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REGULATORY OBSERVATION Resolution Plan

RO Unique No.:	RO-UKHPR1000-0004
RO Title:	Development of a Suitable and Sufficient Safety Case
Technical Area(s)	Cross-cutting
Revision:	1
Overall RO Closure Date (Planned):	2021-04-30
Linked RQ(s)	RQ-UKHPR1000-0111; RQ-UKHPR1000-0136;
Linked RO(s)	
Related Technical Area(s)	Reactor Chemistry,Civil Engineering,Control & Instrumentation,Conventional Fire Safety,Conventional
Other Related Documentation	

Scope of Work

Background

The Requesting Parties (RP) of the UK HPR1000 GDA are required to ensure that adequate arrangements and controls are in place to manage the production and development of the UK HPR1000 safety case so that it is consistent, logical, complete and meets UK regulatory expectations.

In Step 2 of Generic Design Assessment (GDA), the Office for Nuclear Regulation (ONR) stated through RO-UKHPR1000-0004, that interactions had not provided ONR with sufficient confidence that the current arrangements in place ensure that the UK HPR1000 safety case will meet expectations. As a result, ONR considered there is a potential regulatory shortfall that requires action and new work by the RP for it to be resolved. These expectations have been set out in four Regulatory Observation Actions for the RP to address.

In response, The RP has prepared a resolution plan against these actions that cover the strategy, programme, organisation and the management of commitments, assumptions and requirements to demonstrate that the RP will be capable of producing, managing and delivering a suitable and sufficient safety case. In preparation of this resolution plan, GNSL consulted with the requesting parties of UK HPR1000, China General Nuclear (CGN) and EDF, to review the intended approach and provide input to the specific plans to address the RO actions. Experience from 3rd Party contractors who are knowledgeable in the production of UK safety cases has also been sought in order to inform the approach and strategy.

CGN are the designers of the UK HPR1000 and are owners of the Pre-Construction Safety Report (PCSR) and Pre-Construction Environment Report (PCER). GNSL are the owners of the Generic Security Report (GSR). As such, GNSL and CGN discussed the context of the RO in detail and committed to making organisational and management changes to ensure that a high quality and comprehensive adequate Safety, Security and

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Environment Report (SSER), i.e. 'safety case', is produced and developed in GDA. Ultimately an adequate SSER and suite of supporting safety case documents is required to provide the basis for a site licensing phase for UK HPR1000 and support a Design Acceptance Confirmation (DAC) and Statement of Design Acceptability (SoDA) being issued at the end of GDA.

During Step 3, the resolution plan for this RO has evolved as the intended deliverables have been developed to address the RO and the RP has engaged in ongoing discussions with the Regulators. As such, an updated Resolution Plan (Revision 001) has been produced to reflect the updated strategy to address the concerns outlined in the RO and which deliverables have been developed and submitted / planned. This update is limited to RO Action 4 only by specific request of the regulators. The associated updated schedule agreed with the regulators is presented in Appendix A.

Abbreviations and Acronyms

BAT	Best Available Technique
CTO	Chief Technical Officer
EMO	Engineering Management Organisation
GDA	Generic Design Assessment
GDAO	GDA Officer
GSRV1	Generic Security Report Version
ITA	Independent Technical Assessment
MSQA	Management of Safety, Quality and Assurance
ONR	Office for Nuclear Regulation
OPEX	Operating Experience
PCER	Pre-Construction Environment Report
PCSR	Pre-Construction Safety Report
RO	Regulatory Observation
RP	Requesting Parties
RQ	Regulatory Query
SCDM	Safety Case Development Manual
SFR	Safety Functional Requirement
SSC	Structure, System and Component
SSER	Safety, Security & Environment Reports
UK HPR1000	The UK version of the Hua-long Pressurised Reactor

Scope of work

This Resolution Plan describes the current plan to address RO-UKHPR1000-0004. It contains the safety case development strategy, key tasks and planned activities associated with the specified actions.

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Deliverable Description

RO-UKHPR1000-0004.Action 1 – Safety Case Development Strategy

The RO action 1 states that:

GNSL should provide a demonstration of the adequacy of the approach that will be taken to produce and develop the UK HPR1000 safety case throughout GDA. This should provide an adequate description of what the safety case is expected to contain and the approach that is being taken to manage and produce this. The information provided should enable ONR to judge whether a suitable and sufficient safety case will be produced and continually developed throughout GDA, which is likely to meet UK regulatory expectations and facilitates the production of a subsequent site specific safety case by the future licensee.

ONR considers that the response to this Action should include information on:

- 1-1 The documented safety case strategy, associated processes and approach, which provide information on the objectives, scope and purpose for the overall UK HPR1000 safety case and how this will be cascaded into individual documents;*
- 1-2 The integration of the overall strategy with any secondary strategies, such as those which may be produced at a topic, system or process level;*
- 1-3 Clear identification and definition of technical and safety case interfaces, and a description of how they are being managed;*
- 1-4 The definition of the architecture / hierarchy of safety case documentation, demonstrating how the different levels and types of safety case documentation and the arguments and evidence contained therein, will be produced and linked together to cover the full scope, interactions and content of the safety case;*
- 1-5 How learning from previous safety case experience has been incorporated in the above strategy, including UK context matters; and*
- 1-6 How progress will be measured, reviewed and controlled and how the success of the outputs will be measured.*

Resolution Plan

Under Action 1, ONR have provided a further six items for further consideration which GNSL have identified them to be Action 1-1 through to Action 1-6.

For Actions 1-1 and 1-2, GNSL will publish the Safety Case Development Strategy Report as scheduled in the Gantt Chart (see Appendix A). The purpose of this report is to set out the safety case development strategy, approach and arrangements required to manage the interfaces between PCSR V1, PCER V1 and GSR V1 submissions (collectively known as SSER V1) from Step 3 GDA. The strategy report will set out the hierarchy of strategy documents and describe their relationship. The suite of strategy documents set out the production strategy for, and defines, the suite of GDA safety case documentation which along with documentation already produced and design reference documentation comprise the UK HPR1000 Safety Case. The Safety Case Development Strategy Report includes information on aspects not specifically linked to RO-04 action responses

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although additional sections have been added to collect topics related to the RO response such as requirements management and the organisation modification.

An outline of the intended content is as follows:

- Introduction
- Historical Development
- Objectives
- Scope
- Inputs
- Proposed Strategy
 - Safety Case Production
 - Production Strategies
 - Technical Specifications
 - SSER Configuration Control
 - Safety Case Development Manual
 - SSER Supporting Documentation
 - Design Modifications
 - Design Reference Point
 - EA Public Consultation
 - Generic Security Case
 - Requirements Management
 - Interface with Bradwell B GenCo
- Safety Case Organisation
- Management of GDA Documentation
- Key Risks to SSER delivery
- Technical Engagement Arrangements
- Project Governance Arrangements
- Training
- Lessons Learnt
- Key Tasks for Strategy Implementation
- Main Assumptions
- Safety Case Documentation Hierarchy & Linkages to Licensing
- Definition of Key Document Types

The Safety Case Development Strategy Report will be underpinned by PCSR, PCER and GSR production strategy reports which are already planned deliverables and will be published as scheduled in the Gantt Chart. This deliverable will constitute submission of a suite of 25 (22 PCSR, 2 PCER, 1 GSR) reports in total. These are briefly described as follow:

PCSR Production Strategy Reports: An overarching PCSR production strategy report will be produced by CGN

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which sets out the requirements for structure, format, content and scope of chapter specific production strategies. The topic specific production strategies produced by CGN provide detailed information on the document hierarchy, document route map, as well as the objective, scope and content of planned documentation in the topic area to fulfil the safety case for that topic through GDA Step 3 and 4. The topic specific production strategies have been produced as internal documents during Step 2 and will be updated to be suitable for submission.

PCER Production Strategy Reports: For the environment case, two production strategy reports are intended to be produced by CGN – one covering PCER Chapters 1 through 8 (less Chapter 3) and a separate production strategy report for Chapter 3 (which covers BAT). Both reports are intended to be produced to set out the scope, objectives and deliverables through GDA Steps 3 and 4.

GSR Production Strategy Report: For the security case, a single production strategy document is intended to be produced by GNSL that sets out the scope, objectives and deliverables through GDA Steps 3 and 4.

Action 1-3 will be addressed in detail under the GNSL response to RO Action 3, the Safety Case Development Strategy Report shall include a description of the GNSL organisational arrangements associated with the production of the UK HPR1000 safety case. The detailed description of working level interfaces and integration of technical and safety case disciplines will be consolidated in the Terms of Reference for the Safety Case Management Group, Safety Case Control Team and Safety Case Working Group as shown in Gantt Chart.

For Action 1-4, the safety case document hierarchy for the project, definitions and linkages of the document types will be set out in the Safety Case Development Strategy Report. More detailed linkages between documentation are described or illustrated in the underpinning PCSR, PCER and GSR production strategy reports. At the top of the document hierarchy, configuration management of these SSER submissions will be controlled by the GNSL SSER Configuration Control Process. This procedure shall be produced by GNSL to set out the requirements for configuration control of the SSER submissions. The existing SSER Configuration Control Process will be reviewed, updated and submitted as scheduled in the Gantt Chart in Appendix A. CGN will produce an accompanying Configuration Control Process that sets out how the local working level practices for PCSR and PCER within CGN will ensure compliance with the requirements set out in the GNSL procedure. The CGN Configuration Control Process will be submitted as shown in the Gantt chart. Lower tier safety case documentation will be subject to the documentation and configuration management arrangements of the originating organisation.

For Action 1-5, in the development of the Safety Case Development Strategy, GNSL has consulted widely and approached UK safety case experts to technically review the report as well as sharing OPEX based on previous GDA experience. The strategy report will also be presented to the GNSL Technical Committee for information and advice.

Lessons Learnt Reviews have been undertaken on GDA Step 1 and Step 2, encompassing Preliminary Safety Report (PSR) production and review (GDA Step 1), PSR Supplementary Reference Production and Review, SSER V0 Production and Review, SSER V0 Supporting References Production and Review, project interface

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and interaction arrangements and regulatory interface arrangements. The learning so far in GDA has been incorporated into the development of the Safety Case Development Strategy Report and will be summarised in a Lessons Learnt Report produce by GNSL as scheduled in the Gantt Chart. The review shall cover feedback on the processes applied so far in safety case development as well as OPEX on Requirements Management in previous GDAs. It is intended that the Lessons Learnt Review Report will be updated periodically during the remainder of GDA to capture future lessons and review the success of improvement initiatives implemented.

For Action 1-6, within the Safety Case Development Strategy Report, a number of key enabling tasks have been identified that need to be completed for successful implementation of the strategy. This delivery schedule with timescales and owners are already stated in the report and covered in the Safety Case Development Strategy Report. Progress tracking of these key enabling tasks will continue to be monitored via monthly Project Delivery Progress meetings chaired by the GDAO. Any associated technical challenges and/or issues will continue to be dealt with by the Cross-Cutting Forum sponsored by the CTO. These arrangements are described in the strategy report.

To measure the effectiveness of strategy implementation, existing internal and external project metrics will be applied and monitored. Effectiveness includes communication across topics, as well as quality and timeliness of planned deliverables. The existing GNSL internal project metrics are currently under review as an output of GNSL Step 3 planning and will be included in the Safety Case Development Report. As part of normal project arrangements, GNSL internal audits will be carried out to ensure ongoing effectiveness of the proposed arrangements as well as supplier audits as scheduled in the GNSL Project Delivery plan. GNSL will share its audit schedule as stated in the Gantt Chart.

RO-UKHPR1000-0004.Action 2– Safety Case Delivery Programme

The RO action 2 states that:

GNSL should provide a programme for delivery of the UK HPR1000 safety case as identified in the strategy defined under Action 1. This plan should include sufficient detail to demonstrate that the strategy identified in Action 1, will be enacted.

ONR considers that the response to this Action should include information on:

- 2-1 A definition of the main safety case tasks required to be completed during GDA (including any tasks already completed or ongoing), and identification of any interface with future (post GDA) tasks;*
- 2-2 Identification of the various reports (e.g. PCSR, topic reports, basis of safety case, support studies, etc.) which will be produced with clear presentation of their hierarchy and interfaces;*
- 2-3 The timeline for production of the deliverables, including any review period and their submission date to ONR (if applicable);*
- 2-4 Any specific constraints or assumptions which may impact on the programme;*
- 2-5 Any dependencies between technical areas, topics or documentation; and*
- 2-6 The process to control and update the programme, including when this will be submitted to ONR at regular intervals throughout GDA as new information becomes available and changes occur.*

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The programme should cover both steps 3 and 4 of GDA.

Resolution Plan

Under Action 2, ONR have provided a further six items for consideration which the RP have identified as Action 2-1 through to Action 2-6 to 'provide a programme for delivery of the UK HPR1000 safety case as identified in the strategy defined under Action 1. This plan should include sufficient detail to demonstrate that the strategy identified in Action 1, will be enacted'.

For Action 2-1, as described earlier in Action 1-6, within the Safety Case Development Strategy Report, key enabling tasks shall be identified that need to be completed for successful implementation of the strategy. This is included in the Safety Case Development Strategy Report.

For Actions 2-2, 2-3 and 2-5, all documents committed to be produced and submitted to the ONR/EA will be consolidated in a Master Document List which shall cover the remainder of GDA (a baseline integrated delivery plan was submitted on 19th Oct'18, GDA/REC/GNS/003067). The Master Document List will provide visibility to the Regulators of all documents intended to be produced in GDA as part of the safety case. This list will allow the Regulators to identify documents for sampling assessment in GDA. The Master Document List will set out the associated topic area, document tier, if it is intended to be submitted for assessment in GDA Step 3 or Step 4, and the status of the document (i.e. issued, in production, planned for production).

The subset of Master Document List documents that have been committed to be submitted to the Regulators in Step 3 and Step 4 will be developed into a more detailed Integrated SSER Programme. In this programme, each document across the topic areas that is intended to be submitted in GDA shall have the appropriate classification (i.e. Tiers 1, 2, 3) with linkages to the main PCSR, PCER and GSR chapters, logic links to other key SSER deliverables and the intended deliverable date to the Regulators. Links to key enabling tasks will also be shown in the programme. GNSL intends to submit the Integrated SSER Programme as scheduled in the Gantt Chart. Administration of the Integrated SSER Programme will be undertaken by the GNSL Project Planner and managed by the Head of Project Correspondent Department at GNSL. The GNS Project Planner will liaise closely with CGN to establish the Master Document List and Integrated SSER Programme. Once established, the Project Planner will liaise with CGN Project Management team on a weekly basis following the current practice.

Until the Master Document List and Integrated SSER Programme are submitted, as set out in the Gantt chart, the Integrated Delivery Plan (GDA/REC/GNS/003067) shall be maintained as a live document to track delivery status and changes to schedule for planned Step 3 deliverables.

For Action 2-4, assumptions made in the Safety Case Development Strategy Report are stated. Specific constraints and any risks associated with programme impact are recorded in the Project Risk Log and will continually be reviewed at monthly GNSL/CGN/EDF Project Delivery Progress Meetings chaired by the GNSL GDA Officer.

For Action 2-6, a systematic process will be established for the management of the Integrated SSER

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Programme to ensure change management is controlled, maintained and communicated to relevant stakeholders in a systematic and consistent manner. This process will be owned by GNSL and is intended to be shared with the ONR as scheduled in the Gantt Chart.

The Integrated SSER Programme shall cover both Steps 3 and 4 GDA. For Actions 2-1 and 2-4, it is likely that during GDA, the Safety Case Development Strategy Report will need to be updated to reflect its current position or when additional tasks, risks are identified and new assumptions are made. Hence, a commitment will be made within the Safety Case Development Strategy Report to update this document prior to Step 4 Entry.

RO-UKHPR1000-0004.Action 3– Safety Case Development Organisation

The RO action 3 states that:

GNSL should provide a demonstration of the adequacy of the organisation that is in place to produce and develop the UK HPR1000 safety case throughout GDA.

ONR considers that the response to this Action should include information on:

3-1 The organisational arrangement, roles and associated responsibilities and authorities related with the production of the UK HPR1000 safety case;

3-2 The arrangements for ensuring management oversight of the development of the safety case by an individual/individuals with authority and influence to ensure the effective implementation of the strategy and programme.

3-3 The arrangements to ensure that suitably qualified and experienced safety case professionals are used to provide advice on and support writing of the safety case;

3-4 Any training undertaken / planned to inform safety case authors or other individuals who have a role in producing the safety case;

3-5 Any independent or peer review activities and processes that may be employed;

3-6 How any third party inputs will be specified, controlled, managed and integrated; and

3-7 How involvement of personnel with relevant plant and operating experience will be achieved, including consideration of the full lifecycle including construction, commissioning, operations and decommissioning.

Resolution Plan

Under Action 3, ONR have provided a further seven items for further consideration which GNSL have identified them to be Action 3-1 through to Action 3-7, to 'demonstrate adequacy of the organisation that is in place to produce and develop the UK HPR1000 safety case throughout GDA'.

For Actions 3-1 and 3-2 (and Action 1-3), the Safety Case Development Strategy Report shall include a description of the GNSL organisational arrangements associated with the production of the UK HPR1000 safety case. The Safety Case Development Strategy Report describes the amended project organisation with the introduction of the role of the Safety Case Manager (fulfilled by CGN) and its interface with GNSL and BRB. The Safety Case Manager is responsible for the management of safety case and its configuration control on a day-to-day basis. The intent is to ensure that the safety case meets the objectives set out in the SSER Route

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Map.

The Safety Case Manager reports directly to the CGN Project Manager and has authority to make decisions on safety case matters. Where there is an interface with a potential design modification then the Safety Case Manager will be responsible for providing the safety case input to the decision making process.

The Safety Case Manager leads the Safety Case team within CGN which consists of Cross-Cutting Leads, Topic Area Leads who directly author the safety case deliverables (chapters, supporting references and lower tier documents) and a Safety Case Control Team. The Safety Case Control Team consists of CGN Safety Case Advisors and Coordinators who are responsible for supporting the Safety Case Manager in technical issues and ensuring that there is consistency of application of the production strategies. In addition, experts will be contracted to provide experienced UK context support to the CGN Safety Case Manager via the Safety Case Control Team to help ensure that the produced safety case is fit-for-purpose.

The Safety Case Manager will have oversight of the safety case authors and be supported by the topic area leads, safety case coordinators and advisors to ensure consistency of approach is being applied. The chapter production strategies and PCER production strategies will be signed off by the Safety Case Manager and the topic area leads will be accountable to deliver fit-for-purpose safety case documentation against these production strategies. The details will be consolidated in the Terms of Reference for the Safety Case Management Group, Safety Case Control Team and Safety Case Working Group as shown in Gantt Chart.

The GNSL Lead Safety Case Project Correspondent is to ensure there is continuous UK oversight on the safety case development, that it continues to meet UK context, and that the clear, traceable route from the SSER submissions through to GDA documentation continues to be maintained. Together, they constitute the Safety Case Management Group which shall oversee the UKHPR1000 safety case development. Formal Terms of Reference will be produced for the Safety Case Management Team as shown in the Gantt Chart in Appendix A. The size of the group shall be scalable to ensure an adequate level of oversight is maintained for the rest of GDA and into the transition to a potential site licensing phase.

At the working level the GNS:CGN interface shall be via the GNSL Safety Case Working Group which includes representation from EDF. The terms of reference for the Safety Case Working Group shall be reconstituted to clarify the responsibilities of the working group so that it supports the work of the Safety Case Management Team without repeating the function of the CGN Safety Case Control Team.

For Action 3-3, GNSL will continue to apply the GNSL procedures and arrangements already in place to ensure suitably qualified and experienced safety case professionals are utilised to provide advice on safety case development. The general arrangements and requirements that GNSL applies are covered in HPR/GDA/PROC/0028 [2] and HPR/GDA/PROC/0029 [3]. In addition, CGN has its own process for qualifying their personnel to work on project assignments WD-EDE-060 [4]. This is supplemented by GDA specific competency criteria [5] and includes training carried out by UK safety case practitioners to ensure there is an adequate level of competency in safety case production. Further explanation shall be provided in the Safety Case Development Report.

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For Action 3-4, initial safety case training has already been rolled out in 2018 to those in CGN involved in the GDA project with more focused training delivered to the CGN safety case production team (refer to RQ-UKHPR1000-0111 and RQ-UKHPR1000-0146 responses). In the response to RQ-0111, GNSL committed to producing a safety case development manual (SCDM) and deliver training by June 2019. To fulfil this action, GNSL plans to share the SCDM training plan as scheduled in the Gantt Chart which will set out how training is intended to be delivered in 2019 on a continuous basis. The training plan will be based on a needs evaluation by CGN to direct training to areas of most immediate benefit in producing safety case documentation. GNSL will share the updated SCDM upon completion of the training as shown in the Gantt Chart.

The SCDM will provide an enduring resource to safety case authors on how to write a safety case that is fit-for-purpose in the UK context meeting the expectations outlined in the Safety Case Development Strategy Report.

For Action 3-5, GNSL is committed to conducting an independent technical assessment (ITA) on SSER V1. This is already a planned activity in the GNSL Project delivery plan. In addition, GNSL has established a schedule of SSER V1 references for technical review. This list, based on the initial schedule of SSER supporting references, will be shared with the ONR as scheduled in the Gantt Chart. The management of the GNSL Project Delivery Plan is covered by HPR/GDA/PROC/0018 [6].

For Action 3-6, where third party provides technical input to safety case development, this will continue to be managed through the GNSL Control of Service Provider Technical Work Procedure (HPR/GDA/PROC/0028). For more holistic technical reviews, such as ITA, these will be provided as recommendations and incorporated into the improvement plans of each entity (i.e. GNS, CGN and EDF). These improvement plans are maintained and tracked at fortnightly MSQA progress meetings organised between the three entities. Collectively, such reviews form part of the scope of GNS's scheduled audits as shown in the Gantt Chart.

For Action 3-7, personnel with relevant plant and operating experience will be involved in the safety case development when the need arises. This is likely to originate from proposed design modifications which will require some extent of optioneering to be undertaken as part of the design modification process. The processes and procedures that capture these requirements are specified in the Design Modification, Categorisation and Optioneering Process Documents which will be submitted as scheduled in the Gantt Chart. So far, such personnel have been involved in safety case development and shall continue to do so under CGN's organisation arrangements described in GH-40M-004 [1].

RO-UKHPR1000-0004.Action 4 – Capturing Assumptions, Requirements and Commitments from the Safety Case

The RO action states that:

GNSL should provide a demonstration of the adequacy of the approach that is being adopted to ensure that safety related assumptions, requirements and commitments identified within the safety case are appropriately captured and managed throughout GDA, and are supplied to the future licensee.

ONR considers that the response to this Action should include information on:

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4-1 Details of the method that is adopted for clearly identifying any safety related assumptions, requirements and commitments in the text of the safety case, including how they are:

recognised;

uniquely identified and tracked;

collated and catalogued;

graded based on safety significance;

consolidated into a single consistent set, applied throughout the safety case;

updated and managed throughout GDA

4-2 Any training given / planned to the safety case authors, or others involved in the safety case production process;

4-3 How they will be effectively transferred to the future licensee to be included in operating rules, manuals, procedures, training requirements, commissioning tests, etc., as appropriate, including identification of, and mapping to, any documentation with may be produced after GDA (such as in construction and commissioning documentation).

Resolution Plan

For Revision 1 of this resolution plan the response to the RO Actions 4-1 to 4-3 has been updated to reflect the updated strategy that has been agreed with the Regulators. In development of the approach to Requirements Management and Commitment Management, engagement of BRB EMO has been undertaken to ensure alignment of expectations and needs.

For Action 4-1, the RP has decided that the most appropriate approach for requirements management is to align with the existing design process [8] practice within CGN to enable the designers to have maximum familiarity with the concept and not impose a significantly different system to that used by CGN on their other NPP projects. The RP has undertaken a gap analysis [9] between the existing practice and UK nuclear industry norms (in the absence of specific guidance or standard) for requirements management by a UK supplier.

Following the gap analysis, an optioneering exercise has been undertaken to identify potential solutions to address the key gaps identified. The option taken forward for implementation is based on the existing design process with:

- explicit linking to a set of schedules (e.g. fault schedule, hazard schedule, sample engineering schedules, etc.);
- safety functional requirements reports (SFRs) which support the schedules and present detailed description and justification for the requirements; and
- structure, system and component (SSC) design reports which support the SSC schedules and present detailed design information for the SSCs (e.g. System Design Manuals, Basis of Design reports)

All the above will use a common coding system for what are known as “specific requirements” to provide full scope traceability across the whole safety case. It has been noted that the ONR proposal is based on a top down analysis, whereas the UK HPR1000 design process is a bottom-up approach to defining and propagating

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safety, engineering, and operational requirements throughout the design. Both approaches are valid for requirements management, as presented in the RP's letter to ONR on Requirements Management Approach [10].

Following the identification of the option to close the identified key gap on traceability of requirements there has been a period of concept implementation, whereby the identified option has been developed. The evidence for this implementation has been provided as supporting information for the Requirements Management summary report which has been issued to ONR [11]. To address queries raised by ONR in RQ-UKHPR1000-0922 [12], the RP revised the Requirements Management Summary Report [13] including improvements to the description of the general and specific design inputs from the overall design process, description of the documented arrangements and processes to identify and manage requirements for the UK HPR1000 GDA, and the addition of a number of examples to demonstrate the intended implementation.

The summary report provides:

- A description of current requirement management process of CGN;
- A review of the gap analysis undertaken by Wood Group;
- Presentation of the optioneering process undertaken by CGN and General Nuclear System Limited and introduction of the final option;
- Presentation of the development of solution;
- Presentation of management of operational requirements and layout requirements;
- Justification of the process, including a presentation of the comparative decomposition analysis

In tandem with Action 4-2, a procedure [14] for the updated requirements management process has been developed and incorporated into CGN's integrated management system for the UK projects. Furthermore, an update has been made to the Safety Case Development Manual 0 to reflect the updated requirements management process. Finally, a description of the requirements management process will be added to PCSRV2 Chapter 20 which will be issued in 2021.

Training on the aforementioned procedure and updated SCDM has been provided for all relevant engineers within the Requesting Parties. This training material is held on the integrated management system of both CGN and GNSL, and is therefore available to any potential future licensee. The training material includes an overview of relevant information from the SCDM 0 and Requirements Management Summary Report [13] and sets out how the procedure is expected to be implemented with examples of application. The delivery of these tasks is shown in the Gantt Chart.

Implementation of the requirements management coding system, established by CGN's procedure, into project documentation has begun. A sample of submissions has been agreed with ONR in support of Action 4-1 across a range of systems to demonstrate the breadth and depth of application in GDA is provided in Appendix B. Appendix B is a list of the specific deliverables to address this RO. Further documents will be implementing the requirements management coding system in GDA and are scheduled to be submitted to the Regulators as

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agreed at the topic level and communicated via the Integrated Delivery Plan (IDP) but are not intended to be specifically assessed against this RO.

Finally, under Action 4-1, GNSL have produced an updated procedure [6] for commitments management to clarify more explicitly the definition of commitments for UK HPR1000 GDA, and commitments that will be logged for post-GDA implementation. Furthermore, CGN have produced a UK Project procedure within their integrated management system based on the GNSL procedure [7]. Following these procedures, an updated commitment tracking sheet has been established and subjected to routine regulatory inspection through the MSQA topic. The commitment process allows commitments to be logged as GDA commitments or post-GDA commitments that shall be passed to the BRB project or any other future licensee. These post-GDA commitments shall be included in the GDA safety case as a tier 2 document to support handover to future licensees.

For Action 4-3, in the Safety Case Development Strategy report, GNSL has committed to establishing interface and transition arrangements with the future site licensee (BRB GenCo). A key objective is to develop a transition plan for handover between projects to enable knowledge transfer as well as establishing the arrangements to create pipeline of personnel to support the transition from GDA to the licensing phase. To that end, four work packages have been established:

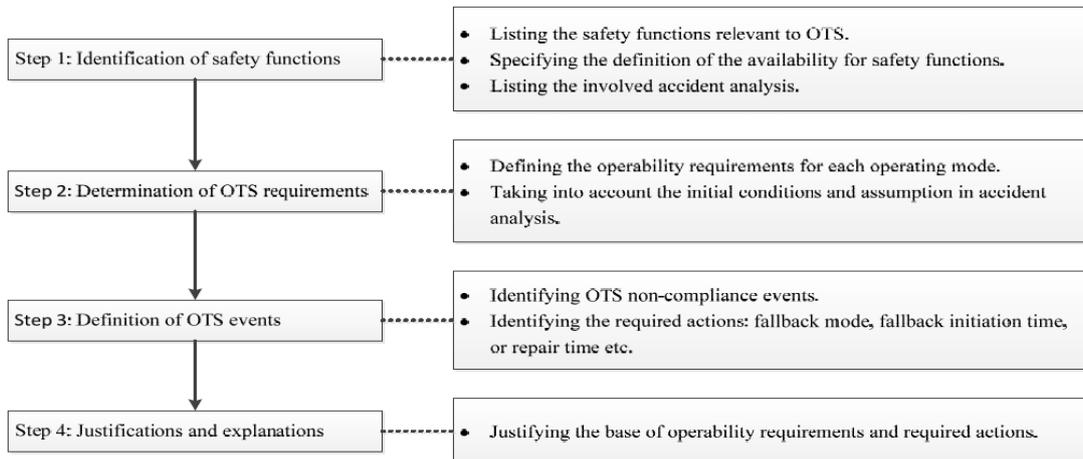
- WP1: Resources and People Planning
- WP2: Technical Planning
 - Under this work package a joint safety case office (JSCO) has been established between GNSL and BRB to facilitate knowledge transfer. Part of the activities of the JSCO are providing BRB with support and training to enable the smooth transition of processes and procedures that have been established in GDA for safety case management including requirements management and commitments management.
 - GNSL will deliver specific training to BRB on the requirements management process as part of the tasks for Action 4-3. In addition GNSL will continue to support BRB in their regulatory interactions and submissions for safety case management to aid smooth transition of processes, procedures and knowledge for UK HPR1000.
- WP3: Organisational Planning
- WP4: Communication and Stakeholder Engagement Planning

The duration of this task to establish appropriate interface arrangements and develop a viable GDA to Licensing Phase transition plan is shown in the Gantt Chart

Furthermore, the Requirements Management Summary Report [13] has been updated to present the process for transferring requirements and assumptions from the safety case and into the operating rules, manuals, procedures, training requirements, commissioning tests, etc. The report includes identification of, and mapping to, any documentation with may be produced after GDA (such as in construction and commissioning

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documentation). For example, for the development of the Limits and Conditions of Operation the following four step process will be undertaken, with steps 1 & 2 being undertaken within GDA, and steps 3 & 4 being undertaken post-GDA:



This process is explained further in the updated Requirements Management Summary Report [13].

In summary, the documents to close actions A4-1, A4-2 and A4-3 are:

Action	Document	Submission / delivery date
RO4.A4-1	Updated Requirements Management Summary Report [13]	August 2020
RO4.A4-1	Procedure for requirements management within Requesting Parties Integrated Management System [14]	September 2020
RO4.A4-1	Updated Safety Case Development Manual (SCDM) to include revised information on requirements management process 0	September 2020
RO4.A4-2	Development of training package for CGN internal procedure on requirements management	August 2020
RO4.A4-2	Delivery of training for CGN internal procedure on requirements management	August 2020

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RO4.A4-2	Update of training package for Safety Case Development Manual	August 2020
RO4.A4-2	Delivery of updated Requirements Management training to GNSL project correspondents team and BRB	February 2021
RO4.A4-3	GNSL-BRB transition plan	November 2020
RO4.A4-3	Updated Requirements Management Summary Report [13] [Linked to RO4.A4-1]	August 2020
RO4.A4-1 RO4.A4-2 RO4.A4-3	List of project engineering and operational documents to be updated as a consequence of the work undertaken in response to RO4.A4 as listed in Appendix B.	January 2021

Impact on the GDA Submissions

Relevant information will be incorporated into PCSR Chapter 20 (and possibly PCER Chapter 1 where relevant). The full extent of any other documents potentially affected by the output from this Resolution Plan will be determined upon completion of each ROA.

Timetable and Milestone Programme Leading to the Deliverables

See attached Gantt Chart in APPENDIX A.

Reference

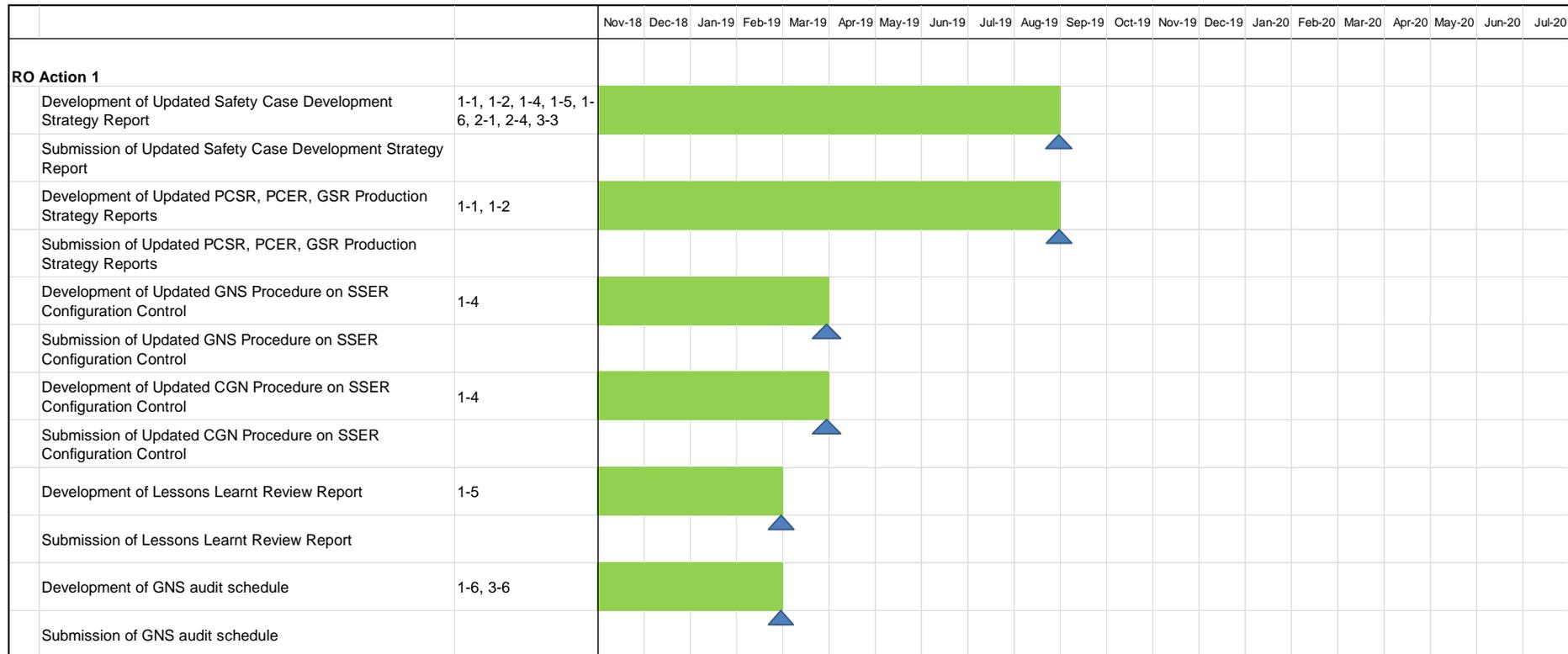
- [1] CGN, Organisation and Operation Rules of UK HPR1000 GDA Project, GH-40M-004, Rev A.
- [2] GNSL, Control of Service Provider Technical Work Procedure, HPR/GDA/PROC/0028, Rev 001, 2019
- [3] GNSL, Suitably Trained, Competent & Experienced Personnel – a Framework for GDA, HPR/GDA/PROC/0029, Rev 0, 2017
- [4] CGN, Position Training Guideline and Management Rules on Authorisation and Job Taking, WD-EDE-060, Rev A, 2018.
- [5] CGN, Rules for Personnel Qualification Management of GDA Project, GH-40M-003, Rev A
- [6] GNSL, Management of Commitments for Safety Case Updates, HPR/GDA/PROC/0046, Rev 3.
- [7] CGN, Management of Commitments for UK HPR1000 GDA Project, GH-40M-020, Rev B, 2019
- [8] CGN, HPR1000 Requirement Management Report, GHX00100122DOZJ03GN, Rev A, 2019
- [9] CGN, UK HPR1000 Requirement Management Gap Analysis Report, 007-GH-L-GENS-G-NSNS-000321, Rev A, 2019
- [10] GNSL, Letter – Requirements Management, HPR-GDA-LETT-0037, 2019

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- [11] CGN, Requirements Management Summary Report, GHX00100127DOZJ03GN Rev A, April 2020
- [12] ONR, RQ-UKHPR1000-0922 RQ Comments on GNSL Summary Report - 3 July 2020 – 2020/200447
- [13] CGN, Requirements Management Summary Report, GHX00100127DOZJ03GN, Rev B, September 2020
- [14] CGN, Requirement Management Provisions for UK HPR1000 Generic Design Assessment (GDA) Project, GH-40M-026, September 2020
- [15] GNSL, Safety Case Development Manual, HPR/GDA/REPO/0110, Rev 1, September 2020

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APPENDIX A RO-UKHPR1000-0004 Gantt Chart



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		Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20					
RO Action 2																											
Development of Integrated Delivery Plan	2-2, 2-3, 2-5	[Green bar from Nov-18 to Dec-19]																			▲						
Submission of Integrated Delivery Plan																											
Development of Totality of Safety Case List	2-2, 2-3, 2-5	[Green bar from Nov-18 to Dec-19]																			▲						
Submission of Totality of Safety Case List																											
Development of Process for the Integrated Delivery Tool	2-6	[Green bar from Nov-18 to Jul-19]									▲																
Submission of Process for the Integrated Delivery Tool																											
RO Action 3																											
Development of Safety Case Delivery Management Terms of Reference	3-1, 3-2 (and 1-3)	[Green bar from Nov-18 to Jan-19]			▲																						
Submission of Safety Case Delivery Management Terms of Reference																											
Development of Safety Case Development Training Plan	3-4	[Green bar from Nov-18 to Feb-19]				▲																					
Submission of Safety Case Development Training Plan																											
Development of Safety Case Development Manual & Training	3-4				[Green bar from Jan-19 to Aug-19]									▲													
Submission of Safety Case Development Manual & Training																											
Development of Initial Schedule of Supporting References for Technical Review	3-5	[Green bar from Nov-18 to Jan-19]				▲																					
Submission of Initial Schedule of Supporting References for Technical Review																											
Development of Design Modification, Categorisation & Optioneering Processes	3-7	[Green bar from Nov-18 to Dec-18]			▲																						
Submission of Design Modification, Categorisation & Optioneering Processes																											

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		May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21
RO Action 4																									
Development of CGN Requirements Management Report	4-1																								
Submission of CGN Requirements Management Report																									
Development of Requirements Management Gap Analysis	4-1																								
Submission of Requirements Management Gap Analysis																									
Development of Requirements Management Summary Report	4-1, 4-2, 4-3																								
Submission of Requirements Management Summary Report																									
Procedure for requirements management within Requesting Parties Integrated Management System	4-1																								
Submission of Procedure for requirements management within Requesting Parties Integrated Management System																									
Updated Safety Case Development Manual (SCDM) to include revised information on requirements management process	4-2																								
Submission of Updated Safety Case Development Manual (SCDM) to include revised information on requirements management process																									
Development of training package for CGN internal procedure on requirements management	4-2																								
Delivery of training for CGN internal procedure on requirements management																									
Update of Requirements Management training to GNSL project correspondents team and BRB	4-2, 4-3																								
Delivery of updated Requirements Management training to GNSL project correspondents team and BRB																									
GNSL-BRB transition plan	4-3																								
Submission of GNSL-BRB Transition Plan																									
Development and submission of project engineering and operational documents to be updated as a consequence of the work undertaken in response to RO4.A4 as listed in Appendix B.	4-1																								
Submission of final example document																									
Assessment																									
Regulators Assessment																									
Target RO Closure Date																									

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APPENDIX B - List of Sample Submissions for Demonstration of RO-UKHPR1000-0004 Action 4 Implementation

Document number	Document title	Revision number	Issue date	RO-0004 Examples Covered
GHX86000015DOZJ03GN	External Hazards Schedule Report	E	31/12/2020	Hazard loads for BFX
GHX00600276DRAF02GN	UK HPR1000 Fault Schedule	C	31/10/2020	RIS; SFP leak detection; Temperature and pressure challenge to BFX;
GHX00600276DRAF02GN	UK HPR1000 Fault Schedule	D	29/01/2021	RIS; SFP leak detection; Temperature and pressure challenge to BFX;
GHX84200051DOZJ03GN	Internal Hazards Schedule Report	B	30/12/2020	High energy pipe failure for BFX;
GHX00100027DNHX03GN	Engineering Schedule for Mechanical Engineering	C	30/10/2020	RIS; PTR purification; SFP leak detection;

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Document number	Document title	Revision number	Issue date	RO-0004 Examples Covered	
GHXNIX10058DWJG42GN	Civil Engineering Schedule Report	A	15/01/2021	Constructability for BFX; High energy pipe failure for BFX; Temperature and pressure challenge to BFX; Shielding for BFX;	
GHX06002013DIYK03GN	BSC of Diverse Actuation System	B	30/11/2020	RIS; SFP leak detection;	
GHX06002005DIYK03GN	BSC of Severe Accident I&C System	B	30/11/2020	Severe Accident	
GHX06002003DIYK03GN	BSC of Safety Automation System	B	30/11/2020	RIS; SFP leak detection;	
GHX06002002DIYK03GN	BSC of Protection System	D	30/11/2020	RIS; PTR purification; SFP leak detection;	
GHX84200047DOZJ03GN	High energy pipe failures safety assessment report for Fuel Building	A	30/10/2020	High energy pipe failure for BFX;	
GHX86000016DOZJ03GN	Aircraft Crash Safety Evaluation Report	A	30/09/2020	Hazard loads for BFX;	
GHX86000016DOZJ03GN	Aircraft Crash Safety Evaluation Report	B	29/01/2021	Hazard loads for BFX;	

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Document number	Document title	Revision number	Issue date	RO-0004 Examples Covered		
GHX00600351DRAF02GN	Safety Functional Requirements of RIS [SIS]	C	26/11/2020	RIS		
GHX00600324DRAF02GN	Functional Requirements of Severe Accident I&C	B	15/11/2020	Severe Accident		
GHX17DWL003DCNT45GN	DWL-Safeguard Building Controlled Area Ventilation System Manual Chapter 3 System Functions and Design Bases	E	30/11/2020	RIS		
GHX17DWK003DCNT45GN	DWK-Fuel Building Ventilation System Manual Chapter 3 System Functions and Design Bases	E	30/11/2020	PTR purification; SFP leak detection; High energy pipe failure for BFX; Temperature and pressure challenge to BFX;		
GHX06002012DIYK03GN	KDA [SA I&C] System Requirements Specification	B	30/11/2020	Severe Accident		
GHX17LV*009DEDQ45GN	LVA/LVB/LVC/LVD/LVP/LVQ NI AC Uninterruptible Power System Design Manual Chapter 9 Flow Diagrams	C	31/08/2020	RIS; Severe Accident; PTR purification; SFP leak detection;		
GHX17LO*009DEDQ45GN	LOA/LOB/LOC/LOD/LOE/LOF NI 380V AC Regulated Power System Design Manual Chapter 9 Flow Diagrams	D	31/08/2020	RIS; PTR purification; SFP leak detection;		

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Document number	Document title	Revision number	Issue date	RO-0004 Examples Covered	
GHX17LL*009DEDQ45GN	LL*-380V Emergency Power Distribution System Design Manual Chapter 9 Flow Diagrams	D	31/08/2020	RIS; PTR purification; SFP leak detection;	
GHX17LJ*009DEDQ45GN	LJA/LJB/LJC/LJD/LJU/LJV-NI 690V SBO Power Distribution System Design Manual Chapter 9 Flow Diagrams	A	31/08/2020	RIS	
GHX17LHU009DCCJ45GN	LJU/LJV SBO Power Supply (SBO DG) System Design Manual Chapter 9 Flow Diagrams	B	31/08/2020	RIS	
GHX17LHP009DCCJ45GN	LHP/LHQ/LHR Emergency Power Supply (EDG) System Design Manual Chapter 9 Flow Diagrams	B	31/08/2020	RIS	
GHX17LH*009DEDQ45GN	LHA/LHB/LHC-NI 10kV Emergency Power Distribution System Design Manual Chapter 9 Flow Diagrams	C	31/08/2020	RIS	
GHX17LG*009DEDQ45GN	LG*-10kV Normal Power Distribution System Design Manual Chapter 9 Flow Diagrams	C	31/08/2020	RIS	
GHX17LA*009DEDQ45GN	LAA/LAB/LAC/LAD/LAP/LAQ NI 220V DC Power Supply and Distribution System Design Manual Chapter 9 Flow Diagrams	C	31/08/2020	RIS; Severe Accident	

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Document number	Document title	Revision number	Issue date	RO-0004 Examples Covered	
GHXFXX10004DWJG42GN	Design substantiation report for BFX	A	15/01/2021	Constructability for BFX; High energy pipe failure for BFX; Temperature and pressure challenge to BFX.	
GHX17RIS006DNHX45GN	RIS-Safety Injection System Design Manual Chapter 6 System Operation and Maintenance	F	30/11/2020	RIS	
GHX17RIS003DNHX45GN	RIS-Safety Injection System Design Manual Chapter 3 System Functions and Design Bases	E	30/11/2020	RIS	
GHX17RIS004DNHX45GN	RIS-Safety Injection System Design Manual Chapter 4 System and Component Design	D	30/11/2020	RIS	
GHXFXX10001DWJG42GN	Basis of Safety Case for BFX	G	30/12/2020	Constructability for BFX; High energy pipe failure for BFX; Temperature and pressure challenge to BFX; Shielding for BFX;	
GHXFXX10002DWJG42GN	Basis of design for BFX	E	30/12/2020	Constructability for BFX; High energy pipe failure for BFX; Temperature and pressure challenge to BFX.	

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Document number	Document title	Revision number	Issue date	RO-0004 Examples Covered	
GHXFXX10003DWJG42GN	Structural analysis and design report for BFX	C	30/12/2020	Constructability for BFX; High energy pipe failure for BFX; Temperature and pressure challenge to BFX.	
GHXFXX10005DWJG42GN	Reinforced concrete barrier substantiation report for BFX	C	30/10/2020	High energy pipe failure for BFX;	
GHXNIX10021DWJG42GN	Basis of Safety Case for Aircraft Impact	F	15/11/2020	Hazard loads for BFX;	
GHXNIX10022DWJG42GN	Basis of Design for Aircraft Impact	E	30/12/2020	Hazard loads for BFX;	
GHXNIX10023DWJG42GN	Aircraft Impact Evaluation Report	D	30/12/2020	Hazard loads for BFX;	
GHXNIX10025DWJG42GN	Aircraft Impact Dynamic Analysis Report	B	30/12/2020	Hazard loads for BFX;	
GHX17PTR003DNHX45GN	PTR-Fuel Pool Cooling and Treatment System Design Manual Chapter 3 System Functions and Design Bases	D	30/11/2020	Temperature and pressure challenge to BFX; PTR purification; SFP leak detection;	
GHX26RISC01DNHX45SS	System Commissioning Program of Safety Injection System (RIS)	B	30/11/2020	RIS	

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Document number	Document title	Revision number	Issue date	RO-0004 Examples Covered	
GHX39RIS001DNHX45SS	Periodic Test Completeness Note of Safety Injection System (RIS)	B	30/11/2020	RIS	
GHX17PTR006DNHX45GN	PTR-Fuel Pool Cooling and Treatment System Design Manual Chapter 6 System Operation and Maintenance	D	30/11/2020	Temperature and pressure challenge to BFX; PTR purification; SFP leak detection;	
GHX26PTRC01DNHX45SS	System Commissioning Program of Fuel Pool Cooling and Treatment System (PTR)	B	31/12/2020	Temperature and pressure challenge to BFX; PTR purification; SFP leak detection;	
GHX39PTR001DNHX45SS	Periodic Test Completeness Note of Fuel Pool Cooling and Treatment System (PTR)	B	31/12/2020	Temperature and pressure challenge to BFX; SFP leak detection;	
GHX99RIS002DNHX45GN	Pre-service Inspection List of Safety Injection System (RIS)	A	31/10/2019	RIS	
GHX00100033DNFP03GN	Fuel Building Shielding Design Report	C	30/6/2020	Shielding for BFX;	
GHXFX000004DNBZ43DD	Fuel building General arrangement drawing Plan View +4.50m	D	18/9/2020	Shielding for BFX;	
GHXFX000007DNBZ43DD	Fuel building General arrangement drawing Plan View +18.30m	E	18/9/2020	Shielding for BFX;	

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Document number	Document title	Revision number	Issue date	RO-0004 Examples Covered	
GHXFX111901DWJG42DD	Civil Arrangement Drawing - BFX at Level +4.500m	A	15/6/2020	Constructability for BFX;	
GHXFX411901DWJG42DD	Civil Arrangement Drawing - BFX at Level +18.300m	A	15/6/2020	Constructability for BFX;	
GHX17DVL004DCNT45GN	DVL-Electrical Division of Safeguard Building	D	7/12/2020	Severe Accident	
GHX17DCL004DCNT45GN	DCL-Main Control Room Air Conditioning System	E	7/12/2020	Severe Accident	
GHX06002031DIYK03GN	Heat load of KDA System	A	15/11/2020	Severe Accident	
GHX00100027DNHX03GN	Engineering Schedule for Mechanical Engineering	D	08/01/2021	RIS; PTR purification; SFP leak detection;	
TBD	Extant Duty Schedule for RIS/ASG/DCL system	A	15/01/2021	RIS	