented in the GDA reference design and could be deferred to the site-specific phase. Subsequently, EDF and AREVA revised CMF 69 to remove reference to the FA3 changes CFSE0336 & CFSE0244 and submitted the revised CMF (Ref. 28) and this was agreed by the Regulators for inclusion in GDA (Ref. 29).

- **CMF 81: C&I – Reference Configuration – Design Freeze 2008 Consistency Review**.

  This CMF covers the following FA3 modifications:

  - CANP0098 – Implementation of Main Stream Relief Train closed loop control functions in accordance with standard rules.
  - CANP0558 – Addition of the reactor vessel level onto the Safety Information and Control System to improve plant operation and assist operators.
  - CANP0565 – Addition of protection system status signals to improve management of Operating Technical Specification events.
  - CCC0147 – This provides for the implementation of a network dedicated to the communication between Safety Automation System cabinets classified F1B (FA3 classification system).
  - CANP0167 – This modification relates to optimisation of the interface between Rodpilot and Reactor Control Surveillance and Limitation system to protect against single failure.

- **CMF 82: New Fuel Dry Storage Rack – Modification of the Upper Support Frame**.

  This CMF concerns a modification of the new fuel dry storage rack upper support frame. Specifically, the location and support plates have been changed from a welded connection to a bolted connection. This modification facilitates fabrication and installation improvements and will allow for improved alignment techniques. Implementation of this modification ensures a consistent design configuration across the EPR™ fleet.

The Regulators had no objection to the inclusion of the seven CMFs listed above and agreed them for inclusion in the GDA reference design.

58 As described in Section 4.2.1.1 all design change proposals categorised as having significant impact on the GDA submission (categorised as 'A1' changes) were subject to a supporting Independent Nuclear Safety Assessment (INSA) or Independent Peer Review (IPR). One such design change, CMF 24, relating to classification methodology, is categorised as an A1 change but the associated INSA was completed before EDF and AREVA had finalised the classification methodology within GDA documentation. Although the Regulators do not judge it necessary for EDF and AREVA to complete a further INSA on this design change in GDA, it is appropriate that a future EPR™ licensee addresses this matter to provide further assurance on the robustness of this approach.

59 Furthermore, although the INSAs for CMFs 26 and 31 (see Table 2 for details) associated with C&I systems and a modification to primary circuit pipework were completed in GDA, further reviews are required during the site-specific phase to address the finalised development details associated with these modifications. Although this does not preclude these design changes from inclusion in the GDA reference design, it will be necessary for any future licensee to complete these activities after GDA to provide the required assurance that these significant design change proposals are robust. This leads to the following Assessment Finding:

> **AF-UKEPR-CC-08:** *A future licensee shall use relevant arrangements under the licence and environmental permits to ensure that an independent technical review is completed on the design changes described in Change Management Forms 24, 26 and 31 and listed in the GDA Reference Design Configuration UKEPR-I-002 Rev. 15.*
>
> **Required timescale:** *SSC Procurement Specifications*

60 In total, 40 design changes were submitted after 31 May 2012 and were assessed using the modified approach described in Section 4.2.1.1. Although the Regulators agreed to the inclusion of these 40 design changes (Ref. 29, 42), the modified assessment approach means that these design changes have been subject to a high level impact assessment only, and a full impact assessment is required to be undertaken after GDA by any future UK EPR™ licensees. Also the categorisation of the safety / environmental significance of these design changes is 'initial' and it will be necessary for a future UK EPR™ licensee to confirm the categorisation and safety / environmental impacts of such design changes as part of the site-specific development activities. This leads to the Assessment Finding:

> **AF-UKEPR-CC-09:** *A future licensee shall use relevant arrangements under the licence and environmental permits to demonstrate that the impact of design changes raised after 31 May 2012 and included in the GDA Reference Design Configuration UKEPR-I-002 Rev 15 are As Low As Reasonably Practicable (ALARP) / Best Available Techniques (BAT), and confirm their categorisation in terms of significance to nuclear safety and environment prior to their implementation into the site-specific detailed UK EPR™ design.*
>
> **Required timescale:** *SSC Procurement Specifications*

61 In conclusion, the Regulators are satisfied that the design changes agreed in GDA enhance the UK EPR™ design but the Regulators recognise that design changes agreed towards the end of GDA are still to undergo full ALARP / BAT assessments and if appropriate, INSA / IPR.

4.2.1.3 Design change proposals not agreed in GDA

62 At the end of 2010, following a design review at FA3, EDF and AREVA proposed to update the GDA EPR™ reference design to include an additional 282 design change proposals (termed 'A2/B changes') to improve consistency between the GDA reference design and the revised FA3 design, and thereby updating the GDA reference design from the DF2008 to DF2010 (Ref. 30). The Regulators agreed to consider this proposal (Ref. 31) and requested supporting information from EDF and AREVA on a sample of 20 of the proposed A2/B changes for further assessment.

63 During the Regulators' assessment, EDF and AREVA implemented a programme of work for their contractor SOFINEL (a joint EDF and AREVA company) to update SDMs affected by design changes already agreed in GDA (CMFs) and the proposed A2/B changes.

64 At a meeting in July 2011 (Ref. 32), EDF and AREVA explained that specifications were being developed to define the work required to update SDMs, and it was noted that there was a split of ownership of SDMs between EDF and AREVA with the majority of the SDMs coming under EDF ownership. Following this meeting, the Regulators raised several Technical Queries (TQs) (Ref. 33) requesting copies of the specifications and supporting procedures for SDM updates, and supplementary information on the proposed A2/B changes.

65 In addition, the Regulators wrote to EDF and AREVA (Ref. 34) and had discussions with them to clarify the Regulators expectations that any document changes resulting from A2/B changes should be clearly identified and reversible so that they could be removed if the Regulators did not ultimately agree to the inclusion of the A2/B changes, and that the focus of this GDA Issue was primarily on implementation of changes associated with CMFs.

66 The Regulators inspected EDF and AREVAs arrangements for updating SDMs in November 2011, and in preparation for this, requested copies of three SDMs that had been updated. However, only one of these SDMs was submitted to the Regulators prior to the inspection date. EDF stated updates to the SDMs were delayed as they wished to further expand the GDA reference design to include an additional 100 A2/B changes resulting from further FA3 design development reviews. This proposal to further expand the GDA design reference had not been expected by the Regulators as the original proposal by EDF and AREVA to include the 282 A2/B changes had not been agreed.

67 The Regulators' inspection concluded that although activities undertaken by SOFINEL to update SDMs were found to be in accordance with the AREVA update specifications (Ref. 35), the reference design quoted by AREVA (DF2010) did not fully align with that agreed in GDA (DF2008). Also, it was noted that the reference design quoted by EDF in their specification to SOFINEL did not align with that agreed in GDA nor did it fully align with the AREVA quoted reference design.

68 Furthermore, the CMFs agreed for inclusion in GDA at that time had limited impact on the SDMs. This meant that there were limited numbers of changes to SDMs affected by these design changes (CMFs) for the Regulators to form a view on the adequacy of the EDF and AREVA's arrangements for control of these updates.

69 Following the inspection, the Regulators wrote to EDF and AREVA (Ref. 36) reiterating their expectations for them to update the GDA reference design and supporting submission documentation affected by design changes (CMFs) agreed in GDA.

70 The Regulators also reviewed the supplementary information provided by EDF and AREVA in response to TQ's, on the sample of proposed A2/B changes (Ref. 37) and found this to be insufficient for us to confirm the categorisation of the proposed A2/B changes, or assess the significance of the proposed changes on technical areas, systems and affected GDA documentation.

71 This led the Regulators to conclude that action was required by EDF and AREVA to ensure that GDA design change deliverables aligned with regulatory expectations. One area of concern was that the level of supporting detail that the Regulators would need to adequately assess the effects of the proposed A2/B changes would not have been consistent with that being assessed in other technical areas of GDA.

72 The Regulators wrote to EDF and AREVA outlining options for converging the GDA reference design (Ref. 38). The options were:

- Include design detail at a level similar to that of the A2/B changes throughout GDA reference design and supporting documentation such as SDMs, including detail associated with design changes (CMFs) for GDA Issues; or
- Limit the level of detail to that of CMFs and handover packages for affected documentation supported by a specification for update of SDMs post GDA, and exclude A2/B changes.

73 EDF and AREVA agreed that the latter option would be progressed for the GDA reference design and confirmed that they would exclude A2/B changes with the exception of a limited number which had already been incorporated into the design documentation (Ref. 39, 40). The Regulators acknowledged this approach (Ref. 41) and the limited number of A2/B changes that were already incorporated into GDA documentation were subsequently progressed through the agreed CMF design change process. These were raised as CMFs associated with consistency reviews across the SSER and are linked to this GDA Issue (see section 4.2.1.2).

74 A consequence of EDF and AREVA not providing updates to SDMs to include agreed design changes and the SF and SSC methodologies was that the Regulators were unable to assess the adequacy of EDF and AREVA arrangements for the control of updates of SDMs by their contractors (SOFINEL). This resulted in the following Assessment Finding:

> **AF-UKEPR-CC-10:** A future licensee shall ensure that the development of the site-specific detail of the UK EPRTM design from the GDA UK EPRTM design, including work that is undertaken by vendors / contractors, is carried out under relevant arrangements as required by the licence and environmental permits.
>
> Required timescale: SSC Procurement Specifications.

4.2.1.4 Documentation affected by design changes agreed in GDA

75 Documents affected by design changes agreed in GDA include:

- UKEPR™ GDA Project Instruction – UKEPR-I-002 Reference Design Configuration (Ref. 11)
- UKEPR-0020-001 – Handover document for GDA design changes (Ref. 15)
- UKEPR-0019-001 – Specification for System Design Manuals update post GDA (Ref. 16)
- SSER (see section 4.2.3 of this report)

- GDA Issue **GI-UKEPR-CC-02** Resolution Plan (Ref. 5)

76 One consequence of the decision not to include A2/B changes in the GDA reference design, was that update of SDMs would not be provided as a GDA deliverable, as it was not practicable for this suite of documents to be updated to include all changes associated with agreed CMFs, or the changes necessary to capture the application of the developing approach on SSC classification which is addressed in GDA Issue **GI-UKEPR-CC-01** (Ref. 55).

77 The Resolution Plan for GDA Issue **GI-UKEPR-CC-02** was amended to remove the requirement to provide evidence of updated SDMs in GDA, and to replace this with a new requirement for a specification for update of SDMs to be used by future licensees in the site-specific design development phase (Ref. 5, 43).

78 The Regulators reviewed the adequacy of the draft specification for SDM update, UKEPR-0020-001 (Ref. 15), and advised EDF and AREVA to include clear guidance on generic requirements and regulatory expectations for incorporation of the cross-cutting requirements associated with the classification and C&I topic areas. This was necessary to ensure consistency of approach and clarity of implementation requirements. Additionally, this document included some specific requirements for individual CMFs.

79 The final specification for update of SDMs post GDA (Ref. 16) was reviewed by the Regulators and judged sufficient to enable future UK EPR™ licensees to develop SDMs for a site-specific design.

80 The Regulators concluded that EDF and AREVA's arrangements for the control and update of the GDA reference design UKEPR-I-002 (Ref. 11) and for controlling design changes UKEPR-I-003 (Ref. 14) were robust (see section 4.1.2.1).

4.2.2 Handover Package documentation for GDA Design Changes

81 Design changes agreed for inclusion in GDA need to be effectively handed over by EDF and AREVA to any future UK EPR™ licensee in order that they can fully incorporate agreed design changes into the site-specific design. Handover documentation was developed for this purpose and included:

- A handover document for GDA design changes UKEPR-0020-001 (Ref. 15). This document includes an annex containing a Change Management Form (CMF) for each design change agreed for inclusion in the GDA reference design.
- A handover package for each design change agreed for inclusion in the GDA reference design.

82 EDF and AREVA developed and updated design change procedure UKEPR-I-003 (Ref. 14) to include the provision for generating handover package documentation. The Regulators reviewed and confirmed the adequacy of this procedure in generating suitable handover packages (Ref. 46).

83 For each design change included in GDA, a Stage 3 CMF was generated to close the design change in GDA and to provide supporting information for future licensees adopting the UK EPR™ design to develop and implement the design change in the detailed site-specific design. The Stage 3 CMF comprised a close-out and handover form which identified the documentation affected by the design change, described which affected documentation had been updated in GDA, and which documentation would need to be updated during the site-specific stage. The purpose of the close-out and handover form is to assist a future licensee adopting the UK EPR™ design to accept and incorporate the handover package into its document management system.

84 EDF and AREVA submitted examples of completed handover packages for CMF 16, 17 and 21 (Ref. 44) to Regulators for assessment and feedback was provided by letter (Ref. 45, 46) advising improvements to the process and details contained in the handover packages. The Regulators required:

- Greater clarity on the changes to impacted documentation;
- Greater clarity on what has been implemented and what is left to do;
- Further information on what is outstanding and how this is to be achieved;
- Further information on generic requirements such as classification and categorisation; and
- Consideration of how specific Assessment Findings related to design changes will be addressed.

85 EDF and AREVA agreed to address the Regulators' comments to improve the quality of handover packages and proposed the development of a handover document (Ref. 15), to give general guidance to future licensees adopting the UK EPR™ design about how to utilise and develop the accompanying handover forms and supporting documentation for each design change agreed for inclusion in the GDA reference design.

86 A draft version of the handover document was reviewed by the Regulators and comments were provided. The Regulators requested that the tracking sheet containing comments made by the Regulators on Stage 1 CMFs submitted after 31 May 2012 and agreed in GDA, should be included in the handover document so that future UK EPR™ licensees could address them.

87 Handover packages were subsequently agreed by the Regulators to provide sufficient information for a future licensee adopting the UK EPR™ design to implement design changes agreed for inclusion in GDA.

88 EDF and AREVA provided a further revision to the handover document UKEPR-0020-001 (Ref. 15). This was reviewed and the Regulators were satisfied that their previous comments had been adequately addressed.

89 The Regulators' judgement is that the handover document (Ref. 15) and supporting handover packages for each design change (CMF) agreed for inclusion in the GDA reference design, provides sufficient information for a future licensee adopting the UK EPR™ design to inform the implementation of these design changes. This resulted in the following Assessment Finding:

> **AF-UKEPR-CC-11:** *A future licensee shall use relevant arrangements under the licence and environmental permits for implementing the design changes listed in the GDA Reference Design Configuration UKEPR-I-002 Rev. 15 and described in handover package documentation (see UKEPR-0020-001 Issue 01).*
>
> **Required timescale:** *SSC Procurement Specifications*

4.2.3 Final GDA Submission Documentation

90 The Final GDA submission documentation comprises:

- UKEPR-I-038 Specification - Consolidated GDA SSER (Ref. 21)
- Final Consolidated SSER
- UKEPR-0018-001 Submission Master List (SML)

91 The EDF and AREVA arrangements for control of updates to the SSER to address the impact of GDA Issues, agreed design changes, and the Regulators' comments on the Consolidated Step 4 SSER (Ref. 47) is documented in the EDF and AREVA Project Instruction (PI) UKEPR-I-038 (Ref. 21). This PI and supporting SSER sub-chapter route maps (which outlined the technical changes to the SSER sub-chapter compared with the Consolidated Step 4 SSER submission in March 2011), were utilised throughout the close-out phase of GDA to control all updates to the SSER.

92 EDF and AREVA's initial proposal (Ref. 48) to address Regulators' comments on the Consolidated Step 4 PCSR was reviewed by the Regulators, and although this was found to be generally acceptable, the Regulators sought clarification on some points. EDF and AREVA provided a further response (Ref. 49) and this was considered to be satisfactory by the Regulators.

93 In order to support the sequential closure of GDA Issues, the Regulators reviewed updates to the SSER chapters associated with individual GDA Issues separately and as appropriate. Review of the final consolidated SSER was undertaken as part of this GDA Issue **GI-UKEPR-CC-02**. As part of the review of updates to SSER chapter(s) associated with individual GDA Issue(s), the Regulators also reviewed changes made to address previous comments on the Consolidated Step 4 SSER. To facilitate these reviews, EDF and AREVA provided route maps for all SSER chapter updates. Assessment of SSER chapters affected by individual GDA Issues are described in more detail in the relevant GDA Issue close-out reports.

94 Some SSER chapters were not associated with specific GDA Issues. Updates to these SSER chapters were, in general, minor amendments. To ensure consistency and a proportionate assessment, the Regulators reviewed the PCSR and PCER chapters. ONR adopted a sampling approach to assessment of PCSR chapters, whilst the Environment Agency reviewed all the updates to PCER chapters. In addition, to ensure that all updates had been subject to appropriate controls, the Regulators conducted an inspection in September 2012 of the assurance activities undertaken by EDF and AREVA, and the processes applied for updates to the SSER. This is discussed further below.

95 From the review of advanced PCSR sub-chapter updates by ONR, some technical inconsistencies were found in SSER sub-chapters affected by GDA Issues. The Regulators wrote to EDF and AREVA (Ref. 50) requesting they review their arrangements for control of updates of the SSER (Project Instruction UKEPR-I-038) to ensure technical consistency across the SSER. No inconsistencies were found during reviews of advanced PCER sub-chapters undertaken by the Environment Agency.

96 During a review of a Level 2 document supporting reference to a PCSR sub-chapter, the Regulators noted an error in a calculation quoted (Ref. 51, 52). In response, EDF and AREVA confirmed that internal arrangements would be reinforced to ensure that key input data including calculations would be checked, reviewed and validated. The Regulators judged that the response provided by EDF and AREVA to this finding (Ref. 53) was adequate and that they were taking reasonable steps to prevent recurrence of this type of error.

97 In response to the Regulators' comments on SSER technical consistency, EDF and AREVA revised Project Instruction UKEPR-I-038 (Ref. 21) to include an additional SSER-wide technical consistency check process.

98 The Regulators inspection in September 2012 (Ref. 53) focused on a review of the EDF and AREVA arrangements for control of updates to the final GDA submission including

the final SSER, SML and the Reference Design Configuration, and included the arrangements for ensuring technical consistency across the SSER. The inspection confirmed that EDF and AREVA's arrangements for control of updates to the SSER were robust and evidence was provided that revised consistency checks were being completed across the SSER chapters to ensure consolidation and concurrence across the GDA deliverables.

99 Although the updates to the final SSER did not address all the Regulators' comments on the Consolidated Step 4 PCSR, outstanding items have been identified and are included in the relevant GDA Issue close-out report with, if appropriate, Assessment Findings to address these comments as part of the site-specific design.

100 The final updates to SSER sub-chapters associated with GDA Issues were reviewed by the Regulators and found to be adequate with respect to individual GDA Issues, relevant agreed design changes and previous comments on the Consolidated Step 4 SSER. In addition, the Regulators review of updated SSER chapters which were not associated with other GDA Issues confirmed that these were in line with expectations.

101 The final GDA SSER was submitted under covering letter (Ref. 54). A sample check was made by the Regulators to confirm that the unique identifier for the final version of each SSER chapter / sub-chapter aligned with the list provided in the covering letter which introduces the final consolidated SSER.

102 Overall, the Regulators' judgement is that the final consolidated SSER has been controlled and updated to include changes required to address GDA Issues and where appropriate design changes[2] agreed for inclusion in GDA, and that the final SSER was considered suitable as a key reference for the DAC / SoDA.

103 The SML lists all documents submitted to the Regulators during GDA for assessment, including the SSER, and all other documents that collectively constitute the complete GDA submission. The documents in the SML have been allocated a documentation Level of 1 to 3. The SSER chapters and sub-chapters are Level 1 documents, key supporting SSER references including the Reference Design Configuration (Ref. 11) are Level 2 documents. Supporting references to Level 2 documents or responses to TQs that have not been incorporated into the SSER or its references are allocated to Level 3.

104 The SML was updated regularly throughout GDA by EDF and AREVA, as described in Project Instruction UKEPR-I-033, and was submitted on a quarterly basis to the Regulators for review. During the close-out phase of GDA the Regulators undertook several sample reviews of the SML and provided feedback to EDF and AREVA (Ref. 50, 56) requesting that they review the SML and confirm the adequacy of arrangements for designating the levels of documentation allocated within it. EDF and AREVA responded to the Regulators and confirmed that the final SML will include all Level 1-3 documents referenced in the GDA Issue close-out reports (Ref. 57).

105 During an inspection in September 2012 (Ref. 54), the Regulators carried out a sample check of the current SML against SSER references and this sample check confirmed alignment between the two. EDF and AREVA also confirmed that a final check would be

[2] The SSER has not been fully updated for some design changes agreed for inclusion in GDA. For these, further work is required by future UK EPR™ licensees to fully incorporate these changes, and these are detailed in handover documentation.

made on the SML prior to submission of the final version to the Regulators to ensure there were no errors or duplications.

106 The Regulators completed a further sample check on the updated SML submitted in October 2012 (Ref. 60) and the outcome was in line with expectations.

107 EDF and AREVA submitted an advanced draft of the final SML document (Ref. 61) which included the listings of GDA submission documents provided in earlier versions of the SML complemented by supporting text to describe its context within the GDA submission. The Regulators judged the format of the draft final SML as satisfactory and confirmed by letter to EDF and AREVA that the draft met expectations and that sample checks completed during the September 2012 SML inspection were satisfactory (Ref. 59).

108 EDF and AREVA submitted the summary of the final check of the SML, undertaken to correct any errors or duplications, to the Regulators. This final check was reviewed and gave the Regulators the required level of assurance that the SML had been adequately controlled and met expectations.

109 On the 30 November 2012, EDF and AREVA submitted the SML (UKEPR-0018-001 issue 02) (Ref. 58) to the Regulators. A sample check by the Regulators revealed that the SML did not include the following GDA Issue deliverables as these documents had been submitted after final issue of the SML:

- Specification for SDM update post GDA UKEPR-0019-001 (Ref. 16); and
- Handover document for GDA changes UKEPR-0020-001 (Ref. 15) .

110 The Regulators requested EDF and AREVA to revise the SML to include these deliverables and EDF and AREVA submitted the revised SML (UKEPR-0018-001 issue 03) (Ref. 10) on 6 December 2012, together with revised revisions of the two documents listed above, as well as updates to Project Instructions UKEPR-I-002 and UKEPR-I-003 as these referenced UKEPR-0019-001 and UKEPR-0020-001.

111 The Regulators subjected the revised SML (Ref. 10) to a final check to confirm that it was satisfactory. The Regulators judged that the SML sufficiently defined the totality of the GDA submission and could be referenced in any DAC / SoDA that may be issued.

112 In summary, from regulatory reviews of the final SSER and SML, the Regulators are satisfied that these documents have been subject to suitable controls and updates to address GDA Issues and where appropriate agreed design changes, and that these documents, together with the Reference Design Configuration (Ref. 11), are referenced in the DAC / SoDA.

4.3 Comparison with Standards, Guidance and Relevant Good Practice

113 The Regulators' assessments and inspections of the EDF and AREVA arrangements for the control and update of final GDA submission documentation including the SSER, SML and Reference Design Configuration provided the necessary evidence and assurance to demonstrate that these arrangements utilised appropriate standards and generally aligned with relevant good practice and guidance.

5 ASSESSMENT CONCLUSIONS

5.1 Overall Conclusions

From regulatory inspections of EDF and AREVA's arrangements and assessments of the deliverables associated with this GDA Issue the Regulators concluded that:

- The EDF and AREVA processes for control of updates to the SSER, SML and reference design affected by GDA Issues and design changes, confirmed by review and inspection, were robust and this provides confidence in the provenance of these key GDA deliverables.
- EDF and AREVA have completed consistency checks across SSER sub-chapters, reviewed the Submission Master List and the final revision of the reference design to ensure consolidation and concurrence across the GDA deliverables.
- Sufficient information was provided by EDF and AREVA for the Regulators to agree the inclusion in GDA of important design changes identified through the resolution of GDA Issues.
- The specification for update of SDMs post GDA is considered to provide sufficient information to assist a future UK EPR™ licensee in developing site-specific SDMs to include GDA SF / SSC methodologies and agreed design changes.
- The handover package documentation provided by EDF and AREVA for agreed design changes was confirmed by review to be sufficient to assist a future licensee in the incorporation of these changes into a site-specific EPR™ design.
- Reviews and sample checks on updated and final GDA key deliverables, including the SSER, SML and reference design, confirmed that these documents have been subject to suitable controls and updates to address GDA Issues, and where appropriate agreed design changes, and that they are referred to as key references in the DAC / SoDA.
- The Assessment Findings included in this report identify the actions required to be undertaken by a future UK EPR™ licensee to control and develop the detailed site-specific design from the GDA UK EPR™ reference design.

On this basis, the Regulators are satisfied that EDF and Areva have adequately addressed GDA Issue, **GI-UKEPR-CC-02**.

6 ASSESSMENT FINDINGS

6.1 Additional Assessment Findings

114 As a result of regulatory assessment for the close-out of GDA Issue **GI-UKEPR-CC-02**, four Assessment Findings have been identified to be taken forward during the site-specific phase:

AF-UKEPR-CC-08: *A future licensee shall use relevant arrangements under the licence and environmental permits to ensure that an independent technical review is completed on the design changes described in Change Management Forms 24, 26 and 31 and listed in the GDA Reference Design Configuration UKEPR-I-002 Rev. 15.*

Required timescale*: SSC Procurement Specifications*

AF-UKEPR-CC-09: *A future licensee shall use relevant arrangements under the licence and environmental permits to demonstrate that the impact of design changes raised after 31 May 2012 and included in the GDA Reference Design Configuration UKEPR-I-002 Rev. 15 are As Low As Reasonably Practicable (ALARP) / Best Available Techniques (BAT), and confirm their categorisation in terms of significance to nuclear safety and environment prior to their implementation into the site-specific detailed UK EPR™ design.*

Required timescale*: SSC Procurement Specifications*

AF-UKEPR-CC-10: *A future licensee shall ensure that the development of the site-specific detail of the UK EPR™ design from the GDA UK EPR™ design, including work that is undertaken by vendors / contractors, is carried out under relevant arrangements as required by the licence and environmental permits.*

Required timescale: *SSC Procurement Specifications.*

AF-UKEPR-CC-11: *A future licensee shall use relevant arrangements under the licence and environmental permits for implementing the design changes listed in the GDA Reference Design Configuration UKEPR-I-002 Rev. 15 and described in handover package documentation (see UKEPR-0020-001 Issue 01).*

Required timescale*: SSC Procurement Specifications*

6.1.1 Impacted Assessment Findings

115 Assessment Finding **AF-UKEPR-CC-01** identified in the Step 4 cross cutting report (Ref. 2) and related to the implementation of GDA agreed design changes is replaced by **AF-UKEPR-CC-11** described in section 6.1

7 REFERENCES

1 *GDA Issue GI-UKEPR-CC-02 Revision 3 Consolidated Final GDA Submission including agreed design change for the UK EPR™.* ONR and Environment Agency. July 2011. TRIM Ref. 2011/358282.

2 *Step 4 Management of Safety and Quality Assurance Assessment of the EDF and AREVA UK EPR™ Reactor*. ONR Assessment Report ONR-GDA-AR-11-029 Revision 0. TRIM Ref. 2010581502.

3 *Generic design assessment. UK EPR™ nuclear power plant design by AREVA NP SAS and Electricité de France SA. Final assessment report – management systems.* Environment Agency. May 2011. www.publications.environment-agency.gov.uk

4 *Generic design assessment. UK EPR™ nuclear power plant design by AREVA NP SAS and Electricité de France SA. Decision Document*. Environment Agency. May 2011. www.publications.environment-agency.gov.uk

5 *Resolution Plan for GDA Issue GI-UKEPR-CC02 Revision 1.* EDF and AREVA. July 2011. TRIM Ref. 2011/349105.

6 *GDA Close-out of the EDF and AREVA UK EPR™ Reactor – GDA Issue GI-UKEPR-CC-01 Revision 3 – classification for the UK EPR*. ONR Report ONR-GDA-AR-12-023 Revision 0. TRIM Ref. 2012/23.

7 *GDA Close-out of the EDF and AREVA UK EPR™ Reactor – GDA Issue GI-UKEPR-CC-03 Revision 3 – Fukushima Lessons Learnt for the UK EPR*. ONR and Environment Agency Report ONR-GDA-AR-12-025 Revision 0. TRIM Ref. 2012/25.

8 *ONR HOW2 Business Management System. Assessment Process.* AST/001 Issue 4. HSE. April 2010. www.hse.gov.uk/nuclear/operational/assessment/index.htm

9 *Enclosure of GDA Submission #28: Final Consolidated UK EPR™ GDA SSER.* Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR01483N. 30 November 2012. TRIM Ref. 2012/470122.

10 *UK EPR™ GDA Submission Master List*. UKEPR-0018-001 Issue 03. EDF and AREVA. December 2012. TRIM Ref. 2012/478569

11 *Reference Design Configuration*. UKEPR-I-002 Revision 15. AREVA NP / EDF. 6 December 2012. TRIM Ref. 2012/478281.

12 *Final Consolidated UK EPR™ GDA Pre Construction Safety Report*. Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR01470N. 30 November 2012. TRIM Ref. 2012/470151.

13 *Final Consolidated UK EPR™ GDA Pre Construction Environmental Report. Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR01471N. 30 November 2012. TRIM Ref. 2012/470186.*

14 *Design Change Procedure.* UKEPR-I-003 Revision 11. EDF and AREVA. 6 December 2012. TRIM Ref. 2012/478287.

15 *Deliverable to GI-UKEPR-CC02 – Transmission of revised Handover document for GDA design changes (UKEPR-0020-001 Issue 01).* Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR01511N. 6 December 2012. TRIM Ref. 2012/478445.

16 *Deliverable to GI-UKEPR-CC02 – Transmission of revised Specification for SDMs update document (UKEPR-0019-001 Issue 01).* Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR01510N. 6 December 2012. TRIM Ref. 2012/478362.

17 *Guidance on the Purpose, Scope, and Content of Nuclear Safety Cases*. TAST/051 Issue 001. HSE. May 2002. www.hse.gov.uk/nuclear/operational/tech_asst_guides/index.htm

18 *The Management System for Facilities and Activities.* International Atomic Energy Agency (IAEA). Safety Requirements No. GS-R-3. IAEA. Vienna. 2006. www.iaea.org.

19 *ISO 9001:2008 Quality management systems – Requirements*. International Organisation for Standardisation. 2008.

20 *Deliverable to GI-UKEPR-CC02 – Action 1 Submission Programme Rev 20*. Letter from UK EPR™ Project Front Office to ONR and EA. EPR01502N. 3 December 2012. TRIM Ref. 2012/472831.

21 *UK EPR™ Specification – Consolidated GDA SSER. UKEPR-I-038 Revision 2*. EDF and AREVA. TRIM Ref. 2012/343562.

22 *UK EPR GDA Step 4 Consolidated Pre-construction Safety Report – March 2011.* EDF and AREVA. Detailed in EDF and AREVA letter EPR00997N. Letter from UK EPR™ Project Front Office to ONR and EA. 18 November 2011. TRIM Ref. 2011/552663.

23 *Enclosure of GDA Submission #21: Consolidated Step 4 SSER.* Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR00844N. 31 March 2011. TRIM Ref. 2011/200260.

24 *UK EPR™ - Arrangements for control of proposed Design Changes for inclusion in GDA*. EPR70197N. Letter from ONR and EA to UK EPR™ Project Front Office. 7 June 2010. TRIM Ref. 2010/231493.

25 *UK EPR™ – Proposed Way forward on GDA design detail and resolution of GDA issues GI-UKEPR-CC-01 and GI-UKEPR-CC-02*. Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR01131R. 25 April 2012. TRIM Ref. 2012/174614.

26 *UK EPR™ - Resolution of GDA Issue GI-UKEPR-CC-02.* Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR70419R. 4 May 2012. TRIM Ref. 2012/189414.

27 *UK EPR™ - Resolution of GDA Issue GI-UKEPR-CC-02*. EPR70447R. Letter from ONR and EA to UK EPR™ Project Front Office. 5 October 2012. TRIM Ref. 2012/383785.

28 *UK EPR™ - Deliverable to GI-UKEPR-CC-02 – Action 1 – Submission Programme Rev 19.* Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR01475R. 16 November 2012. TRIM Ref. 2012/451002.

29 *UK EPR™ - Resolution of GDA Issue GI-UKEPR-CC-02a.1 Inclusion of CMFs in the GDA Design Reference*. – EPR70473R. Letter from ONR and EA to UK EPR™ Project Front Office. 3 December 2012. TRIM Ref. 2012/470009.

30 *UK EPR™ - Design Freeze 2010 Cat A2/B Modification list.* Letter from UK EPR ™ Project Front Office to ONR and EA. Unique Number EPR00787N. 18 February 2011. TRIM Ref. 2011/109556.

31 *Initial Sample of Design Freeze 2010 Category A2 and B proposed modification list.* EPR70303N. ONR and EA letter to UK EPR™ Project Front Office. 21 April 2011. TRIM Ref. 2011/232482 – response to Ref. 30.

32 *Meeting to Discuss GI-UKEPR-CC02 Resolution Plan, in particular the Control of Future Supply Chain Activities*. ONR-GDA-CR-11-108. ONR/EA Contact Report. TRIM Ref. 2011/410893.

33 *EDF and AREVA Tracking Sheets Technical Queries (TQ) – Closure of GDA for the UK EPR™.* ONR. TRIM Ref 2011/389411.

34 *GDA Issue GI-UKEPR-CC-02 Action 1: Comments on EDF and AREVA's design change submission programmes revision 011 and regulators' expectations for arrangements for control of updates to GDA submission docs impacted by CMFs.* EPR70372R. Letter from ONR and EA to UK EPR™ Project Front Office. 14 October 2011. TRIM Ref. 2011/530081.

35 *Inspection 29 November to 2 December 2011*. ONR-GDA-IR-12-005. ONR/EA Intervention Report. 10 February 2012. Trim Ref. 2012/59395.

36 *UK EPR™ - Resolution of GDA Issue GI-UKEPR-CC-02 – Regulators Requirements for GDA Design Reference and update of Submission Documentation Impacted by Agreed Design Changes for the UK EPR™.* EPR70387R. Letter from ONR and EA to UKEPR™ Project Front Office. 8 December 2011. TRIM Ref. 2011/628046.

37 *GDA Issue GI-UKEPR-CC02 Action 1 – Provision of additional information for initial sample of 5 design changes identified in TQ-EPR-1490.* Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR01089N. 21 February 2012. TRIM ref. 2012/84727.

38 *UK EPR™ - Proposed Way Forward on GDA design detail and resolution of GDA Issues GI-UKEPR-CC-01 and GI-UKEPR-CC-02.* EPR70405R. Letter from ONR and EA to UK EPR™ Project Front Office. 22 February 2012. TRIM ref. 2012/86680.

39 *UK EPR™ - Resolution of GDA Issue GI-UKEPR-CC-02. Progress on Action 2.* Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR01126N. 24 April 2012. TRIM ref. 2012/440683.

40 *UK EPR™ – Proposed Way forward on GDA design detail and resolution of GDA issues GI-UKEPR-CC-01 and GI-UKEPR-CC-02*. Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR01131R. 25 April 2012. TRIM Ref. 2012/174614.

41 *UK EPR™- Resolution of GDA Issue GI-UKEPR-CC-02.* EPR70419R. Letter from ONR and EA to UK EPR™ Project Front Office. 4 May 2012. Trim ref. 2012/189414.

42 *UK EPR™ - Resolution of GDA Issue GI-UKEPR-CC-02A.1 Inclusion of CMFs in the GDA Design Reference.* EPR70459R. Letter from ONR and EA to UK EPR™ Project Front Office. 26 November 2012. TRIM Ref. 2012/457257.

43 *UK EPR™ - Resolution Plan for GI-UKEPR-CC02 Revision 3*. GI-UKEPR-CC02-RP. EDF and Areva. July 2012. TRIM Ref. 2012/301450.

44 *Part Response to GI-UKEPR-CC02 Action 2 Transmission of CMF16 Stage 3 and Handover Package*. Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR01048R. 29 December 2011. TRIM Ref. 2011/657297.

45 *UK EPR™ - Resolution of GDA Issue GI-UKEPR-CC-02. Progress on Actions 1 and 2*. EPR70401R. Letter from ONR and EA to UK EPR™ Project Front Office. 8 February 2012. TRIM Ref. 2012/66738.

46 *UK EPR™ - Resolution of GDA Issue GI-UKEPR-CC-02*. EPR70419R. Letter from ONR and EA to UK EPR™ Project Front Office. 4 May 2012. TRIM Ref. 2012/189414.

47 *UK EPR™ - Consolidated PCSR Chapter Review actions under GI-UKEPR-CC-02*. EPR70323R. Letter from ONR and EA to UK EPR™ Project Front Office. 22 June 2011. TRIM Ref. 2011/334787.

48 *UK EPR™ - Part Response to GI-UKEPR-CC02 Action 3 Task 2 – Provision of Responses to ONR/EA comments on March 2011 SSER*. Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR00964N. 30 September 2011. TRIM Ref. 2011/506745.

49 *UK EPR – Resolution of GDA Issue GI-UKEPR-CC-02 Action 3 – Progress on action 3 - EDF/A response 2*. Letter from UK EPR Project Front Office to ONR and EA. Unique Number EPR01137N. 5 September 2012, TRIM Ref. 2012/349673.

50 *UK EPR™ - Resolution of GDA Issue GI-UKEPR-CC-02. Progress on Action 2.* EPR70408R. Letter from ONR and EA to UK EPR™ Project Front Office, 3 April 2012. TRIM ref. 2012/13214.

51 *UK EPR™ Avoidance of Fracture Approach – Fast fracture analytical studies for critical defect sizes determination using surrogate R6 method (RSE-M V Option).* PEERF 10-2069 B. EDF and Areva. 7 January 2010. TRIM Ref. 2011/86018.

52 *GI-UKEPR-CC-02 Topic Meeting Action Response and Closure*. Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR01282N + TQ-879 (step 4) supporting ref PEFR F Rev B (2011/86018). 2 August 2012. TRIM Ref. 2012/307188.

53 *ONR/EA Intervention report*. ONR-GDA-IR-12-195. 11 September 2012. Trim Ref. 2012/389056.

54 *UK EPR™ - Enclosure of GDA Submission #28: Final Consolidated UK EPR GDA SSER*. Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR01483N. 30 November 2012. TRIM Ref. 2012/470122.

55 *GI-UKEPR-CC-01 – GDA Issue; Categorisation and Classification of Systems Structures and Components – Revision 1*. July 2011. TRIM Ref. 2011/385286.

56 *UK EPR™ - Transmission of Updated Submission Tracking Sheet and Submission Master List.* Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR01276N. 1 August 2012. TRIM Ref. 2012/306756.

57 *UK EPR™ - Part Response to GI-UKEPR-CC02 – Action 3 transmission of Updated Submission Tracking Sheet and Submission Master List*. Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR01434N. 26 October 2012. TRIM Ref. 2012/418123.

58 *UK EPR™ - Part Response to GI-UIKEPR-CC-02 Action 3 – Transmission of Draft Consolidated Submission Master List – UKEPR-0018-001 Issue 02.* Letter from UK EPR™ Project Front Office to ONR and EA. Unique Number EPR01438N. 26 October 2012. TRIM Ref. 2012/418383.

59 *UK EPR™ - Resolution of GDA Issue GI-UKEPR-CC-02. Progress on Action 3.* EPR70448R. Letter from ONR and EA to UK EPR™ Project Front Office. 6 April 2012. TRIM Ref. 2012/399071.

60 *UK EPR™ - GI-UKEPR-CC02 – Topic Meeting Actions Response and Closure*. Letter from UK EPR™ Project front office to ONR and EA. Unique Number EPR01478N. 16 November 2012. TRIM Ref. 2012/450494.

61 *UK EPR™ GDA Submission Master List*. UKEPR-0018-001 Issue 02. EDF and Areva. 30 November 2012. TRIM Ref. 2012/470206.

Table 1

Radioactive Substances Regulation Environment Principles considered for Close-out of **GI-UKEPR-CC-02** Revision 3

SAP/REP No.	REP Title	Description
REP:MLDP1	Establishing and Sustaining Leadership and Management	All organisations whose activities might adversely affect people or the environment should establish and sustain effective leadership and management for the environment to ensure that people and the environment are properly protected from adverse effects.
REP:MLDP2	High Standards of Environment Protection	Directors, managers and leaders at all levels should focus the organisation on achieving and sustaining high standards of protection of people and the environment.
REP:MLDP3	Capability	Organisations should have the capability to secure and maintain proper protection of people and the environment.
REP:MLDP4	Decision Making	Decisions at all levels that might affect environment protection should be rational, objective, timely, transparent and prudent.
REP:MLDP5	Learning from Experience	Organisations should learn from their own and others' experience so as to continually improve their ability to protect the environment.

Note: Safety Assessment Principles (SAPs) relevant to this topic area are listed in the Technical Assessment Guides referenced in section 2.4.1

Table 2

Design changes agreed in GDA – the complete list of 82 CMFs (adapted from Ref. 15)

CMF Ref.	FA3 Modification Ref.	Related GDA Issue	Title
CMF001	CFSE0236	N/A	Change in the power distribution following the Forsmark event
CMF002	CFSE0246	N/A	Suppression of automatic isolation of PTR main cooling trains
CMF003	CFSE0247	N/A	Creation of an “override” for the handling of fuel in state “E”
CMF004	CFSE0211 CANP0068	N/A	Protection against pool emptying
CMF005	CFSE0216 CANP0023	N/A	Alcalinisation" of the IRWST function by implementation of a Soda injection device in EVU [CHRS]
CMF006	CFSE0208 CANP0027	N/A	Implementation of "advanced pH concept"
CMF007	CANP0050	N/A	Implementation of a new signal in the PS (RIGZ in cold shutdown state) – RPR
CMF008	CFSE0268 CANP0125	N/A	'I&C Implementation of SA I&C functions
CMF009	CANP0081	N/A	Integration of a 3rd demineraliser on RCV [CVCS] system
CMF010	CANP0103	N/A	Partial cooldown gradient modification
CMF011	CFSE0342 CANP0409	N/A	Dedicated standard I&C cabinets for RRC-B situations
CMF012	CANP0128	N/A	Implementation of new functions in the PS
CMF013	UK Specific Modification	N/A	RCCAs design
CMF014	UK Specific Modification	**GI-UKEPR-CI-01**	C&I backup system
CMF015	UK Specific Modification	**GI-UKEPR-CI-06**	Communication of PS with other systems

Table 2

Design changes agreed in GDA – the complete list of 82 CMFs (adapted from Ref. 15)

CMF Ref.	FA3 Modification Ref.	Related GDA Issue	Title
CMF016	UK Specific Modification	N/A	Door control measures for doors installed within Safety Fire Compartment
CMF017	UK Specific Modification	N/A	SG and PZR Material – 20MND5
CMF018	UK Specific Modification	N/A	Reactor Building Liner Anchorage
CMF019	CANP0417	N/A	Reduction of Microtherm in PZR support area
CMF020	CFSE0206 CFSE0298 CFSE0299 CFSE0300 CFSE0303 CFSE0358	N/A	Confinement - Modification of HVAC systems
CMF021	CANP0250	N/A	Average Coolant Temperature (ACT) and PZR Level LCO Modification at low Power
CMF022	UK Specific Modification	**GI-UKEPR-FS-04**	Functional classification KRT activity detection channels
CMF023	UK Specific Modification	**GI-UKEPR-FS-02**	Addition of new Reactor Trip signals
CMF024[6]	UK Specific Modification	**GI-UKEPR-CC-01**	RO 43 Impact on SSC Classification
CMF025	CANP0452	N/A	Automatic Actuation of EBS on low SG pressure in 1 SG
CMF026[3]	UK Specific Modification	**GI-UKEPR-CI-06**	Class 1 interface in the MCR and RSS
CMF027	UK Specific Modification	N/A	Safety Information and Control System Class Upgrade (class 1)
CMF028	CANP0314	N/A	Monophasic Start Up Mode

[3] Further INSA/IPR is required on these CMFs categorised as A1 during the site specific phase, see Assessment Finding **AF-UKEPR-CC-08**.

Table 2

Design changes agreed in GDA – the complete list of 82 CMFs (adapted from Ref. 15)

CMF Ref.	FA3 Modification Ref.	Related GDA Issue	Title
CMF029	UK Specific Modification	**GI-UKEPR-CI-05**	Change SPPA-T2000 platform version from S5 to S7 (S5 obsolescence)
CMF030	UK Specific Modification	**GI-UKEPR-CC-01**	Use of nuclear codes for Class 2 components
CMF031[6]	UK Specific Modification	**GI-UKEPR-SI-01**	MCL Crossover Leg Vertical Straight Parts Extension
CMF032	UK Specific Modification	**GI-UKEPR-SI-01**	MCL Welds Counterbore Extension
CMF033(*)	CSNE0014	**GI-UKEPR-CC-01**	Implementation of an automatic class 1 signal
CMF034	UK Specific Modification	**GI-UKEPR-IH-01**	Dropped loads - Reactor cavity floor shear reinforcement
CMF035	UK Specific Modification	**GI-UKEPR-IH-01**	Dropped loads – I&C control measures
CMF036	UK Specific Modification	**GI-UKEPR-CC-01**	Classification – Diverse lines of protection
CMF037	UK Specific Modification	**GI-UKEPR-CC-01**	Classification – UDG Diesel generators
CMF038	UK Specific Modification	**GI-UKEPR-CC-01**	Classification – Spent fuel pool cooling system
CMF039(*)	CSNE0023	**GI-UKEPR-CC-01** **GI-UKEPR-FS-05** **GI-UKEPR-HF-01**	Modification of EFWS valves
CMF040(*)	UK Specific Modification	**GI-UKEPR-CC-01** **GI-UKEPR-CI-06**	Functional Scope Allocation of Main Reactor Controls
CMF041(*)	UK Specific Modification	**GI-UKEPR-FS-05**	Fault studies – Loss of essential support systems – DVL/DEL [SBVSE/SCWS] modifications
CMF042(*)	UK Specific Modification	**GI-UKEPR-FS-05**	FS05 – Design improvements linked with RRI [CCWS] cooling functions
CMF043	CANP0028	**GI-UKEPR-CC-02**	DF2008 - Consistency Review - Fault Studies
CMF044	CANP0047 CFSE0207	**GI-UKEPR-CC-02**	DF2008 - Consistency Review - Reactor Chemistry

Table 2

Design changes agreed in GDA – the complete list of 82 CMFs (adapted from Ref. 15)

CMF Ref.	FA3 Modification Ref.	Related GDA Issue	Title
CMF045	CFSE0437 CFSE0407 CFSE0367	**GI-UKEPR-CC-02**	DF2008 - Consistency Review - Radiation Protection
CMF046	CFSE0269 CFSE0373 CANP0466 CMA0046 CFSE0445 CANP0896	**GI-UKEPR-CC-02**	DF2008 - Consistency Review - Mechanical Engineering
CMF047(*)	CIG0231	**GI-UKEPR-CC-03**	FKA – Task 4 – Severe Accident Addition of a sound powered telephone network to the DTV system
CMF048(*)	CIG0274	**GI-UKEPR-CC-03**	FKA – Task 2 – Flooding
CMF049(*)	CEL0011 CEL0007 CEL0004 CCC0198	**GI-UKEPR-CC-03**	FKA – Task 3 &4 – Loss of Electrical power/ Heat Sink & Severe Accident - Robustness and management of Power Sources
CMF050(*)	CCSE0023 CCSE0047 CCSE0049 CCSE0048 CCSE0046	**GI-UKEPR-CC-03**	FKA – Task 3 &4 – Loss of Electrical power/ Heat Sink & Severe Accident - Design Against Seismic Events
CMF051(*)	CSNE0004 CMA0151	**GI-UKEPR-CC-03**	FKA – Task 3 &4 – Loss of Electrical power/ Heat Sink & Severe Accident - Fuel strategies
CMF052	UK Specific Modification	**GI-UKEPR-CC-01**	Upgrade of RIS [SIS] accumulators to M2
CMF053(*)	UK Specific Modification	**GI-UKEPR-CC-01**	Earthing System (LTR) classification
CMF054(*)	UK Specific Modification	**GI-UKEPR-FS-01**	RPR [PS] interlock for RCP [RCS] pump start up
CMF055(*)	UK Specific Modification	**GI-UKEPR-FS-01**	ALARP improvement of the isolation of the RRI [CCWS] heat exchangers to prevent heterogeneous dilution in shutdown states
CMF056(*)	UK Specific Modification	**GI-UKEPR-IH-03**	Internal Flooding – Design Modification of Fire-Fighting System (JPI) in the Annulus

Table 2

Design changes agreed in GDA – the complete list of 82 CMFs (adapted from Ref. 15)

CMF Ref.	FA3 Modification Ref.	Related GDA Issue	Title
CMF057(*)	UK Specific Modification	**GI-UKEPR-IH-03**	Internal Flooding – Design Modification of Essential Service Water System (SEC) in the Safety Auxiliary Building
CMF058(*)	UK Specific Modification	**GI-UKEPR-IH-03**	Internal Flooding – Design Modification of Distribution of Demineralised Reactor Water System (SED) in the Annulus
CMF059(*)	UK Specific Modification	**GI-UKEPR-FS-02**	Diverse protection function for RCV homogeneous boron dilution events in shutdown states
CMF060(*)	UK Specific Modification	**GI-UKEPR-CI-01**	Classification of maintenance and testing tools of C&I systems
CMF061(*)	UK Specific Modification	**GI-UKEPR-CI-06**	Classification of the RodPilot™
CMF062(*)	UK Specific Modification	**GI-UKEPR-CI-04**	Qualification of SMART devices in UK context
CMF063(*)	UK Specific Modification	**GI-UKEPR-CI-06**	Production Excellence and Independent confidence building measures on software based C&I systems
CMF064(*)	UK Specific Modification	**GI-UKEPR-CI-06**	C&I diversity on sensors and sensor conditioning
CMF065(*)	UK Specific Modification	**GI-UKEPR-CI-06**	C&I diversity on PAC modules
CMF066(*)	UK Specific Modification	**GI-UKEPR-CI-06**	Protection System Reference Configuration
CMF067(*)	UK Specific Modification	**GI-UKEPR-CI-06**	Addition of secondary side (VVP) pressure measurements
CMF068(*)	UK Specific Modification	**GI-UKEPR-CI-01**	Non Computerized Safety System Design Improvement
CMF069(*)	CANP0352 ECNF0481 CFSE0364 CANP0183 CIG0164 CIG0056	**GI-UKEPR-CC-02**	GDA Deliverables Consistency Review

Table 2

Design changes agreed in GDA – the complete list of 82 CMFs (adapted from Ref. 15)

CMF Ref.	FA3 Modification Ref.	Related GDA Issue	Title
CMF070(*)	UK Specific Modification	**GI-UKEPR-FS-03**	Addition of removable standpipes and covers on the penetrations at the bottom of the HR-HK pool compartments
CMF071(*)	UK Specific Modification	**GI-UKEPR-FS-03**	Upgrade of the SFP emergency make up to Class 1
CMF072(*)	UK Specific Modification	**GI-UKEPR-FS-03**	Fuel transfer tube modification
CMF073(*)	UK Specific Modification	**GI-UKEPR-FS-03**	Removal of personnel access doors located on the fuel path
CMF074(*)	UK Specific Modification	**GI-UKEPR-FS-03**	Change of cask procedure
CMF075(*)	UK Specific Modification	**GI-UKEPR-FS-05**	Management of scenarios without availability of RBS [EBS] trains or of two neighbouring Electrical and C&I divisions
CMF076(*)	CFSE0418	**GI-UKEPR-FS-05**	Connection of reactor coolant pump (RCP) thermal barrier cooling system
CMF077(*)	UK Specific Modification	**GI-UKEPR-FS-05**	DCL [CRACS] modifications
CMF078(*)	UK Specific Modification	**GI-UKEPR-FS-05**	Solutions to manage common cause failures (CCF) on LJ*and LV* electrical switchboards
CMF079(*)	UK Specific Modification	**GI-UKEPR-FS-05**	Modifications to manage the Total Loss Of Cooling Chain (TLOCC)
CMF080(*)	UK Specific Modification	**GI-UKEPR-FS-05**	Reduce the frequency of the failure of the DVP system coming from CCF
CMF081(*)	CANP0098 CANP0558 CANP0565 CCC0147 CANP0167	**GI-UKEPR-CC-02**	C&I – Reference Configuration – Design Freeze 2008 Consistency Review
CMF082(*)	UK Specific Modification	**GI-UKEPR-CC-02**	New Fuel Dry Storage Rack – Modification of the Upper Support Frame

(*) CMFs submitted to regulators after 31 May 2012

Annex 1

Technical Queries Raised During Close-out Phase

GI-UKEPR-CC-02 Revision 3 – Consolidated GDA submission including agreed design change for the UK EPR – Technical Queries raised

TQ Reference	GDA Issue Action	Related Submission	Description
TQ-1469	Action 1	Final SSER	Request for INSAs, IPRs and DSRC recommendations for A1 design changes agreed in GDA reference design
TQ-1470	Actions 1 and 3	Final SSER and Reference Design Configuration	Request for information on EDF and AREVA service providers for the GDA submission
TQ-1471	Action 1	SDMs in the Reference Design Configuration	Request for EDF and AREVAs specifications provided to SOFINEL for the update of SDMs to include agreed design changes and SF/SSC methodologies agreed in GDA
TQ-1490	Action1	Reference Design Configuration	Request for further information from EDF and AREVA to support A2/B changes proposed for inclusion in the GDA reference design
TQ-1491	Action 1	Reference Design Configuration	Request for clarification on the graded approach applied to SDM production
TQ-1494	Actions 1 and 3	SSER and Reference Design Configuration	Request for details of EDF and AREVA's audit programme for GDA close-out

Annex 2

GDA Assessment Findings arising from GDA close-out for GI-UKEPR-CC02 Revision 3

Finding No.	Assessment Finding	MILESTONE (by which this item should be addressed)
AF-UKEPR-CC-08	A future licensee shall use relevant arrangements under the licence and environmental permits to ensure that an independent technical review is completed on the design changes described in Change Management Forms 24, 26 and 31 and listed in the GDA Reference Design Configuration UKEPR-I-002 Rev. 15.	**Required timescale:** SSC Procurement Specifications
AF-UKEPR-CC-09	A future licensee shall use relevant arrangements under the licence and environmental permits to demonstrate that the impact of design changes raised after 31 May 2012 and included in the GDA Reference Design Configuration UKEPR-I-002 Rev. 15 are As Low As Reasonably Practicable (ALARP) / Best Available Techniques (BAT), and confirm their categorisation in terms of significance to nuclear safety and environment prior to their implementation into the site-specific detailed UK EPR™ design.	**Required timescale:** SSC Procurement Specifications
AF-UKEPR-CC-10	A future licensee shall ensure that the development of the site-specific detail of the UK EPR™ design from the GDA UK EPR™ design, including work that is undertaken by vendors / contractors, is carried out under relevant arrangements as required by the licence and environmental permits.	**Required timescale:** SSC Procurement Specifications
AF-UKEPR-CC-11	A future licensee shall use relevant arrangements under the licence and environmental permits for implementing the design changes listed in the GDA Reference Design Configuration UKEPR-I-002 Rev. 15 and described in handover package documentation (see UKEPR-0020-001 Issue 01).	**Required timescale:** SSC Procurement Specifications

Note: It is the responsibility of the Licensees / Operators to have adequate arrangements to address the Assessment Findings. Future Licensees / Operators can adopt alternative means to those indicated in the findings which give an equivalent level of safety.

For Assessment Findings relevant to the operational phase of the reactor, the Licensees / Operators must adequately address the findings during the operational phase. For other Assessment Findings, it is the Regulators' expectation that the findings are adequately addressed no later than the milestones indicated above.

Annex 3

GDA ISSUE

CONSOLIDATED FINAL GDA SUBMISSION INCLUDING AGREED DESIGN CHANGE FOR THE UK EPR

GI-UKEPR-CC-02 REVISION 3

Technical Area	**CROSS CUTTING**		
Related Technical Areas	**All**		
GDA Issue Reference	**GI-UKEPR-CC-02**	**GDA Issue Action Reference**	**GI-UKEPR-CC-02.A1**
GDA Issue	**EDF and AREVA to continue to control, maintain and develop the GDA submission documentation, including the SSER, SML and design reference document and deliver final consolidated versions of these as the key references to any DAC/SODA ONR or Environment Agency (the joint Regulators) may issue at the end of GDA. These should include the management and acceptance of changes to GDA submission documentation impacted by design changes agreed for inclusion in GDA.** **This GDA Issue is raised by both ONR and Environment Agency**		
GDA Issue Action	EDF and AREVA to fully implement its processes to manage the implementation and acceptance of amendments to documentation impacted by design changes agreed for inclusion in GDA, including any other additionally agreed design changes associated with other GDA Issues Resolution Plans. This should involve the incorporation of all relevant amendments into the impacted documentation associated with design changes, including the Reference Design Configuration Document UKEPR-I-002, the PCSR, and the PCER. Evidence we expect to see to address this action includes: • Revision of GDA submission documentation impacted by design changes agreed for inclusion in GDA and scheduled to be updated before the end of GDA; in particular, amendments to submission level 2 design information such as SDMs impacted by design changes agreed for inclusion in GDA. • Acceptance by EDF and AREVA of amendments to submission level 2 design change documentation provided by a GDA supplier (for example SOFINEL as a supplier of amended SDMs) • Completion of INSA and IPR where applicable and incorporation of DSRC recommendations into the GDA submission documentation, where appropriate, for any design changes agreed for inclusion in GDA. • Application of appropriate surveillance arrangements for suppliers/contractors used for the products. To facilitate our assessments and our inspections in this area the programme of deliverables of amended impacted design change documentation will need to		

Annex 3

GDA ISSUE

CONSOLIDATED FINAL GDA SUBMISSION INCLUDING AGREED DESIGN CHANGE FOR THE UK EPR

GI-UKEPR-CC-02 REVISION 3

Technical Area		**CROSS CUTTING**	
Related Technical Areas		**All**	
GDA Issue Reference	**GI-UKEPR-CC-02**	**GDA Issue Action Reference**	**GI-UKEPR-CC-02.A1**
	include sufficient time for us to complete our assessments before we may issue any DAC/SODA. With agreement from the joint Regulators this action may be completed by alternative means.		

Annex 3

GDA ISSUE

CONSOLIDATED FINAL GDA SUBMISSION INCLUDING AGREED DESIGN CHANGE FOR THE UK EPR

GI-UKEPR-CC-02 REVISION 3

Technical Area	**CROSS CUTTING**		
Related Technical Areas	All		
GDA Issue Reference	**GI-UKEPR-CC-02**	GDA Issue Action Reference	**GI-UKEPR-CC-02.A2**
GDA Issue Action	EDF and AREVA to apply the revised Design Change procedure in order to identify and transfer all relevant agreed incomplete GDA design changes into Nuclear Site Licensing and permissioning activities, and Environmental Permitting. Evidence we expect to see provided to address this action includes: • Examples of application of arrangements for transfer of incomplete GDA design changes into Nuclear Site Licensing and Environmental Permitting activities. With agreement from the joint Regulators this action may be completed by alternative means.		

Annex 3

GDA ISSUE

CONSOLIDATED FINAL GDA SUBMISSION INCLUDING AGREED DESIGN CHANGE FOR THE UK EPR

GI-UKEPR-CC-02 REVISION 3

Technical Area	**CROSS CUTTING**		
Related Technical Areas	**All**		
GDA Issue Reference	**GI-UKEPR-CC-02**	**GDA Issue Action Reference**	**GI-UKEPR-CC-02.A3**
GDA Issue Action	EDF and AREVA shall continue to control, maintain and develop the GDA submission documentation, including the SSER, SML and design reference document and shall deliver final consolidated versions of these as key references to any DAC/SODA we may issue at the end of GDA. Evidence we expect to see to address this action: • Application of EDF and AREVA due processes, including QA and technical reviews for the control and development of the GDA submission documentation scheduled to be created or updated before the end of GDA and contained within the SSER, SML and design reference document to address GDA Issue resolution, agreed design changes, and any other updates agreed with the joint Regulators. • Application of EDF and AREVA due processes, including technical reviews, INSA and IPR where applicable and QA consolidation checks on final GDA submission documentation scheduled to be created or updated before the end of GDA and contained within the SSER, SML and design reference document. The final GDA submission documentation is to be referenced from any DAC/SODA we may issue. The evidence should include: - Management and incorporation of all review comments and DSRC recommendations in the final consolidated documentation as necessary. - The full assessment of impacts arising from proposed modifications or changes in specific topic areas, including consequential impacts across the SSER. • Delivery of final consolidated GDA submission documentation scheduled to be created or updated before the end of GDA including SSER, SML and design reference document in good time for regulatory assessment prior to any decisions to issue DAC/SODA that would reference these documents With agreement from the joint Regulators this action may be completed by alternative means.		