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**Civil Nuclear Reactors Programme**  
**NNB GenCo: First Project Convergence Point at Hinkley Point C**  
**Summary Progress Report**

Progress Report ONR-CNRP-PR-14-044  
Revision 0  
18 December 2014

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## EXECUTIVE SUMMARY

This report provides a summary of an assessment by the Office for Nuclear Regulation (ONR) of the progress of NNB Generation Company (NNB GenCo) Limited towards readiness for the construction phase of the Hinkley Point C project. This is the first of a series of project convergence points at which ONR will record its judgement on the performance of NNB GenCo, as licensee for Hinkley Point C, and its readiness to proceed to the next phase of the project. It should be noted that this first project convergence point has been introduced prior to the start of construction by agreement between ONR and NNB GenCo, with the objective of exercising licensee and regulatory processes. As such, it does not permission or constrain any activities in respect of NNB GenCo and Hinkley Point C. ONR's judgement on NNB GenCo's progress draws on interventions and assessments carried out since granting of the Hinkley Point C nuclear site licence in December 2012, including assessment of the Hinkley Point C Nuclear Site Security Plan and Pre-Construction Safety Report.

This report summarises four separate 'cornerstone' reports on the following themes:

- Security, safeguards and conventional (non-nuclear) safety;
- Design and safety case;
- Licence condition compliance; and
- Organisational capability.

The following sections summarise key developments in the Hinkley Point C project since licensing, together with the matters arising from ONR's assessment of the above themes and the overall conclusions and recommendations. Also included are ONR's observations on the convergence process itself.

### **Key developments in the Hinkley Point C project since licensing**

The Hinkley Point C project schedule is currently constrained pending a final investment decision. However NNB GenCo is continuing to develop its organisation and arrangements, progress development of the Hinkley Point C reference design configuration, mobilise the development site and complete trial activities (a construction 'mock-up').

In December 2012 NNB GenCo submitted the Hinkley Point C Pre-Construction Safety Report, which was assessed by ONR and has been reported separately. Currently NNB GenCo is working towards acceptance of design Reference Configuration 1, which will form the basis of the next version of the Pre-Construction Safety Report. Reference Configuration 1 includes the majority of modifications arising from ONR's Generic Design Assessment of the UK EPR™.

### **Matters arising from ONR's assessment**

*Security, safeguards and conventional safety.* On matters relating to security, the licensee has demonstrated compliance with the relevant regulations, is progressing with responses to the Generic Design Assessment findings and is continuing to develop the security strategies for the operational site.

In the area of safeguards, the licensee has demonstrated its commitment to ensure that its nuclear materials accountancy and safeguards verification arrangements for Hinkley Point C are met by engagement with the ONR safeguards team and the safeguards inspectorate of the European Commission (Euratom).

In fire safety design, NNB GenCo has made significant progress in developing draft fire strategy documents for the more challenging buildings on the nuclear island. Although considerable work is still to be undertaken, ONR considers that fire safety is developed to an adequate level and is progressing satisfactorily.

ONR's conventional health and safety engagement and intervention on site has been limited because of the minimal site works activity to date.

*Design and safety case.* ONR's assessment has underlined that little new safety case material has been submitted by the licensee since the submission of Hinkley Point C Pre-Construction Safety Report 2012. It has also highlighted a number of outstanding design risks, of which progress with close-out of the Generic Design Assessment findings is considered by ONR to represent one of the biggest regulatory risks.

ONR's design and safety case lead identifies the following areas where NNB GenCo needs to focus to manage this regulatory risk:

- To demonstrate through its Construction Safety Justifications, that it has decoupled the outstanding design risks sufficiently to allow the start of civil construction in advance of delivery of the next revision of the Pre-Construction Safety Report;
- To adequately progress, and hopefully accelerate, the closure of significant outstanding Generic Design Assessment findings and issues to mitigate the associated design risk;
- To develop, through its list of deliverables, adequate work programmes to ensure detailed design reports and design substantiation reports are delivered in a timely manner to enable ONR assessment and feedback; and
- Through active surveillance of its Responsible Designer, to ensure that an adequate safety case is provided to substantiate the design and manage the design risk.

ONR is generally satisfied with NNB GenCo's progress towards acceptance of design Reference Configuration 1, application of the interim design modifications process and progress towards preparation of the Construction Safety Justifications and next revision of the Pre-Construction Safety Report.

*Licence condition compliance.* ONR judges that the arrangements and procedures for compliance with the Group 1 licence conditions (those required for the construction and installation phases of the Hinkley Point C project) address the expectations of ONR published guidance, are appropriate for the early construction and installation phases, and represent good practice. Implementation of the arrangements is satisfactory for the current stage of the project, recognising the constraints arising from the delay in the project investment decision.

ONR is also satisfied that NNB GenCo is developing its Group 2 licence compliance arrangements (those required for commissioning, operation and decommissioning) and that Pre-Operations Department personnel are actively engaged in the design, acceptance and review of relevant design and safety case deliverables.

*Organisational capability.* ONR's overall judgement is that NNB GenCo's organisational capability is close to that expected for the first consent point. However NNB GenCo will need to increase resourcing in key areas to match activities required for, and permitted by, the first consent point. This includes consideration of NNB GenCo's readiness for post-permitted construction activities, and other key activities running in parallel.

ONR's assessment has identified strengths, including NNB GenCo's management of organisational change, its overall competence and safety culture, approach to learning and independent assurance function. Key areas of focus for ONR include NNB GenCo's ability to resource key technical and commercial disciplines, the effectiveness of the Design Authority's intelligent customer role and the readiness of procurement and supply chain processes for the acceleration of activity post financial investment decision.

*Convergence process.* ONR judges that NNB GenCo has taken full opportunity of the construction of the mock-up to exercise its licence condition 19 arrangements (relating to construction or installation of new plant). Overall, the convergence process was effective and

robust and Safety Directorate's parallel 'concurrence' process delivered a valuable independent view on NNB GenCo's readiness to commence construction of the mock-up. ONR has identified a number of learning points which it will feed into NNB GenCo's lessons learned exercise.

### **Conclusions**

In the areas of security (including safeguards and conventional safety), licence compliance and organisational capability, ONR is satisfied that NNB GenCo has made adequate progress towards readiness for construction phase of the Hinkley Point C project. On security matters there are six outstanding resolution plans for Generic Design Assessment findings which ONR recommends should be submitted by the end of 2014 (see below).

As regards the Hinkley Point C design and safety case, ONR is satisfied that NNB GenCo has made adequate progress towards acceptance of design Reference Configuration 1, readiness for licence condition 20 (modification to plant under construction) and preparation of future safety report submissions (construction safety justifications and Pre-Construction Safety Report). However ONR's assessment has also highlighted a number of outstanding design risks, of which progress with close-out of the Generic Design Assessment findings is considered by ONR to represent one of the biggest regulatory risks. In this regard ONR has made a number of follow-up recommendations (see below).

### **Recommendations**

- Recommendation 1: Based on the advice given in the civil engineering assessment, ONR should commence a series of interventions focussed on NNB GenCo's arrangements for the control and oversight of nuclear related site activities.
- Recommendation 2: ONR should consider raising a Level 3 Issue with regard to the turbine disintegration safety case to ensure adequate consideration of the site layout plan is taken into account to ensure risks are reduced as low as reasonably practicable.
- Recommendation 3: ONR should continue to focus on the close out of Generic Design Assessment findings and Hinkley Point C Pre-Construction Safety Report 2012 issues (including submission by NNB GenCo of the six outstanding security-related resolution plans by 31 December 2014).
- Recommendation 4: ONR should work with NNB GenCo to develop an agreed list of deliverables for each topic area to ensure timescales provide adequate time for ONR assessment and feedback. ONR will need to work with NNB GenCo to ensure it has adequate resourcing plans to meet these commitments.
- Recommendation 5: ONR should commence a series of interventions looking at the interface between NNB GenCo and the Responsible Designer (including AREVA) to ensure adequate control and understanding of the design process is in place.

## LIST OF ABBREVIATIONS

ALARP	As low as reasonably practicable
AR	Assessment Report
BDR	Basic Design Reference (for Hinkley Point C)
BMS	(ONR) How2 Business Management System
BS	British Standard
BTC	Basic Technical Characteristics
C&I	Control and Instrumentation
CNRP	Civil Nuclear Reactor Programme
CSA	Conceptual Security Arrangement
CSJ	Construction Safety Justification
DA	Design Authority
EDF	Electricite de France
EPR™	The generic design of pressurised water reactor submitted for GDA
EQ	Equipment Qualification
FA3	Flamanville-3
FCV	Filtered Containment Vent
FID	Financial Investment Decision
GDA	Generic Design Assessment
GDAF	Generic Design Assessment Finding
HF	Human Factors
HPC	Hinkley Point C
HSE	Health and Safety Executive
HVAC	Heating, Ventilation and Air Conditioning
IACO	Independent Assessment Challenge and Oversight
IMS	Integrated Management System
ISFS	Interim Spent Fuel Store
ITA	Independent Technical Assessment
KM	Knowledge Management
LC	Licence Condition
LoD	List of Deliverables
MoC	Management of Change
NISR	Nuclear Industries Security Regulations
NMA	Nuclear Materials Accountancy
NNB GenCo	NNB Generation Company Limited
NORMS	National Objectives, Requirements and Model Standards
NSC	Nuclear Safety Committee
NSSP	Nuclear Site Security Plan

ONR	Office for Nuclear Regulation
PCmSR	Pre-Commissioning Safety Report
PCSR	Pre-Construction Safety Report
PCSR-3	Working title for the document that will succeed PCSR 2012
PEP	Project Execution Plan
PR	Progress Report
PSA	Probabilistic Safety Assessment
RC1	Reference Configuration 1
RC1.1	Reference Configuration 1.1
RC2	Reference Configuration 2
RD	Responsible Designer
SAA	Severe Accident Analysis
SAP	Safety Assessment Principle(s) (ONR)
SDM	System Design Manual
SFRN	Safety Functional Requirements Note
SSC	System, Structure or Component
TAG	Technical Assessment Guide(s) (ONR)
TIG	Technical Inspection Guide(s) (ONR)
UDG	Ultimate Diesel Generator
UK	United Kingdom

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## 1 INTRODUCTION

### 1.1 Background

1. This report provides a summary of an assessment by the Office for Nuclear Regulation (ONR) of the progress of NNB Generation Company (NNB GenCo) Limited towards readiness for the construction phase of the Hinkley Point C (HPC) project. This is the first of a series of project convergence points at which ONR will record its judgement on the performance of NNB GenCo, as licensee for HPC, and its readiness to proceed to the next phase of the project, as outlined in ONR's Construction Intervention Strategy (Refs 1 and 2).
2. It should be noted that this first project convergence point has been introduced prior to the start of construction by agreement between ONR and NNB GenCo, with the objective of exercising licensee and regulatory processes. The aim is to de-risk future convergence points, in particular the formal consent that will be required for the pour of nuclear safety related concrete at the start of the construction phase of HPC. As such, this first convergence point does not permission or constrain any activities in respect of NNB GenCo and HPC. While the convergence point is primarily safety related, it also provides the opportunity to review security requirements and identify good practice or areas where improvements may be required.
3. In its role as owner, licensee and intelligent customer for the HPC project, NNB GenCo developed a Management Expectations Document (MED) (Ref 3) and acceptance strategy for the first project convergence point. This has been supplemented by an evidence pack (Refs 4 - 7) supporting NNB GenCo's claim to have completed the specified acceptance activities. ONR's assessment of NNB GenCo's progress and readiness to proceed with the HPC project has been informed by sampling of this evidence pack. It also draws on interventions and assessments carried out by ONR since granting of the HPC nuclear site licence in December 2012, including assessment of the HPC Nuclear Site Security Plan (NSSP) and Pre-Construction Safety Report (PCSR) 2012. ONR's assessment of HPC PCSR 2012 has been reported separately (Ref 8).
4. This report summarises four separate 'cornerstone' reports (Ref 9) on the following themes:
  - Security, safeguards and conventional (non-nuclear) safety - covering the development of NNB GenCo's arrangements to meet national security requirements, international safeguards obligations, and for conventional health and safety (including fire safety) issues related to both the design and on-site activities;
  - Design and safety case - including the acceptability of design Reference Configuration 1 (RC1), NNB GenCo's readiness for application of licence condition (LC) 20, and an assessment of progress on its timely production of Construction Safety Justification (CSJ) 01 and PCSR-3;
  - Licence condition compliance - including the development and status of NNB GenCo's licence condition compliance arrangements and its implementation of the nuclear site licence forward work plan; and
  - Organisational capability - covering the development of NNB GenCo as a capable and competent licensee in its current state and its development towards readiness for start of construction.
5. These cornerstone reports are supported by 40 individual workstream reports (Ref 10).

## 1.2 Scope

6. This report is based on an assessment of NNB GenCo's progress in the following areas as at mid October 2014:

- Security, safeguards and conventional safety:
  - Security
  - Safeguards
  - Fire safety
- Design and safety case:
  - Categorisation and classification of safety functions and associated structures, systems and components (SCCs)
  - Civil engineering
  - Structural integrity
  - Mechanical engineering
  - Equipment qualification (EQ)
  - Electrical engineering
  - Control and instrumentation (C&I)
  - Fuel and core design
  - Interim spent fuel storage
  - Radioactive waste and decommissioning (LCs 32-34)
  - Reactor chemistry
  - Radiological protection
  - Human factors
  - Fault studies
  - Internal hazards
  - External hazards
  - Severe accident analysis (SAA)
  - Probabilistic safety assessment (PSA)
  - Management of Generic Design Assessment findings (GDAFs)
- Licence condition compliance:
  - Siting and planning (LCs 2, 3 and 16)
  - Control of nuclear matter (LC4)
  - Incidents on the site (LC7)
  - On-site construction activities (LCs 8, 9 and 11)
  - Training and competence (LC10)
  - Construction or installation of new plant (LC19)
  - Design management (LC20)
  - Plant operations (LCs 11, 22-24 and 26-31)
- Organisational capability:
  - Design Authority (DA)
  - Knowledge management (KM)
  - Organisational development and management of change (LC36)
  - Project management
  - Internal regulator capability
  - Governance

- Nuclear safety culture
- Intelligent customer
- Organisational learning
- Engineering Directorate
- Integrated management systems (IMS) (LC17)
- Documents, records, authorities and certificates (LC6)
- Quality management (LC17)
- Procurement and supply chain
- Supplier audit and manufacturing inspection

### **1.3 Methodology**

7. The assessments summarised in this progress report were undertaken in accordance with the requirements of ONR's How2 Business Management System (BMS) procedure (Ref 11). The ONR Safety Assessment Principles (SAPs) (Ref 12), together with supporting Technical Inspection and Assessment Guides (TIGs and TAGs) (Refs 13 and 14), have been used as the basis for this assessment. The assessment also takes into account the Nuclear Industries Security Regulations (NISR) 2003, as amended, and the National Objectives, Requirements and Model Standards (NORMS) (Ref 15).

### **1.4 Structure of Report**

8. The structure of the report is as follows. In Section 2, the strategy adopted for the assessment is set out. Section 3 summarises developments since granting of the HPC nuclear site licence in December 2012, including developments in the licensee's safety case. ONR's assessment of these developments is presented in Section 4. Finally Section 5 presents ONR's conclusions and recommendations.

## **2 ASSESSMENT STRATEGY**

9. ONR's assessment strategy is set out in this section. This identifies the scope of the assessment and the standards and criteria that have been applied. It contributes to, and is consistent with the overall HPC assessment strategies and guidance (Refs 1 and 2). The assessment has been based on the following interventions and assessments:

- Routine Level 4 topic meetings;
- Dedicated interventions on particular topics;
- Cross-cutting interventions on the interim arrangements for design modifications and the management of GDAFs; and
- Assessment of key documentation.

### **2.1 Standards and Criteria**

10. The relevant standards and criteria adopted within this assessment are principally the SAPs, internal ONR TIGs and TAGs, relevant national and international standards and relevant good practice informed from existing practices adopted on UK nuclear licensed sites. The specific SAPs, TIGs and TAGs used, together with any applicable national and international standards, guidance and relevant good practice, are cited within the individual progress reports (Ref 10).

11. This assessment also focuses NNB GenCo's compliance with its NSSP and has drawn on ONR interventions carried out under NISR 2003 against the arrangements detailed in the NSSP. It has also taken into account the licensee's security arrangements for information and personnel security, and work carried out to address the GDAFs for security.

### **2.2 Use of Technical Support Contractors**

12. No technical support contractors were used in the production of this report.

### **2.3 Out of Scope Items**

13. The detailed scope of the assessments supporting this progress report are contained in the individual workstream reports (Ref 10). It should be recognised that the first convergence point does not permission or constrain any activities in respect of NNB GenCo and HPC and so no formal regulatory decisions are being made.

### 3 POSITION AT LICENSING AND SIGNIFICANT DEVELOPMENTS

#### 3.1 Security, Safeguards and Conventional Safety

14. As regards security matters, the outcome of the GDA process was the production of a Conceptual Security Arrangement (CSA) and 13 assessment findings relating to security. The licensee was required to put in place adequate resolution plans to address these findings. The key developments since licensing have been:
- Approval of the first issue of the NSSP;
  - Development of the site security organisation;
  - Development of phase A1 of the NSSP; and
  - Production of resolution plans for the GDAFs.
15. Safeguards work was not part of the GDA process for the UK EPR™. However the ONR safeguards team has worked since then with NNB GenCo and the European Commission (Euratom) safeguards inspectorate to devise and enable implementation of nuclear materials accountancy (NMA) and safeguards verification arrangements whereby UK safeguards obligations for the HPC facility are met as effectively and efficiently as possible. This has included:
- Early formal submission to the European Commission by NNB GenCo of the preliminary information required by Euratom Safeguards Regulations, a so-called 'Basic Technical Characteristics' (BTC) declaration for the facility, followed by provision of a first draft of the full BTC declaration;
  - Euratom / NNB GenCo / ONR discussion on the draft BTC documentation and detailed safeguards measures for verification and inspection at the facility, including specification of Euratom surveillance and sealing equipment;
  - Continued contact of the ONR safeguards team with its counterparts overseeing the Olkiluoto and Flamanville EPR projects in Finland and France respectively.
16. Conventional fire safety was also not part of the GDA process. The HPC project uses the ETC-F, German and French nuclear industry fire codes developed by EDF, as a reference. This code use different techniques compared to UK expectations to achieve safety. In 2013 a document was produced, the 'HPC ETC-F Application Document', which collates the requirements of the ETC-F and UK approaches (latter based on BS 9999) into a single strategy.

#### 3.2 Design and Safety Case

17. There are currently two versions of the PCSR addressing the safety of the twin UK EPR™ reactor unit facility proposed for HPC:
- The final version of the UK EPR™ GDA PCSR, issued in November 2012. This PCSR addressed only the key elements of the design of a single UK EPR™ unit (the generic features on the nuclear island) and excluded ancillary installations.
  - HPC PCSR 2012, issued in December 2012, which addresses the whole HPC licensed site, comprising the proposed twin UK EPR™ units and all ancillary installations.
18. The next issue of the HPC PCSR (current working title PCSR-3) will fully integrate the new generic material in the final GDA PCSR in addition to integrating design changes arising from the reference design for the UK EPR™ namely Flamanville-3 (FA3). However, this will not be completed until construction of safety significant structures has commenced. In the interim period the safety case to justify the start of construction will consist of the above two PCSRs supplemented by a series of CSJs,

the first of which is defined as CSJ-01 and relates to the technical galleries (first nuclear safety related concrete pour). CSJ-01 is currently being developed. Consequently, since the issue of the two PCSRs only very limited new safety case material has been made available to ONR for assessment.

19. In the interim period, while it has been waiting for a Financial Investment Decision (FID) to commit funding for the construction of HPC, NNB GenCo has decided to develop an appropriate design reference configuration to de-risk the initial phase of detailed design work and to support the preparation of the CSJs and PCSR-3. The aim of the Basic Design Reference (BDR) (Refs 16 and 17) was to deliver a design reference called Reference Configuration 1 (RC1) that incorporated the modifications resulting from GDA on the UK EPR™ design. RC1 (Refs 18 - 20) will be the reference design used as the starting point for detailed design and construction, and its safety justification will be provided in PCSR-3. An updated Reference Configuration 2 (RC2) will be used during commissioning and its safety justification will be provided in the Pre-Commissioning Safety Report (PCmSR).
20. BDR acceptance and the convergence point process have been the subject of independent assessment by NNB GenCo's Safety Directorate (Refs 21 - 24) and regular reports of these activities have been made to the Nuclear Safety Committee (NSC) (Refs 4, 25 and 26).

### **3.3 Licence Condition Compliance**

21. As at December 2012, ONR was satisfied that NNB GenCo had developed adequate arrangements for complying with the licence conditions assigned to Group 1, which apply to the early design, procurement, construction and installation phases of the HPC project. This comprises LCs 1-4, 6-12, 13, 14, 16-18, 20, 32-34 and 36. ONR also noted and accepted NNB GenCo's commitment to the timely development and implementation of detailed arrangements for complying with the licence conditions assigned to Group 2, which are required for commissioning, operation and decommissioning phases of the HPC project. This comprises LCs 5, 15, 18, 21-31 and 35.
22. The extent of ONR's assessment of NNB GenCo's progress on licence compliance is dependent upon the HPC project schedule. Since licence grant the schedule has permitted NNB GenCo to progress the development and implementation of the Group 1 licence conditions. Significant developments have included:
  - Remobilisation of the site in Spring 2014;
  - Development and implementation of the site emergency response arrangements;
  - Implementation of the arrangements for management of project hold points; and
  - Implementation of interim arrangements for design modifications.

### **3.4 Organisational Capability**

23. At the point of licensing ONR judged that NNB GenCo had demonstrated that its arrangements for compliance with LC36 in respect of providing and maintaining adequate financial and human resources, and control of changes to its organisational structure which may affect safety, have the essential elements for demonstrating organisational capability as defined in ONR's SAPs (MS.2) and TAGs (NS-TAST-GD-048 and NS-TAST-GD-065), and the international standard GS-R-3 'The Management System for Facilities and Activities'.
24. ONR also considered that NNB GenCo's organisational capability and associated arrangements had adequately addressed the requirements of ONR's guide 'Licensing

Nuclear Installations' and other relevant standards. This included consideration of governance arrangements, organisational structure, nuclear safety advice and challenge, intelligent customer and DA capability. Additionally arrangements for other key aspects of organisational capability were deemed adequate for licensing with satisfactory plans for continued development, including LC10 (training) and LC12 (duly authorised and other suitably qualified and experienced persons).

25. Since licencing there has been significant development and growth of NNB GenCo's organisation to match the HPC project demands, and to prepare for the start of the major construction phase. Notable developments have included:

- Growth of the assurance function within Safety Directorate - in particular the Independent Assessment Challenge and Oversight (IACO) and Independent Technical Assessment (ITA) teams;
- Re-organisation of NNB GenCo in preparedness for project delivery;
- Expansion of the HPC site team to match the early preparatory site activities;
- Progression of the design and safety case to establish a clear reference design for the HPC EPR;
- Early contractor interactions - to establish relationships and develop detailed plans for construction and commissioning - building in learning from FA3 and major construction projects;
- The expansion of the Engineering Directorate to establish a clear project delivery focus, including creation of the Owner's Engineering team; and
- Development of a detailed project management approach - matrixed area and works programmes.

26. In 2013 NNB GenCo implemented two significant changes to its organisation:

- Enactment of the HPC Project Execution Plan (PEP), which is on-going; and
- Re-alignment of the organisation with financial investment requirements (Ref. 21) - essentially constraining the development of the organisation due to the delay in FID and focussing its activities on consolidation of the HPC design and supporting safety case development.

## 4 ONR ASSESSMENT

### 4.1 Security, Safeguards and Conventional Safety

#### 4.1.1 Scope of assessment undertaken

27. The scope of ONR's assessment of security matters covered four main areas:
- Progress with GDAFs;
  - Development of, and compliance with, the NSSP;
  - Development of, and compliance with, information and personnel security standards; and
  - Regulatory meetings between the licensee and ONR.
28. As regards safeguards, ONR's interactions have included:
- exchange of information between NNB Genco, Euratom and the ONR safeguards team to further clarify specifications and requirements for safeguards equipment, its installation and subsequent support; and
  - NNB GenCo provision of, and detailed ONR comment on, a further update to the draft BTC declaration, first formal submission of which (to Euratom) is now scheduled for March 2015.
29. On fire safety NNB GenCo has recognised that, in addition to differences between BS 9999 and ETC-F, elements of the fire strategy on the nuclear island need to differ from the recommendations of BS 9999. This is due to constraints from other hazards, eg radiation, flooding, security etc, within some buildings. These requirements led to NNB GenCo's development of a consistent strategy for managing code departures through demonstration of examples of non-compliance which were discussed with ONR and refined over a series of meetings. ONR assessed a range of documents and building plans to gain confidence that the dutyholder's final building design fire risk assessments would satisfy the requirements of the Regulatory Reform (Fire Safety) Order 2005.
- #### 4.1.2 Security assessment
30. ONR's security lead has based his view of the licensee's security arrangements on NNB GenCo's progress in transitioning from the Construction to the Nuclear Site Security Plan and inspections carried out against the security arrangements detailed in these plans. It is also based on the progress of the licensee's response to the GDAFs and interactions held at Level 4 meetings.
31. NNB GenCo continues to develop the security strategy for the operational site and has provided overviews of the arrangements that will be adopted. It has detailed its approach to security and the way in which the security arrangements are being developed. The NSSP was approved in November 2013 and the licensee has demonstrated its commitment to reviewing the plan, with a new issue approved by ONR (on behalf of the Secretary of State) on 27 May 2014.
32. GDAFs are being addressed, and there has been constructive dialogue on the issue of Vital Area Identification (VAI), which has resulted in agreement on the way forward on this important issue. The submission of the revised Vital Area study in the coming months will be an important step and will provide evidence of the licensee's understanding of the VAI methodology.

#### **4.1.3 Safeguards assessment**

33. ONR considers that the licensee has demonstrated its commitment to ensure that its NMA and safeguards verification arrangements for HPC are met by engagement with ONR's safeguards team and Euratom.

#### **4.1.4 Fire safety assessment**

34. NNB GenCo has made significant progress in developing draft fire strategy documents for the more challenging buildings on the nuclear island. The documents provide evidence of compliance with UK expectations for fire safety in building design where this is reasonably practicable and a robust process for developing equivalent levels of safety through alternative measures when code compliance is not suitable on the grounds of nuclear safety and security.
35. Considerable work remains outstanding on both the nuclear island and conventional areas - from confirming company endorsement of the current draft fire strategy documents, through production of plans of final design fire safety proposals, to development of fire risk assessment documents. However at this stage of the project, fire safety is considered to be developed to an adequate level and is progressing satisfactorily.

### **4.2 Design and Safety Case**

#### **4.2.1 Scope of assessment undertaken**

36. This section summarises ONR's assessment of developments in the HPC design and safety case. It also considers NNB GenCo's convergence point process, including a review of NNB GenCo's acceptance of RC1, an assessment of the acceptability of NNB GenCo's GDAF resolution plans, NNB GenCo's readiness for LC20 arrangements, and an assessment of progress on its timely production of CSJ-01 and PCSR-3. The assessment concludes with a summary of ONR expectations with regard to consent for first nuclear safety related concrete.

#### **4.2.2 Assessment of progress with the design and safety case**

37. There is a common theme in many of the progress reports that form the design and safety case cornerstone, ie that little new safety case material has been submitted by the licensee since the submission of HPC PCSR 2012. This reflects the delay in the HPC project while NNB GenCo has been awaiting FID to commit funding for the construction of HPC. While this is understandable, it does mean that ONR has had only limited visibility of the design work carried out in the design and safety case area. Exceptions to this include some progress with the safety categorisation and classification of safety functions and associated SSCs, the civil design of structures, the manufacture of primary pressure circuit components and the performance of the 'adjusting phase' studies in the fault studies topic area.
38. The assessment has also highlighted a number of outstanding design risks that still need to be resolved. These are the introduction of diversity into the safeguard building Heating, Ventilation and Air Conditioning (HVAC) system, concerns with the complexity and sizing of the Control and Instrumentation (C&I) system design in general, the electrical loading demand on the Ultimate Diesel Generators (UDGs), consideration of implementation of a Filtered Containment Vent (FCV), completion and substantiation of the categorisation and classification process, demonstration of adequate safety margins in design basis faults, adequate progress with the closure of GDAFs associated with the civil design, the adequacy of the turbine disintegration safety case and the choice of Interim Spent Fuel Store (ISFS) technology.

#### 4.2.3 Consideration of the convergence point process

39. *Adequacy of NNB GenCo's acceptance of RC1.* With regard to NNB GenCo's acceptance of RC1, the feedback from inspectors is generally positive. Nevertheless, it must be recognised that NNB GenCo's acceptance is a conditional acceptance as there are still outstanding modifications to be included within the design reference and there remain design risks particularly associated with GDAFs on the C&I aspects of the HVAC system and the sizing of the UDGs. A key design decision is still required over the choice of a wet or dry ISFS and the implementation of category and classification methodology is still to be completed with only one Safety Functional Requirement Note (SFRN) issued at the time of this assessment. It is highly desirable that these issues are resolved in order to give full confidence in the RC1.1 design reference as suitable starting point for detailed design work.
40. *Progress with the close-out of GDAFs.* With regard to progress in the close-out of GDAFs, there are a number of assessment areas where in the judgement of ONR's inspectors progress should have been more advanced than it is at this stage. In the view of ONR's design and safety case lead, this represents one of the biggest regulatory risks to the project. It is urgent that progress is made on the resolution of GDAFs in the areas of civil engineering, electrical engineering, C&I, EQ for hazards, fault studies, severe accident analysis, and the treatment of hazards within the PSA.
41. *Implementation of interim modification process and readiness for LC20.* Feedback from those inspectors involved in interventions on the modification process was very positive both with regard to NNB GenCo's interim modification process and its suitability as a basis for future LC20 arrangements. Nevertheless, it must be remembered that the modification process only identifies the preferred design solution and associated work activities together with a categorisation for nuclear safety. Detailed implementation and substantiation of modifications through the production of a safety case is left to the design process and so there is an inherent design risk that ill-conceived modifications could be adopted into the reference design that need to be reversed at a later stage. As noted in the fault studies intervention, one way to mitigate this design risk would be for NNB GenCo to improve the quality of the information provided to the technical screening process with the Responsible Designer (RD) being encouraged to identify the potential safety dis-benefits of any modification as well as the safety benefits.
42. *Progress with CSJ-01 and PCSR-3.* With regard to the preparation of CSJ-01 and PCSR-3, feedback from the inspectors was generally positive. There are risks associated with the choice of ISFS technology. Nevertheless, the inspectors generally considered that preparation of CSJ-01 and PCSR-3 appears to be going well.

#### 4.2.4 Judgement on the current position compared with expectations for the first consent

43. ONR's design and safety case lead has identified four areas where NNB GenCo needs to focus to manage its regulatory risk:
- To demonstrate, through CSJ-01 and the other CSJs, that it has decoupled the outstanding design risks associated with the on-going development of the design sufficiently to allow the start of civil construction in advance of PCSR-3 delivery;
  - To adequately progress, and hopefully accelerate, the closure of significant outstanding GDAFs and issues to mitigate the associated design risk;
  - To develop, through its list of deliverables (LoD), adequate work programmes to ensure detailed design reports and design substantiation reports are delivered in a timely manner to enable ONR assessment and feedback, and;

- Through active surveillance of the RD's design activities, to ensure that an adequate safety case is provided to substantiate the design and manage the design risk. The RD needs to recognise that the safety case is a strategic document that has to be used to inform and control the design process including the adequate justification of modifications.

### 4.3 Licence Condition Compliance

#### 4.3.1 Scope of assessment undertaken

44. The aim of ONR's assessment in this area is to judge whether NNB GenCo has made acceptable progress with the development and implementation of its arrangements for compliance with the conditions attached to the standard nuclear site licence. This is relevant to NNB GenCo's current site activities which comprise mobilisation of personnel and equipment for the start of significant earthworks activity in preparation for the commencement of nuclear safety related construction.

#### 4.3.2 Group 1 licence conditions - construction and installation

45. *Development of arrangements for compliance with Group 1 licence conditions.* The current version of the NNB GenCo nuclear site licence compliance matrix for HPC includes changes to the entries for several Group 1 licence conditions. These changes include the removal of redundant procedures, the introduction of new procedures to improve compliance and clarity of the compliance arrangements, and updated procedures to reflect learning gained during implementation.

46. Overall ONR judges that the updated arrangements and procedures for compliance with the Group 1 licence conditions:

- address the expectations of ONR published guidance;
- are appropriate for the early construction and installation phases; and,
- represent good practice.

47. *Implementation of compliance arrangements.*

- Work Stream C3: On-site Construction Activities.

ONR concludes that, for the purposes of the preliminary earthworks and mock-up construction activities, NNB GenCo's arrangements for compliance with LC8 (warning notices) and LC9 (instructions to persons on the site) are adequate or better. ONR will look to NNB GenCo to continue to develop its arrangements as it prepares to seek consent to commence nuclear safety related construction.

- Work Stream C4: Site Incidents

ONR judges the HPC organisational learning function is staffed with personnel competent in the use of NNB GenCo's OLIM<sup>3</sup> tool and application of the arrangements for compliance with the LC7 (incidents on the site). ONR judges HPC's implementation of the arrangements for complying with LC7 to be adequate for this stage of the project and that the site's organisational learning function is committed to their continued development as NNB GenCo prepares to commence significant earthworks activity.

- Work Stream C6: Construction and Installation of New Plant

ONR judges that NNB GenCo's arrangements for compliance with LC19 (construction or installation of new plant) have been informed by the valuable

<sup>3</sup> *Organisational Learning, Incident and Non-Conformance Management Tool*

learning obtained during early non-nuclear safety related construction activities. The HPC Site Enabling Works team has demonstrated its competence to implement the LC19 arrangements for managing the release of hold points in the construction and installation programme.

ONR judges that the management of project hold points has provided NNB GenCo with the opportunity to exercise the application of its LC19 'Define, manage and release key hold points' procedure and demonstrate that it provides adequate arrangements for dividing the project into stages and thus facilitate ONR's use of powers to permission the construction and installation of HPC. ONR judges that NNB GenCo's Regulatory and Licensing team has a mature understanding the regulator's use of primary and derived powers to permission the construction and installation of HPC.

- Work Stream C9: Training and Competence

ONR judges NNB GenCo has established an appropriate set of arrangements to comply with the requirements of LC10 on training. These arrangements will also be a key element in meeting its future arrangements for compliance with the LC 12 (Group 2).

- Work Stream C10: Design Management

ONR judges that NNB GenCo and the RD have each developed procedures which aim to create a seamless process for managing modifications to the HPC design.

Overall ONR judges that implementation of the HPC interim modifications process has had a positive impact upon the relationship between NNB GenCo and the RD. The RD personnel demonstrate strong ownership of the process. ONR concludes that NNB GenCo has demonstrated that the communication of its requirements and the delivery of formal training to the RD are proving effective.

ONR judges NNB GenCo's interim arrangements for the technical review of modifications it is accepting for inclusion in the HPC reference design to be mature and are helping to establish its intelligent customer credentials in respect of the RD. Implementation of these arrangements has provided both NNB GenCo and RD personnel with valuable experience of processes that are shared with the arrangements for compliance with LC20.

- Work Stream C12: Siting and Planning

ONR remains satisfied with NNB GenCo's arrangements for preventing unauthorised persons entering the site. ONR is satisfied that NNB GenCo is undertaking the significant preliminary earthwork activity within the terms of the current leasing arrangements for the HPC licensed site. NNB GenCo has demonstrated satisfactory implementation of its arrangements for complying with LC16 (site plans, designs and specifications).

- Work Stream C13: Control of Nuclear Matter

ONR judges the procedure for controlling and restricting nuclear matter on the site to be adequate. ONR judges the NNB GenCo personnel responsible for drafting, implementing, testing and overseeing the arrangements for the control of nuclear matter to be proactive and well qualified.

48. *Self-assessment and independent assessment of Group 1 licence compliance arrangements.* ONR is satisfied that NNB GenCo has made appropriate use of its hold point release arrangements to report a satisfactory position with regard to actions arising from self-assessment and independent assessment of its compliance with the Group 1 licence conditions.

#### **4.3.3 Group 2 licence conditions - commissioning, operation and decommissioning**

49. ONR is satisfied that NNB GenCo is developing its licence compliance arrangements in these areas and that Pre-Operations Department personnel are actively engaged in the design, acceptance and review of relevant design and safety case deliverables.

### **4.4 Organisational Capability**

#### **4.4.1 Scope of assessment undertaken**

50. The scope of this assessment covers three main areas:
- Developments in NNB GenCo's overall organisational capability since licensing;
  - Consideration of NNB GenCo's convergence point process as related to aspects of organisational capability; and
  - The current state of NNB GenCo's organisational capability against ONR's expectations for the topic at the first consent point.

#### **4.4.2 Nuclear safety**

51. ONR's organisational capability lead considers that NNB GenCo has established appropriate arrangements and capability to match ONR's expectations for nuclear safety advice and challenge. The key features are:
- The DA has a high level of competence, and is generally providing satisfactory intelligent customer control over the RD and other supplier activities;
  - An NSC that is operating effectively; and
  - An assurance function that is performing well and is now close to the necessary resource level.
52. NNB GenCo has also established and is implementing satisfactory arrangements for ensuring an appropriate level of intelligent customer capability for all potentially safety related areas across the project.
53. NNB GenCo currently has a good safety culture and has taken very positive measures to develop a strong site safety culture. It is continuing to develop measures to further enhance its safety culture and means to monitor the safety culture both at site and within the project team. It is also taking measures to ensure key supply chain partners have a suitable safety culture.
54. NNB GenCo's DA and assurance functions will need to increase resource levels to match post-FID project demands, but are close to expected requirements for the first consent.
55. The acceptability of NNB GenCo's 'lean' assurance model is dependent on evidence of continued satisfactory oversight of the supply chain (particularly the RD) by the DA, and this is likely to be in part dependent on the Owner's Engineering team becoming fully resourced and effective post-FID.

#### **4.4.3 Organisational development and knowledge management**

56. ONR's organisational capability lead considers that NNB GenCo has established satisfactory management of change (MoC) arrangements, having implemented two

very significant changes since licensing. These have generally been well implemented and managed, maintaining a strong focus on ensuring nuclear safety. NNB GenCo has maintained and updated an appropriate nuclear baseline to match the changes in the project and has been appropriately resourced to this point for the activities undertaken.

57. On training and competence, NNB GenCo has established and is now effectively implementing arrangements to ensure staff are competent for their roles and that suitable training and development is provided. The arrangements match the expectations for compliance with LC10 and also support LC12 compliance.
58. NNB GenCo has established appropriate project management arrangements, incorporating learning from FA3 and other nuclear and major construction projects. It has developed a suitable IMS that supports intended project management arrangements for each phase of the project.
59. NNB GenCo is clearly committed to learning from both internal and external experience and has clearly sought to bring learning into the project in many ways. It has also established effective internal learning processes and it has also developed plans for its knowledge management strategy. Its OLIM tool is being used as a key means of capturing and tracking learning. OLIM and other OL processes will require further development to match site needs when considerable site activities commence.
60. NNB GenCo has established appropriate management systems for documents and records for this point in the project.

#### **4.4.4 Procurement and supply chain**

61. ONR's organisational capability lead judges that NNB GenCo has established a range of embedded arrangements across the project to deliver quality, however it has yet to develop a suitable set of overarching arrangements to ensure delivery of quality across the project. It has now determined its overall approach and in principle this seems to match ONR's expectations.
62. NNB GenCo has established a satisfactory supply chain policy and management approach. The commercial organisation has been resource-limited and post-FID this will need to increase to match the level of procurement activity. NNB GenCo has established appropriate management system arrangements for supplier audit and inspection of suppliers for the current stage of the project.
63. Overall NNB GenCo has established all the key foundations for successful supply chain management post-FID. However the level of resource and the implementation of effective quality management arrangements will need to increase considerably to match the needs of both the first, and particularly the second, consent point.

#### **4.4.5 Consideration of convergence point process**

64. ONR's organisational capability lead judges that NNB GenCo's convergence process included a satisfactory consideration of key organisational capability aspects relevant to the hold point. ONR would expect similar relevant organisational capability criteria to be included in future major hold points, particularly for the first and second consent points. Overall the convergence process was effective and robust. Generally appropriate and satisfactory evidence was provided for each criteria and the assurance function's concurrence process gave confidence in the independent controls relating to hold point release.

#### 4.4.6 Judgement on the current position compared with expectations for the first consent

65. The overall view of ONR is that NNB GenCo's organisational capability is close to that which ONR would expect for the first consent point. However NNB GenCo will need to increase resourcing in key areas to match activities required for, and permissioned by, the first consent point. This includes consideration of NNB GenCo's readiness for post-permissioned construction activities, and other key activities running in parallel.

66. Key ongoing areas of interest for ONR are as below:

- Assurance and DA roles in nuclear safety advice and challenge;
- Programme and project management - MDTs are functioning effectively;
- Safety culture at the HPC site and within the rest of NNB GenCo - approaches working with means of monitoring;
- Supply chain processes resourced and tested;
- QA arrangements in place with evidence that they work in project delivery;
- Nuclear baseline updated to match post-permissioning demands, and resource plans in place for all key nuclear safety significant areas;
- Continued satisfactory operation of the NSC and governance processes ;
- Organisational learning - processes and tools suitable to support extensive site activities;
- Documents and records - system demonstrated to match functional requirements; and
- Continued confidence in application of intelligent customer arrangements - to match expansion in the organisation.

67. Particular areas of interest are:

- Continued increase in assurance function resource in key specialist areas;
- The effectiveness of the DA intelligent customer role and surveillance of the RD (to support the lean assurance model) - this is likely to be enabled by the Owner's Engineering function being fully effective;
- Development of processes and tools for organisational learning suitable for large scale on-site activities;
- Readiness of procurement and supply chain management processes.

## 5 CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Conclusions

68. This report provides a summary of an assessment by ONR of NNB GenCo's progress towards readiness for the construction phase of the HPC project.
69. In the areas of security (including safeguards and conventional safety), licence compliance and organisational capability, ONR's is satisfied that NNB GenCo has made adequate progress ahead of the first consent point for the pour of nuclear safety related concrete. On security matters there are six outstanding GDAF resolution plans which ONR recommends should be submitted by the end of 2014 (see below).
70. As regards the HPC design and safety case, ONR is satisfied that NNB GenCo has made adequate progress towards acceptance of the 'RC1' reference design configuration, readiness for LC20 and preparation of future safety report submissions (CSJs 01-06 and PCSR-3). However ONR's assessment has also highlighted a number of outstanding design risks, of which progress with close-out of the GDAFs is considered by ONR to represent one of the biggest regulatory risks. In this regard ONR has made a number of follow-up recommendations (see below).

### 5.2 Recommendations

- Recommendation 1: Based on the advice given in the civil engineering assessment, ONR should commence a series of interventions focussed on NNB GenCo's arrangements for the control and oversight of nuclear related site activities.
- Recommendation 2: ONR should consider raising a Level 3 Issue with regard to the turbine disintegration safety case to ensure adequate consideration of the site layout plan is taken into account to ensure risks are reduced ALARP.
- Recommendation 3: ONR should continue to focus on the close out of GDAFs and HPC PCSR 2012 issues (including submission by NNB GenCo of the six outstanding security-related resolution plans by 31 December 2014).
- Recommendation 4: ONR should work with NNB GenCo to develop an agreed list of deliverables for each topic area to ensure timescales provide adequate time for ONR assessment and feedback. ONR will need to work with NNB GenCo to ensure it has adequate resourcing plans to meet these commitments.
- Recommendation 5: ONR should commence a series of interventions looking at the interface between NNB GenCo and the Responsible Designer (including AREVA) to ensure adequate control and understanding of the design process is in place.

ONR's existing intervention strategy and task sheets will inform the future programme of interventions for the HPC project. The outcome of these interventions will inform ONR's judgement of the continued adequacy of NNB GenCo's arrangements as it progresses towards the consent point for commencement of construction.

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