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ONR	[redacted], Delivery Lead New Reactor Construction
	[redacted] HPC Site Inspector
	[redacted] HPC DMG Lead – Organisational Capability
	[redacted] HPC DMG Lead – Design & Safety Case
	Workstream Leads
	[redacted]
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Environment Agency	[redacted] Lead Nuclear New Build
	[redacted]
BEIS	[redacted]
NNB GenCo	[redacted] Licensing Director
	[redacted] Regulatory and Licensing Manager
	[redacted]
	[redacted] HPC Project Director
	[redacted] Safety Director
	[redacted] Site Construction Director HPC

Commencement of First Nuclear Safety Concrete at Hinkley Point C

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Project Assessment Report ONR-NR-PAR-16-006
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EXECUTIVE SUMMARY

COMMENCEMENT OF FIRST NUCLEAR SAFETY CONCRETE AT HINKLEY POINT C

This report summarises the findings of ONR's assessment of NNB GenCo's request for consent under Licence Condition 19(4) for commencement of First Nuclear Safety Concrete (FNSC) at Hinkley Point C.

PERMISSION REQUESTED

NNB Generation Company (HPC) Limited (NNB GenCo) intends to construct a twin reactor EPR™ nuclear power station at Hinkley Point (HPC) in Somerset. NNB GenCo is the holder of a nuclear site licence for HPC, initially granted by ONR in December 2012. In October 2016, in anticipation of the start of nuclear construction, ONR issued a Specification under Licence Condition (LC)19(4) of the HPC site licence requiring NNB GenCo to seek ONR's consent before commencing FNSC, defined by its Hold Point 1.2.1.

NNB GenCo identifies the 'technical galleries' as the first nuclear safety related structure and that FNSC marks the placement of the first structural concrete for the technical galleries. The technical galleries are a series of underground reinforced concrete structures to be located beneath the site at HPC and some above ground structures that connect essential services (for example, cooling water, gases, electricity) to the two reactor units and other structures.

On 16th December 2016, NNB GenCo requested ONR to grant consent under LC 19(4) to commence FNSC at HPC, as defined by Hold Point 1.2.1.

ASSESSMENT AND INSPECTION WORK CARRIED OUT BY ONR

The report summarises ONR's assessment in relation to the following key areas:

- status of the plant design & safety case;
- NNB GenCo's organisational capability for FNSC;
- NNB GenCo's compliance with its nuclear site licence conditions;
- conventional health & safety readiness;
- nuclear security and nuclear safeguards considerations; and
- other matters ONR considers relevant to its decision on granting consent.

The report also considers NNB GenCo's processes for determining its own readiness, and that of its Tier 1 contractors, for the commencement of nuclear safety related construction.

CONCLUSIONS

Design & safety case

ONR's Design and Safety Case cornerstone report draws together material from several discipline-specific assessment reports covering, in particular:

- adequacy of the safety case to support commencement of FNSC;
- assessment of the proposed modifications to certain Heating, Ventilation and Air Conditioning systems;
- resolution of Generic Design Assessment (GDA) Assessment Findings; and
- progress with the Pre-Construction Safety Report needed to support future hold-points.

Considering these and other relevant aspects of the design and safety case, the cornerstone report recommended that ONR grants NNB GenCo consent under LC19(4) to commence FNSC, which is construction of the technical galleries.

Organisational Capability

ONR's wide-ranging assessment of NNB GenCo's organisational readiness to commence FNSC covered 17 work-streams, reported in 7 ONR assessment reports under:

- essential organisational and Intelligent Customer capabilities;
- training & competence ;
- learning and culture;
- foundations for project delivery;
- oversight and governance;
- integrated management systems;
- essential supply chain capability

Considering these and other relevant aspects of the licensee's organisational capability and readiness, ONR's cornerstone report concluded that ONR should grant NNB GenCo consent under LC19(4) to commence FNSC, which is construction of the technical galleries.

Licence condition compliance

ONR's licence compliance cornerstone report draws on six individual assessment reports, focusing primarily on:

- adequacy of NNB GenCo's arrangements and procedures required to comply with those Licence Conditions relevant to construction;
- management and production of the design and safety case for the construction of the technical galleries;
- maturity of those aspects of NNB GenCo's organisational capability required to facilitate compliance with the licence conditions.

From the perspective of licence condition compliance, the ONR cornerstone report recommended that ONR grants NNB GenCo consent under LC19 (4) to commence FNSC, which is construction of the technical galleries.

Conventional health & safety and fire safety

Up to now the on-site construction activities have been limited to preparatory and enabling works, including the construction of a number of concrete batching plants and aggregate stores. ONR has been assessing NNB GenCo's compliance with the relevant legislation since licensing, and is satisfied that NNB GenCo has been satisfactorily discharging all of its statutory responsibilities for conventional (i.e. non-nuclear) health and safety. Post-FNSC the site workforce will grow rapidly to several thousand and overseeing the health & safety aspects of the project will represent a significant task, but ONR is satisfied that at this stage that NNB GenCo has arrangements in place to meet this challenge.

Similarly, related to fire safety in the technical galleries, ONR is satisfied that NNB GenCo's fire safety arrangements are adequate.

From the perspective of both conventional health and safety and fire safety, there are no issues emerging that prevent ONR granting NNB GenCo consent under LC19(4) to commence FNSC, which is construction of the technical galleries.

Nuclear security and safeguards

One of ONR's key interests regarding security at HPC has been on the physical security arrangements of the construction site and the associated supply chain in accordance with NNB GenCo's Nuclear Site Security Plan. In addition ONR has assessed NNB GenCo's compliance with Information Security requirements as well as the relevant Personnel Security

requirements for both NNB GenCo and the supply chain. On all of these ONR is satisfied that there are no matters that prevent ONR granting NNB GenCo consent under LC 19(4) to commence FNSC, which is construction of the technical galleries.

On safeguards, ONR's assessment is that maintaining the current level of engagement with ONR and Euratom should ensure the safeguards arrangements implemented for HPC are both effective and efficient – and suitably aligned with approaches for such facilities elsewhere. ONR's safeguards lead sees no reason on the grounds of safeguards that prevent ONR granting NNB GenCo consent under LC19(4) to commence FNSC, which is construction of the technical galleries.

Other ONR considerations

This report also sets out ONR's position on a number of other matters which it considers relevant to its decision on granting consent for the release of the FNSC hold point. These are:

- closure or satisfactory position with all GDA Assessment Findings relevant to FNSC;
- closure of all relevant Regulatory Issues;
- confirmation that there are no open NNB GenCo Commitments related to FNSC;
- confirmation of NNB GenCo's security of tenure for the whole of the HPC licensed site;
- verification that an approved Funded Decommissioning Programme is in place; and
- the Environment Agency's views on the basis for ONR's decision on granting consent.

This report concludes that there are no concerns regarding any of these matters which should prevent ONR from granting NNB GenCo consent under LC 19(4) to commence FNSC, which is construction of the technical galleries.

NNB GenCo's assessment of its readiness

The report considers the process by which NNB GenCo has undertaken its own assessment of its readiness to release Hold Point 1.2.1 and proceed to construction of the technical galleries. ONR's Organisational Capability cornerstone lead concluded that NNB GenCo's hold point release process, including consultation with the Nuclear Safety Committee, clearance from the Hold Point Panel and endorsement by the NNB GenCo Board, had been robust and appropriately implemented.

This report notes that the outcome of NNB GenCo's hold-point release process was a Hold Point Review Document approved by the NNB GenCo Board, with a Residual Action Plan (RAP) setting out a number of actions for closure before commencement of FNSC. The Pre-Consent Readiness Level 4 meeting with NNB GenCo gave ONR confidence that the licensee's actions to close out the outstanding RAP items were appropriate and had been rigorously undertaken. In particular, ONR considers that the involvement of the NNB independent assurance function in the licensee's oversight of the RAP closure process to represent good practice.

RECOMMENDATION

On the basis of the request submitted by NNB GenCo and the conclusions of this report, I recommend that:

1. the Head of New Reactor Construction signs this PAR to confirm support for the ONR technical and regulatory arguments that justify granting HPC Licence Instrument 509, Consent to commence FNSC;

2. the Head of New Reactor Construction signs this PAR approving its release for publication, after redaction where appropriate; and
3. the Head of the New Reactors Programme signs HPC Licence Instrument 509, Consent to commence FNSC.

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
BoSC	Basis of Safety Case
BS	British Standard
BTC	Basic Technical Characteristics
C&I	Control and Instrumentation
CDM	Construction (Design and management) Regulations 2015
CNRP	Civil Nuclear Reactor Programme
CSA	Conceptual Security Arrangement
CSJ	Construction Safety Justification
DA	Design Authority
EDF	Électricité de France
EPR™	The generic design of pressurised water reactor submitted for GDA
EQ	Equipment Qualification
FA3	Flamanville-3
FCP	First Convergence Point
FCV	Filtered Containment Vent
FDP	Funded Decommissioning Programme
FID	Financial Investment Decision
FNSC	First Nuclear Safety Concrete
GDA	Generic Design Assessment
GDAF	Generic Design Assessment Finding
HF	Human Factors
HP	Hold Point
HPC	Hinkley Point C
HPRD	Hold Point Release Document
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

MDT	Multi-Disciplinary Delivery Team
MoC	Management of Change
NIC	Nuclear Island Concrete
NISR	Nuclear Industries Security Regulations 2003
NMA	Nuclear Materials Accountancy
NNB GenCo	NNB Generation Company (HPC) Limited
NORMS	National Objectives, Requirements and Model Standards
NSC	Nuclear Safety Committee
NSL	Nuclear Site Licence
NSSP	Nuclear Site Security Plan
ONR	Office for Nuclear Regulation
PAR	Project Assessment Report
PCmSR	Pre-Commissioning Safety Report
PCSR	Pre-Construction Safety Report
PCSR3	Working title for the document that will succeed PCSR 2012
PEP	Project Execution Plan
PR	Progress Report
PSA	Probabilistic Safety Assessment
QA	Quality Assurance
RAP	Residual Action Plan
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
SPB	ONR New Reactor Construction Sub-Programme Board
SSC	System, Structure or Component
TAG	Technical Assessment Guide(s) (ONR)
TIG	Technical Inspection Guide(s) (ONR)
UK	United Kingdom

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1 PERMISSION REQUESTED

1. NNB Generation Company (HPC) Limited (NNB GenCo) has requested the Office for Nuclear Regulation's (ONR) consent (Ref. 1) under Licence Condition (LC) 19(4) to commence first nuclear safety concrete at Hinkley Point C (HPC), as defined by its Hold Point 1.2.1 (Ref. 2). NNB GenCo's arrangements for compliance with LC19 identify the technical galleries as the first nuclear safety related structure.

2 DETAILS OF REQUEST

2.1 Background

2. NNB GenCo, the nuclear site licensee, intends to construct a twin reactor EPR™ nuclear power station at HPC. The ONR "Hinkley Point C – Construction Intervention Strategy for the UK EPR™" (Ref. 3) sets out ONR's current strategy for regulating the construction phase of the HPC project.

3. ONR has supplemented its strategy for HPC construction with "Guidance for Early Construction Phase Activities up to ONR Consent to Nuclear Island Concrete" (Ref. 4). That document provides guidance to ONR's topic leads to assist planning interventions and the preparation of topic specific assessment reports that will inform ONR's collective judgement of NNB GenCo capability as it prepares to proceed beyond key construction hold-points.

2.2 HPC construction hold points

4. Under its arrangements for compliance with Licence Condition 19 (*Construction or installation of new plant*), NNB GenCo has divided the HPC project into stages separated by Hold Points (HPs) which represent the key project milestones where there is a step change in the risk of poorly conceived or executed construction or commissioning impacting upon nuclear safety.

5. For the regulation of HPC ONR will expect NNB GenCo to have effective and robust arrangements for managing the progress of construction from one stage to the next. For HPC unit 1 ONR judges the following Hold Points separate stages of construction that, if inadequately conceived or executed, represent a significant increase in risk to nuclear safety of the operating plant.

   - HP1.2.1 First Nuclear Safety Concrete - First pour of nuclear safety related concrete on site.
   - HP1.2.2 Nuclear Island Concrete – Pouring of the common raft concrete.

6. ONR has consequently issued Specifications using its primary powers under LC19(4) (Ref. 5) in the form of Licence Instruments 504 and 505, requiring NNB GenCo to gain the Consent of ONR before passing Hold Point 1.2.1 - First Nuclear Safety Concrete (FNSC) and Hold Point 1.2.2 - Nuclear Island Concrete (NIC).

7. NNB GenCo equates HP 1.2.1 (First Nuclear Safety Related Concrete) to the "commencement of construction". This is consistent with ONR publication *Licensing Nuclear Installations* (Ref. 6) which defines the commencement of construction as the placement of first structural concrete for buildings with nuclear safety significance.

2.3 Hold Point 1.2.1 – First Nuclear Safety Concrete

8. NNB GenCo's Hold Point 1.2.1 constrains the start of placement of concrete for the Technical Galleries. The technical galleries are a series of underground reinforced concrete structures to be located beneath the site at HPC and some above ground structures that connect essential services (for example, cooling water, gases, electricity) to the two reactor units and other structures.

9. NNB GenCo has defined Hold Point 1.2.1 as a 'primary hold point' (Ref. 2) and its process for the release of such hold points (Ref. 7) requires it to apply the most extensive governance to ensure an appropriate level of readiness, including approval to proceed from the NNB GenCo Board. ONR's considerations of NNB GenCo's hold-point release process are discussed later in this report.

2.4 The licensee's case for ONR to grant Consent to commence FNSC

10. In December 2016 the licensee, NNB GenCo, submitted a request (Ref. 1) for ONR to grant consent to the commencement of FNSC. That request was supported by a number of documents that were also submitted:

- Consent to commence First Nuclear Safety Concrete – summary (Ref.8)
- Hold Point Release Document (HPRD) – Hold Point 1.2.1 Approved by NNB GenCo Board on 30th November 2016 (Ref. 9)
- Residual Action Plan. Hold Point 1.2.1 – First Nuclear Safety Concrete (Ref. 10)
- Independent Assurance Challenge and Oversight (IACO) Concurrence Part B (Ref. 11)

11. Additionally, the request identified some further supporting information:

- HPC Pre-Construction Safety Report 2012 Head Document (Ref. 12)
- Construction Safety Justification for Technical Galleries CSJ-01 (Ref. 13)
- NNB GenCo Response to ONR issues on CSJ01 (Ref. 14)
- Minutes of Nuclear Safety Committee 2nd November 2016 (Ref. 15)

12. This report provides a summary of ONR's assessment of the information provided by NNB GenCo in support of its request for consent. This information includes not only that referenced in NNB GenCo's request for Consent, but additional information gathered from meetings with NNB GenCo and its Tier 1 contractors, as well as from inspections carried out at the HPC site.

13. This report draws on separate reports, provided by the relevant ONR delivery leads, covering five 'cornerstone' themes:

- Design and safety case
- Organisational capability
- Licence condition compliance
- Conventional health & safety and fire safety
- Nuclear security and nuclear safeguards

2.5 Scope of this report

14. This report draws on ONR's cornerstone reports and additional evidence available up to the end of February 2017 relevant to NNB GenCo's request for consent. ONR's consideration of the case for granting consent primarily covers the areas described in the remainder of this Section.

2.5.1 Design and safety case

15. The design and safety case cornerstone report (Ref. 16) draws together material from a number of discipline-specific assessment reports to record a judgement from the perspective of the design and safety case cornerstone on whether ONR should grant consent. That report covers:

- the adequacy of the safety case to support commencement of first nuclear safety concrete;
- resolution of relevant Generic Design Assessment (GDA) Assessment Findings;
- progress with NNB GenCo's development of the next version of the pre-construction safety report (PCSR), known as PCSR3;
- assessment of the basis of safety cases (BoSC) for the proposed modifications to the heating, ventilation and air conditioning (HVAC) design in the safeguard auxiliary buildings;

16. In addition, this cornerstone report draws conclusions on the adequacy of NNB GenCo's arrangements for compliance with LC 14 (*Safety documentation*) and ONR specialist inspectors' experience of and exposure to NNB GenCo arrangements for compliance with LC 20 (*Modification to design of plant under construction*). These conclusions are taken into account in the separate Licence Compliance cornerstone report discussed below.

2.5.2 Organisational capability

17. The scope of the Organisational Capability cornerstone report (Ref. 17) covers the development of NNB GenCo's organisational capability arrangements since the ONR assessment undertaken for the First Convergence Point in December 2014 (see Section 3 below). The assessment at that point considered how NNB GenCo had developed its arrangements since being granted the HPC site licence and how well it was progressing towards FNSC.

18. The cornerstone report presents the findings of the ONR assessment of the following workstreams which collectively assess NNB GenCo's organisational capability for nuclear safety:

- Design Authority
- Knowledge Management
- Organisational Development and Management of Change
- Project Management
- Internal Regulator Capability
- Governance
- Nuclear Safety Culture
- Intelligent Customer
- Organisational Learning
- Engineering Directorate
- Integrated Management Systems (IMS)
- Documents, Records, Authorities and Certificates
- Quality Management
- Procurement/Supply Chain
- Supplier Audit & Manufacturing Inspection
- Information & Data Management and Configuration Control

2.5.3 Licence condition compliance

19. Although a licensee must comply with all licence conditions attached to its site licence at all times, as reported in the Licence Condition Compliance cornerstone report (Ref. 18), ONR's assessment of status of NNB GenCo's licence condition compliance for FNSC has focused primarily on the adequacy of NNB GenCo's arrangements for

complying with those licence conditions most pertinent to this stage of the project. These are:

- Siting and planning (LCs 2, 3 and 16)
- Incidents on the site (LC7)
- On-site construction activities (LCs 8, 9 and 11)
- Training and competence (LCs 10 and 12)
- Construction or installation of new plant (LC19)
- Modification to design of plant under construction (LC20)
- Control of nuclear matter (LC4)

2.5.4 Conventional health & safety and fire safety

20. The conventional and fire safety cornerstone report (Ref. 19) considers NNB GenCo's:

- experience so far in overseeing safe preparatory works activities on the HPC site;
- leadership as Client under the Construction (Design and Management) Regulations, through commitment to maintaining the highest standards of health and safety throughout construction; and
- arrangements for ensuring that conventional fire safety in the technical galleries is equivalent to UK expectations for fire safety in building design and management.

2.5.5 Nuclear security and nuclear safeguards

21. This cornerstone is covered by separate reports (Refs. 20 and 21) addressing nuclear security and nuclear safeguards respectively.

22. ONR's assessment of nuclear security matters focused on:

- progress with relevant GDA Assessment Findings;
- development of, and compliance with, the Nuclear Site Security Plan; and
- development of, and compliance with, information and personnel security standards.

23. As regards nuclear 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
- detailed ONR comment on further updates to the draft Basic Technical Characteristics declaration.

3 POSITION AT FIRST CONVERGENCE POINT

3.1 Background

24. NNB GenCo was granted a nuclear site licence (NSL) in respect of Hinkley Point C in December 2012. The granting of the NSL was the outcome of an 18 month assessment and intervention process by ONR, which culminated in the production of over 40 assessment reports (AR) by ONR workstream leads, four summary ARs by cornerstone leads and an overall Project Assessment Report (PAR) recommending the granting of the NSL. These reports were made public on the ONR website.

25. Subsequently ONR introduced the concept of convergence points for the construction phase of the HPC project (Ref. 22). Intervention convergence points are milestones in the HPC project at which ONR records its collective judgement of the performance of NNB GenCo and their readiness to proceed with the project. Thus, convergence occurs at:

- ONR permission to proceed beyond a hold point by use of its primary powers, e.g. issue of a consent under LC19(4);
- ONR flexible permission to proceed beyond a hold point by use of derived powers Licence Instruments, e.g. issue of an agreement under arrangements made by NNB GenCo under LC19(1);
- other selected NNB GenCo Hold Points to inform ONR's decision on the need to exercise primary (LC19(4)) or derived (LC19(1)) powers; and
- non-permissioned milestones agreed with NNB GenCo. In terms of ONR's Guide *Use of Flexible Permissioning* this corresponds to flexible permissioning by enhanced implementation monitoring and control.

26. A convergence point provides ONR with a milestone against which it can measure NNB GenCo's progress and performance. At each of the above ONR will record its collective judgement of NNB GenCo, and thus its readiness to proceed, in a Progress Report (non-permissioned milestone) or a Project Assessment Report (permissioning by use of primary powers Licence Instruments or flexible permissioning by use of derived powers Licence Instruments) supported by Assessment Reports as needed.

27. When ONR produced its initial Intervention Strategy in 2013, the indicative date of FNSC meant that there would be a considerable gap (more than 3 years) between NSL grant and ONR providing a formal report on its judgement of NNB GenCo's progress with the project. This gap had the potential to grow and so ONR and NNB GenCo agreed to introduce a non-permissioned convergence point prior to FNSC, with the objective of exercising licensee and regulator processes and thereby de-risking the key permissioned milestone represented by Hold Point 1.2.1.

28. This led to ONR undertaking a series of interventions and assessments during 2014 to inform its judgement on the First Convergence Point (FCP). ONR's findings were reported in a summary document in December 2014 (Ref. 23).

3.2 ONR findings at first convergence point

3.2.1 Design and safety case

29. PCSR2012 was produced in 2012 and is the current version of the HPC Pre-Construction Safety Report. The final version of the PCSR (PCSR3) will not be formally submitted to ONR until after commencement of construction of the technical galleries. Consequently PCSR2012 provides the baseline safety justification for the release of the first nuclear safety concrete hold point. NNB GenCo's Construction Safety Justification (CSJ)-01 supplements the baseline safety justification presented in PCSR2012 and provides the nuclear safety justification and civil design substantiation for the construction of the technical galleries at HPC.

30. In the design and safety case area ONR identified four areas where NNB GenCo needed to focus to manage its regulatory risk. These were for NNB GenCo to:

- demonstrate, through CSJ-01 and 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 PCSR3 delivery;
- adequately progress the closure of significant outstanding GDA Assessment Findings and issues to mitigate the associated design risk;

- develop, through its list of deliverables (LoD), work programmes to provide detailed design reports and design substantiation in a timely manner in order to facilitate ONR assessment and feedback, and;
- ensure, by active surveillance of the Responsible Designer's (RD's) design activities, that an adequate safety case is provided to substantiate the design and manage the design risk.

3.2.2 Organisational capability

31. ONR's overall view was that although NNB GenCo's organisational capability was approaching that which it would expect for the first consent, NNB GenCo would need to increase its focus/resourcing in some key areas.

32. ONR identified the following key areas of ongoing interest:

- NNB GenCo internal assurance (IACO) and Design Authority (DA) roles in nuclear safety advice and challenge;
- effective functioning of Multi-Disciplinary Delivery Teams (MDT) for project delivery;
- safety culture, both at the HPC site and within the rest of NNB GenCo;
- the resourcing and testing of NNB GenCo's supply chain processes;
- development and implementation of QA;
- updating of the 'nuclear baseline' to match post-FNSC demands, and resource plans in place for all key nuclear safety significant areas;
- continued satisfactory operation of the Nuclear Safety Committee and governance processes ;
- Organisational Learning - processes and tools suitable to support extensive site activities;
- documents and records management systems demonstrated to match functional requirements; and
- continued confidence in application of intelligent customer arrangements - to match expansion in the organisation.

3.2.3 Licence Condition Compliance

33. The aim of ONR's assessment in this area was to judge whether NNB GenCo had made acceptable progress with the development and implementation of its arrangements for compliance with the Licence Conditions. This was relevant to NNB GenCo's site activities at that time which were comprised of mobilisation of personnel and equipment for the start of significant earthworks activity in preparation for FNSC.

34. ONR's overall conclusion at the first convergence point was that the arrangements and procedures for compliance with the licence conditions relevant to construction and installation:

- addressed the expectations of ONR published guidance;
- were appropriate for the early construction and installation phases; and,
- represented good practice.

3.2.4 Nuclear Security and Nuclear Safeguards

35. ONR noted that NNB GenCo had detailed its approach to security and the way in which its security arrangements were being developed. The original NSSP had been approved in November 2013 and NNB GenCo had demonstrated its commitment to reviewing the plan, with a new issue approved by ONR in May 2014.

36. Security related GDA Assessment Findings were being addressed, with constructive dialogue on the issue of Vital Area Identification (VAI), which resulted in agreement on the way forward on this important issue.

3.2.5 Conventional Health & Safety and Fire Safety

37. ONR noted that NNB GenCo had made significant progress in developing draft fire strategy documents for the more challenging buildings on the nuclear island. The documents provided 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.

3.3 ONR conclusions at First Convergence Point

38. In the areas of security (including safeguards and conventional safety), licence compliance and organisational capability, ONR was satisfied that NNB GenCo was making adequate progress towards being ready for the release of Hold Point 1.2.1 (FNSC).

39. As regards the HPC design and safety case, ONR was satisfied that NNB GenCo had made adequate progress towards acceptance of the RC1 reference design configuration and preparation of future safety report submissions. ONR's summary report recommended that ONR should:

- undertake interventions focussed on NNB GenCo's arrangements for the control and oversight of nuclear safety related site activities;
- consider raising a Level 3 Issue regarding the turbine disintegration safety case.
- continue to focus on the close out of GDA Assessment Findings and PCSR2012 issues.
- work with NNB GenCo to develop an agreed list of deliverables for each topic area to ensure adequate time for ONR assessment and feedback.
- undertake interventions looking at the interface between NNB GenCo and the Responsible Designer (including AREVA).

40. Progress since the first convergence point is addressed in ONR's cornerstone reports and where relevant is summarised in Section 4 below.

4 ASSESSMENT OF NNB GENCO'S CASE FOR FNSC CONSENT

4.1 Methodology

41. The assessments referenced in this report, as well as the preparation of this report itself, were undertaken in accordance with the requirements of ONR's How2 Business Management System (BMS) procedure (Ref. 24).

42. The ONR Safety Assessment Principles (SAPs) (Ref. 25), together with supporting Technical Inspection and Assessment Guides (TIGs and TAGs) (Refs. 26 and 27), have been used as the basis for ONR's technical assessment and interventions. As appropriate, the assessments have also taken into account the Nuclear Industries

Security Regulations (NISR) 2003, as amended, and the National Objectives, Requirements and Model Standards (NORMS) (Ref. 28).

4.2 Design and safety case cornerstone

43. The design and safety case cornerstone report (Ref. 16) draws together material from discipline-specific assessment reports to record a judgement from the perspective of the design and safety case cornerstone on whether ONR should grant consent. The scope of the report was set out previously in Section 2.5.1.

44. The technical galleries themselves are relatively straightforward structures; however, they are important in defining and potentially constraining the positioning and layout of other buildings on the HPC site. Their size also needs to be sufficient for safety related systems that are routed through or contained within them. Consequently, the key focus of ONR's consideration of the safety case was:

- the safety justification for the technical gallery design itself;
- the structural integrity of the civil structures;
- sizing of the safety related cooling water system pipework to ensure sufficient margin to accommodate any required increases in flowrates without having to alter the design of the technical galleries;
- sizing of the technical galleries to ensure there is sufficient space for mechanical piping and cable trays / cables with appropriate allowance for maintenance activities; and
- the potential constraints placed by construction of the technical galleries on the overall site layout (the 'plot plan').

45. ONR's assessment was carried out in two stages to ensure early identification of issues by ONR and resolution by NNB GenCo, thus de-risking timely FNSC consent and impacting the HPC project schedule. The first stage was to assess the adequacy of CSJ-01 and is reported in a summary assessment report (Ref. 29).

46. The second stage was to assess NNB GenCo's response to issues raised in ONR's assessment of CSJ-01, as well as progress with resolution of other ONR issues, for example those raised in ONR's assessment of PCSR2012, and also assess progress with the development of PCSR3.

4.2.1 Adequacy of the safety case to support commencement of FNSC

47. In terms of the safety case (CSJ-01) initially submitted to support NNB GenCo's request, with the exception of external hazards, civil engineering and radioactive waste and decommissioning all the other discipline-specific assessment reports concluded that the safety justification supported the judgement that ONR should grant NNB GenCo consent to commence construction of the technical galleries.

48. For external hazards, civil engineering and radioactive waste and decommissioning, ONR assessments concluded that the initial submission did not support ONR granting FNSC consent, and a number of level 3 regulatory issues were raised. As reported in Ref. 16, further justification was provided by NNB GenCo and the relevant ONR assessors subsequently confirmed that those level 3 issues had been adequately addressed by NNB GenCo.

49. In addition to the level 3 issues discussed above, a number of level 4 issues were required to be addressed prior to first nuclear safety concrete. These had been raised in ONR's assessment of PCSR2012, its preliminary assessment of CSJ-01 (version 1) or during level 4 meetings with NNB GenCo. Where relevant, the discipline-specific assessment reports confirm that all such issues have been adequately resolved in relation to the commencement of FNSC.

50. Consequently ONR's cornerstone lead was able to conclude that that the totality of the safety documentation submitted as part of NNB GenCo's request supports the judgement that ONR should grant NNB GenCo consent to commence first nuclear safety concrete.

4.2.2 Assessment of the proposed modifications to HVAC design

51. Significant modifications have been proposed by NNB GenCo to the design of the Heating, Ventilation and Air Conditioning (HVAC) systems in the safeguard auxiliary buildings. The HVAC systems in these buildings have an important role in cooling safety related control and instrumentation and mechanical equipment to ensure their operability.

52. Although these modifications do not have a direct impact on the technical galleries, they could impact the site layout if significant changes are required to the civil design of the safeguard buildings. Given the significance of the modifications, and ONR's earlier concern including the size and complexity of the system architecture, air velocities in ducting, high electrical loads and unresolved control and instrumentation issues, ONR undertook an assessment of the supplied Basis of Safety Case (BoSC) documents for these systems. The purpose of the assessment was to gain confidence that an adequate solution can be provided to support the (later) nuclear island concrete milestone and that the HVAC design and safety case had reached sufficient maturity to be progressed as part of normal business.

53. The cornerstone report noted that adequate progress has been made in addressing the shortfalls previously identified by both NNB GenCo and ONR. The cornerstone lead therefore concluded that the development of the HVAC system for the safeguard building and associated safety case was adequate for commencement of FNSC.

4.2.3 Resolution of Generic Design Assessment (GDA) Assessment Findings

54. The design and safety case cornerstone report noted that all GDA Assessment Findings relevant to that cornerstone which had been identified as requiring closure or a demonstration of adequate progress by first nuclear safety concrete had either been noted as closed by ONR or that progress towards closure is adequate. The cornerstone lead therefore concluded that NNB GenCo had made adequate progress towards resolution of GDA Assessment Findings for commencement of FNSC.

4.2.4 Progress with PCSR3

55. Following the issue of a Design Acceptance Confirmation for the EPR at the end of GDA and the granting of a site licence for HPC in late 2012, NNB GenCo has been developing the safety case. This has involved bringing the versions of the PCSRs produced for GDA and for site licensing together, as well as updating to reflect modifications to the design both from generic modifications proposed for EPRs globally and those specific to the UK.

56. The combined document, known as PCSR3, will be the baseline safety report for start of construction of the nuclear island and other safety classified structures (with the exception of the technical galleries) such as the pumping station and turbine hall. PCSR3 is due to be formally submitted to ONR in early July 2017, but as part of early engagement NNB GenCo shared part of an early version (freeze 2) of PCSR3 and have started to share a further update (freeze 3). By the end of 2016 most sub-chapters of PCSR3 at freeze 3 had been sent to ONR consistent with NNB GenCo's programme, with only 5 out of 127 of the documents that make up PCSR3 outstanding.

57. The design and safety case cornerstone lead was able to conclude that progress towards development of PCSR3 and the supporting substantiation is adequate for commencement of FNSC. Although a number of areas of concern have been identified

regarding the development of the safety case, these relate to later construction milestones. ONR specialist inspectors will continue to engage with NNB GenCo to ensure these concerns are, where necessary, adequately addressed well in advance of the required milestone.

4.2.5 Licence compliance relevant to the design and safety case cornerstone

58. The design and safety case cornerstone report summarises the observations of ONR assessment topic stream inspectors on those licence condition arrangements most relevant to that cornerstone: LC14 (*Safety documentation*) and LC20 (*Modification to design of plant under construction*).

4.2.5.1 LC14 (Safety documentation)

59. The cornerstone report noted that the submitted safety documentation is adequate to support NNB GenCo's request to commence FNSC. The cornerstone lead was therefore able to conclude that NNB GenCo's LC14 arrangements and their implementation are adequate for this stage of the project, although improvements need to be considered for future hold points. ONR's expectations have been set out in writing to NNB GenCo and will be taken forward through routine meetings.

4.2.5.2 LC20 (Modification to design of a plant under construction)

60. ONR inspectors report that routine level 4 dialogues with NNB GenCo subject matter experts are providing appropriate visibility of modifications being proposed for Reference Configuration 1.2 as well as the opportunity to engage in early dialogue on their impact on nuclear safety. Although ONR has yet to complete the first assessment of a Licence Summary Statement submitted under LC20, the cornerstone lead was able to conclude, based on reports from inspectors, that NNB GenCo has implemented adequate arrangements for compliance with this licence condition.

4.2.6 Conclusion on Design and Safety Case

61. Considering the various aspects of the design and safety case cornerstone summarised above, the cornerstone lead was able to recommend that ONR grants NNB GenCo consent under LC19(4) to commence construction of the technical galleries at HPC, as defined by Hold Point 1.2.1 entitled First Nuclear Safety Concrete.

4.3 Organisational Capability cornerstone

4.3.1 Scope and methodology

62. The organisational capability cornerstone report (Ref.17) summarises developments in NNB GenCo's organisational capability since the First Convergence Point (see Section 3), when ONR completed its last round of assessments. It considers NNB GenCo's immediate readiness for FNSC as well as its broader progress and readiness for activities after FNSC, up to start of construction of the Nuclear Island.

63. The scope of this cornerstone was set out in Section 2.5.2 which noted that it drew on ONR's findings across a number of work-streams. For reporting purposes, these workstreams were grouped into separate ONR Assessment Reports covering:

- Essential organisational and IC capabilities
- Learning and culture
- Foundations for Project delivery
- Oversight and governance
- Integrated management systems
- Essential supply chain capability

64. ONR's assessments were based on regular workstream meetings with NNB GenCo over the past two years, focussed interventions on specific topics, observation of key meetings and training events, interviews with NNB GenCo directors and a review of key supporting documentation.

65. Additionally, the organisational capability cornerstone report summarises the observations of ONR assessment topic stream inspectors on those licence condition arrangements most relevant to that cornerstone, i.e. LC 17 (*Management systems*) and LC36 (*Organisational Capability*).

4.3.2 Essential organisational and IC capabilities

66. This area consists of workstreams covering Design Authority (DA), Organisational Capability & Management of Change, Intelligent Customer Capability, Engineering, and Training & Competence. The cornerstone lead's conclusions were that NNB GenCo has:

- a Design Authority that is adequately resourced with satisfactory Intelligent Customer (IC) performance.
- maintained its nuclear baseline & resourcing to match the current project demands.
- management of change arrangements that are essentially unchanged since the FCP, and are satisfactory.
- continued to maintain a satisfactory level of IC capability and enactment across its current activities.
- established an acceptable level of oversight of the Responsible Designer.
- established an adequate site capability for construction management and oversight.
- implemented the MoC process well, particularly for significant changes (e.g. the Bristol re-location).
- established and maintained satisfactory arrangements for competence management and delivery of supporting training in advance of FNSC.
- satisfactory arrangements for compliance with LC 10 and 12; and has maintained a satisfactory level of compliance since the FCP.
- established and is satisfactorily implementing an effective approach for ensuring contractor staff competence on the HPC site.

67. Overall the cornerstone lead concluded that, in respect of these workstreams, NNB GenCo has demonstrated its readiness to commence construction of the technical galleries.

4.3.3 Learning and culture

68. This area consisted of workstreams covering Nuclear Safety Culture, Knowledge Management and Organisational Learning. The cornerstone lead's conclusions were that NNB GenCo has:

- established an organisational culture at a sufficiently mature stage for FNSC with a clear focus on nuclear safety and quality, with a programme to establish a single project culture across its organisation and supply chain. This is led by the HPC Project Director with accountability for delivery via functional directors.
- continued to demonstrate a commitment to organisational learning since 2014. Examples of relevant learning activities include:
  - construction mock-ups – e.g. section of the Safeguards Building in 2015, Technical Galleries in late 2016.
  - early contractor involvement.

  - parent body expat programme.
  - learning from other nuclear / construction sector projects.
  - oversight of design modifications proposed by the RD (which include modifications based on lessons learned from FA3).
- developed and enhanced tools to support organisational learning, in particular for non-conformance reports (NCRs), safety observation reports (SORs) and learning reports (LRs) (including corrective action tracking).

69. ONR's cornerstone lead was satisfied that:

- NNB GenCo's organisational culture is at a sufficiently mature stage for FNSC with a clear focus on nuclear safety and quality;
- NNB GenCo's capability and management arrangements for Knowledge Management are adequate for FNSC; and
- NNB GenCo has established adequate management processes for organisational learning and including compliance with LC7 (Incidents on the site).

4.3.4 Foundations for project delivery

70. This area consisted of workstreams covering Project Management and Quality Management. The cornerstone lead's conclusions were that NNB GenCo has:

- established project management arrangements which are sufficiently mature for the current phase of the HPC project;
- introduced three command centres (in Paris, Bristol and at HPC) which ONR views as a positive development. This has enabled co-location of dedicated staff from NNB GenCo, the RD and suppliers thereby reducing interface risk;
- established a Quality Systems Branch with the appointment of an experienced Head of Quality Systems and a team of Quality Leads (QLs). ONR views the QL as the key role for programme and project delivery.
- deployed arrangements for supplier auditing, assisting IACO with internal auditing, tender assessments which are satisfactory for this point in the HPC Project;
- made satisfactory progress with the five GDA Assessment Findings in this area to allow them to be closed;
- set up arrangements for compliance with Licence Condition 17 (Management systems) which are judged to be satisfactory for FNSC.

71. Overall the cornerstone lead concluded that, in the area of project management NNB GenCo's arrangements are sufficiently mature for the current phase of the HPC project.

4.3.5 Oversight and governance

72. This area consisted of workstreams covering the internal regulator capability/ internal assurance function and governance. On oversight, the cornerstone lead's conclusions were:

- NNB GenCo's Independent Technical Assessment (ITA) function performs well and its findings often reflect similar views as ONR's specialist inspectors. This maintains the level of ITA technical performance as at the first convergence point.

- IACO assessments are appropriate, and that the scope of its work programme provides a good independent examination of NNB GenCo, its arrangements and their implementation. The findings of interventions ONR has undertaken, notably in 2016 are generally similar to the IACO assessment findings, providing confidence in the effectiveness of the IACO function

73. Overall the cornerstone lead concluded that the assurance function performs effectively as part of NNB GenCo's overall independent challenge capability and matches relevant good practice. It has reached acceptable resource levels – both numerically and in the expertise of staff for their roles – to match the activities at FNSC.

74. ONR's assessment of nuclear safety governance focused on:

- the impact of the change of ownership in 2016 (introduction of the Chinese Joint Venture as a minority shareholder);
- the effective functioning of NNB GenCo's senior committees, in particular the Nuclear Safety Committee;
- NNB GenCo's top level processes for risk management, in particular with respect to nuclear safety and quality risks; and
- the status of NNB GenCo's top level management system documentation and its alignment with actual practice.

75. Having assessed each of these aspects of NNB GenCo's nuclear safety governance, the cornerstone report notes that ONR is satisfied that the licensee has in place arrangements which are sufficiently mature for the start of nuclear safety construction.

4.3.6 Integrated management systems

76. This area consisted of workstreams covering the NNB GenCo Integrated Management System (IMS), Documents & Records, and Information & Data Management. The cornerstone lead concluded:

- the IMS arrangements developed and deployed thus far are adequate for this project stage and ONR's consent for FNSC.
- the documentation and record management arrangements developed and deployed thus far are adequate for this project stage and ONR's consent for FNSC.
- NNB GenCo has effectively identified the key challenges and needs; and developed an appropriate IM strategy. This strategy has very evident board level backing and the HPC Project and key partners are fully engaged in its implementation.

4.3.7 Essential supply chain capability

77. This area consisted of workstreams covering supply chain & procurement and manufacturing inspection. The cornerstone lead concluded:

- NNB GenCo's Supply Chain Policy (SCP) highlights its principles for supply chain (SC) oversight, control and performance management. Early assurance activities associated with supplier audit have identified shortfalls in supplier nuclear safety culture that will require mitigating action to reduce project risks and have highlighted to NNB GenCo the importance of SC assurance activity;
- although ONR has a regulatory concern over NNB GenCo's SC management arrangements with AREVA that will require improvement effort, overall ONR

judges that NNB GenCo have established appropriate management system arrangements for the current stage of the project and the deliverables from AREVA are not critical to FNSC consent;

- ONR is satisfied that the organisation and management arrangements are adequate for the scope of work to be undertaken by NNB GenCo's Manufacturing Inspection Team (MIT) at this stage of the project.

4.3.8 Overall conclusions on Organisational Capability

78. Considering the various aspects of the organisational capability cornerstone summarised above, the cornerstone lead was able to recommend that ONR grants NNB GenCo consent under LC19(4) to commence construction of the technical galleries at HPC, as defined by Hold Point 1.2.1 entitled First Nuclear Safety Concrete.

4.4 Licence Compliance Cornerstone

79. The scope of the Licence Compliance cornerstone report (Ref. 18) was set out previously in Section 2.5.3.

80. The cornerstone report draws on a number of individual assessment reports which broadly cover:

- the adequacy of NNB GenCo's arrangements and procedures required to comply with those licence conditions that are relevant to the construction of HPC;
- management and production of the design and safety case for the construction activities constrained by ONR's consent to commence FNSC; and
- the maturity of those aspects of NNB GenCo's organisational capability that are required to facilitate compliance with licence conditions.

4.4.1 On-site construction activities

81. ONR assessment of the implementation of the arrangements for compliance with the licence conditions relating to on-site construction activities concludes that NNB GenCo has:

- satisfactorily progressed the development and implementation of its arrangements for compliance with:
  - LC08: Warning notices;
  - LC09: Instruction to persons on the site; and
  - LC11: Emergency arrangements.
- demonstrated that its arrangements for compliance with these licence conditions are sufficiently mature to support its request for consent to commence FNSC.

4.4.2 Incidents on the site

82. ONR's assessment of the development and implementation of the arrangements for compliance with LC07 (Incidents on the site), and when read in conjunction with ONR's assessment of NNB GenCo's organisational learning function (Ref. 17), concludes that NNB GenCo has:

- satisfactorily progressed the development and implementation of its arrangements for compliance with LC07: Incidents on the site; and

- demonstrated that its arrangements for compliance with the licence condition are sufficiently mature to support its request for consent to commence FNSC.

4.4.3 Control of construction

83. ONR assessment of the implementation of the LC19 arrangements for controlling the construction and installation of HPC concludes that NNB GenCo has:

- satisfactorily progressed the development and implementation of its arrangements for compliance with LC19: Construction or installation of new plant;
- successfully applied the arrangements to the definition management and release of Hold Point 2.1.11 (First Earthworks Quality Related Activities (QRA) on Site and Start of Deep Excavations); and Hold Point 1.2.1 (FNSC); and
- demonstrated that its LC19 arrangements are sufficiently mature to support its request for consent to commence FNSC.

4.4.4 Training and competence

84. ONR assessment of the implementation of arrangements for compliance with the training and competence licence conditions concludes that NNB GenCo:

- has satisfactory arrangements for compliance with LC10 and 12; and has maintained a satisfactory level of compliance since the first convergence point in 2014; and
- intends introducing a Learning Management System (LMS) that should enhance its overall arrangements for competence management and training – including more robust compliance with LC10 and 12.

4.4.5 Managing design modifications

85. ONR assessment of NNB GenCo's LC 20 arrangements for managing design modifications during construction concludes that:

- prior to its LC20 arrangements coming into effect, NNB GenCo's interim arrangements to manage modifications adopted for HPC RC 1.1 were adequately made and implemented;
- NNB GenCo's arrangements for compliance with LC20 are adequate for the purposes of managing modifications adopted post-Reference Configuration 1.1 as well as for modifications arising during construction; and,
- NNB GenCo has demonstrated that its arrangements for managing modifications to the design of HPC are sufficiently mature to support its request for consent to commence FNSC.

4.4.6 Siting and planning

86. ONR assessment of the development and implementation of the arrangements for compliance with the siting and planning licence conditions concludes that NNB GenCo has:

- satisfactorily progressed the development and implementation of its arrangements for compliance with:
  - LC02: Marking of the site boundary;
  - LC03: Control of property transactions;
  - LC16: Site plans, designs and specification; and,

- demonstrated that its arrangements for compliance with these licence conditions are sufficiently mature to support its request for consent to commence FNSC.

4.4.7 Safety case production

87. Section 4.2.5.1 noted that the design and safety case cornerstone report concluded that the submitted safety documentation is adequate to support NNB GenCo's request to commence FNSC. The cornerstone lead was therefore able to conclude that NNB GenCo's LC14 arrangements and their implementation are adequate for this stage of the project, although improvements need to be considered for future hold points. ONR's expectations have been set out in writing to NNB GenCo and will be taken forward through routine meetings.

4.4.8 Organisational capability conclusions

88. ONR's assessment of the organisational capability work streams (Ref. 17) concluded that the NNB GenCo organisation, its management systems and associated arrangements are sufficiently mature for this stage of the project and are facilitating compliance with relevant conditions attached to the HPC nuclear site licence.

4.4.9 Overall conclusions on Licence Compliance

89. From the perspective of licence condition compliance, the ONR cornerstone lead recommended that ONR grants NNB GenCo consent under LC19(4) to commence construction of the technical galleries.

4.5 Conventional health & safety and fire safety cornerstone

90. This cornerstone draws on the views of the ONR's conventional health & safety, and fire safety specialists.

4.5.1 Conventional health & safety

91. As explained in the cornerstone report (Ref.19), ONR has responsibility for regulating all aspects of safety, including conventional health and safety, within licensed nuclear sites or in adjacent nuclear construction sites. However, HPC is a major construction project spread over several years and would require a greater specialist conventional health and safety resource than ONR has in place.

92. In this context and in recognition of the Health & Safety Executive's (HSE) Construction Division's expertise developed during interventions with other major projects, ONR has provided warrants under the Energy Act 2013 to a number of experienced HSE health and safety construction inspectors to enable them to act on ONR's behalf at the HPC main construction site.

93. Since HPC became a licensed site in December 2012, on site construction activities have been limited to preparatory works (e.g. earth moving, removal of historic asbestos contamination), construction of temporary roads and networks, and installation of temporary office accommodation. In addition, concrete batching plants have recently been erected along with temporary aggregate stores. In due course there will be several thousand construction personnel on site and overseeing the health & safety aspects of the project will represent a significant task.

94. ONR has been assessing compliance with the Construction (Design and Management) Regulations 2015 (CDM) and other relevant legislation since licensing and will continue to do so throughout the construction phase. Strong leadership by NNB GenCo as CDM Client will be a particular focus, as demonstrated in their commitment to the highest standards; championing the importance of, and a common sense approach to, health and safety; setting expectations for all suppliers, designers and contractors; and in a clear commitment to ensuring and developing competence.

95. ONR has also been carrying out proportionate engagement with NNB GenCo's Tier 1 contractors to gain a greater understanding of the main contractor packages to ensure a proportionate risk based approach. This has been facilitated by a number of site inspection visits by ONR's representatives from HSE Construction Division, and these are set to continue throughout the project.

96. Routine reporting by the ONR conventional health and safety lead at ONR's New Reactor Construction sub-programme board has not indicated any significant concerns or issues arising from ONR's conventional health and safety interventions.

4.5.2 Fire Safety

97. As explained in the cornerstone report, the fire safety strategy for HPC utilises the recommendations contained within British Standard 9999 for means of escape and firefighter access. However, in a nuclear power plant it is difficult and in some cases undesirable to comply fully with prescriptive guidance on building design. Consequently NNB GenCo developed a management process to identify, prioritise and undertake fire engineered optioneering of alternative solutions for departures from code compliance. ONR's Fire Safety specialist inspector has undertaken an assessment to consider whether the arguments made by NNB GenCo related to conventional fire safety in the technical galleries is equivalent to UK expectations for fire safety in building design and management.

98. As a result of the studies undertaken by NNB GenCo, the ONR fire safety inspector was satisfied that the evidence provided gave confidence that adequate fire safety arrangements will be available following the release of the first hold point.

4.5.3 Conclusions on conventional and fire safety cornerstone

99. The cornerstone report noted that in the views of its specialist inspectors, NNB GenCo is demonstrating a satisfactory degree of compliance with conventional health and safety and fire safety legislation in its preparatory and enabling works at HPC. As the site activities escalate and on-site worker numbers increase significantly, NNB GenCo's responsibilities for ensuring a safe site will become more onerous but their current arrangements are appropriate for this stage of the project.

100. The cornerstone report concluded that there are no issues emerging from ONR's regulation of conventional health and safety, and fire safety that should prevent ONR from granting Consent under LC19(4) for commencement of FNSC at HPC.

4.6 Nuclear security and nuclear safeguards cornerstone

4.6.1 Nuclear security

101. As described in the report (Ref. 20) on the nuclear security aspects of this cornerstone, ONR's interventions relevant to FNSC have focused on:

- the physical security arrangements of the HPC construction site and the associated supply chain in accordance with the Nuclear Site Security Plan.
- compliance of the site against Information Security requirements; and
- compliance with the relevant Personnel Security requirements including both NNB GenCo and the supply chain.

102. In addition, attention had been placed on the closure of four GDA Assessment Findings relating to security and which ONR had targeted for closure before FNSC.

103. Ref. 20 reports that:

- the latest version of the HPC Nuclear Site Security Plan (NSSP) was approved by ONR in September 2016;

- NNB GenCo's approach to the security of the technical galleries is considered satisfactory for this stage of the project, and for FNSC;
- NNB GenCo continue to develop suitable and proportionate physical security arrangements for the technical galleries post-FNSC; and
- NNB GenCo have satisfactorily addressed the nuclear security related Assessment Findings (AFs) directly related to FNSC arising from the Generic Design Assessment process.

4.6.2 Nuclear safeguards

104. The main objective of the interaction of the ONR safeguards team with NNB GenCo and the European Commission's safeguards inspectorate (Euratom) is to ensure that appropriate nuclear materials accountancy and safeguards arrangements for HPC are agreed and included in the overall programme.

105. As explained in the nuclear safeguards report for this cornerstone (Ref. 21) ONR has had timely engagement with NNB GenCo and Euratom to:

- define and agree nuclear materials accountancy and safeguards arrangements for HPC, including the process and timeline for specifying and installing Euratom surveillance and sealing equipment, and means of transmitting data from the equipment to Euratom in Luxembourg;
- ensure all statutory safeguards reporting requirements (e.g. formal declarations to Euratom) are met.

106. Ref. 21 reports that both ONR and Euratom are satisfied that NNB GenCo has demonstrated the necessary positive and proactive commitment to early and substantive engagement with both organisations. ONR's assessment is that maintaining this engagement should ensure the safeguards arrangements implemented for HPC are both effective and efficient – and suitably aligned with domestic regulatory requirements and consistent with safeguards approaches for such facilities elsewhere.

4.6.3 Conclusions on nuclear security and nuclear safeguards

107. The conclusions in both the nuclear security and nuclear safeguards contributions to this cornerstone were that there were no matters relating to either area which should prevent ONR from granting Consent under Licence Condition 19(4) for commencement of FNSC at HPC.

4.7 Other ONR considerations

108. The above sections have considered the conclusions from the five cornerstone themes regarding the readiness of NNB GenCo to release Hold Point 1.2.1 and commence FNSC at HPC. These are ONR's primary considerations in making a judgement on whether to grant consent under LC 19(4).

109. This section considers some other matters which are pertinent to the commencement of FNSC, and on which ONR needs to be satisfied; namely:

- closure or satisfactory position with all GDA Assessment Findings relevant to FNSC;
- closure of all relevant ONR Issues;
- closure of NNB GenCo Commitments related to FNSC;
- confirmation of NNB GenCo security of tenure for the HPC licensed site;
- an approved Funded Decommissioning Programme;
- liaison with the Environment Agency; and

- preparation of the Licence Instrument.

4.7.1 GDA Assessment Findings

110. In ONR's EPR™ Generic Design Assessment (GDA) Step 4 reports (Ref. 30) and GDA issue close-out reports (Ref. 31) 42 Assessment Findings (out of 716) were identified by ONR for resolution by first nuclear safety concrete. In addition, NNB GenCo identified a further 82 GDA Assessment Findings which it either wished to close ahead of the milestone specified by ONR in GDA, or to demonstrate adequate progress for the first nuclear concrete milestone via an interim closure form. Full closure forms summarise the basis for closure and provide links to the supporting evidence. Interim closure forms are used as part of planned, staged closure or to record evidence of adequate progress to support lifting of a key hold point.

111. The majority of the Assessment Findings identified as requiring closure by FNSC related to the design and safety case area, with a small number covering organisational capability and nuclear security aspects.

112. The sections above, covering ONR's assessment of the design and safety case, organisational capability and nuclear security areas, conclude that the Assessment Findings requiring closure by FNSC have all been noted by ONR as satisfactorily closed or covered by an adequate interim closure form. Consequently there are no outstanding Assessment Findings which would prevent ONR from granting Consent under LC19 for commencement of FNSC at HPC.

4.7.2 Regulatory Issues

113. ONR defines a Regulatory Issue as "any matter that has the potential to challenge regulatory compliance …"; they are normally identified following ONR interventions and are the licensees responsibility to manage and correct. ONR places the issue on its Regulatory Issues Database in order to record that it is given the appropriate regulatory oversight. Issues are ranked levels 1 to 4 with level 1 denoting the highest level of importance.

114. For HPC, ONR inspectors had identified a number of level 3 and level 4 issues which had FNSC as the target closure milestone. Level 4 issues are tracked to closure by individual inspectors while the closure of a Level 3 issue is subject to the agreement of ONR's New Reactor Construction Sub-Programme Board (SPB).

115. The status of regulatory issues identified for closure by FNSC is discussed in the design and safety case cornerstone report and, as summarised in Section 4.2.1 above, all relevant Level 3 issues have been reviewed and accepted for closure by the SPB. In addition all Level 4 issues that needed to be resolved by FNSC have been. Consequently, there are no outstanding Regulatory Issues which would prevent ONR from granting consent under LC 19(4) for commencement of FNSC.

4.7.3 NNB GenCo Regulatory Commitments

116. Significant undertakings given by NNB GenCo to the regulators during the course of normal interactions are recorded formally as regulatory Commitments. Each commitment will be given a milestone by which it will be expected to be fulfilled.

117. Examination of the relevant Commitments log (Ref. 32) has shown that in relation to the FNSC milestone there are no formal regulatory Commitments which ONR would expect NNB GenCo to fulfil. There are therefore no matters relating to unfilled Commitments which would prevent ONR from granting Consent under LC19 for commencement of FNSC.

4.7.4 Security of tenure

118. As explained in *Licensing Nuclear Installations* (Ref.6), it is ONR's policy to ensure that a licensee has full rights of access to, and control of, the site so that it can satisfy the demands placed upon it by the licence and the Nuclear Installations Act. In ONR's PAR prepared for granting NNB GenCo a licence for HPC (Ref. 33), it was noted that part of the land to be occupied by the licensed site was subject to a 'Preliminary Works Lease' from the landowner, which allowed occupation of the land until 2023. The Preliminary Works Lease was expected to be converted into a 999 year operational lease once certain conditions relating to the then anticipated Development Consent Order (DCO) had been fulfilled.

119. Following the final go-ahead from the UK Government in September 2016, NNB GenCo confirmed that it had signed a long-term lease with the landowner for those parts of the HPC licensed site subject previously to the Preliminary Works Lease. This will allow it to construct, commission, operate and decommission the site with full security of tenure throughout that lifecycle. The Licence Condition Compliance cornerstone report (Ref. 18) was therefore able to note that ONR was satisfied with NNB GenCo's implementation of its LC3 arrangements and that there are no security of tenure matters that should prevent ONR from granting consent under LC19 for commencement of FNSC.

4.7.5 Approved Funded Decommissioning Programme

120. It is a requirement of the Energy Act 2008 that a Funded Decommissioning Programme (FDP), approved by the Secretary of State, must be in place before the licensee 'uses the site by virtue of the licence'. Government guidance (Ref. 34) interprets this point as being the commencement of First Nuclear Safety Concrete.

121. The Government announced that the FDP for HPC had been conditionally approved on 21 October 2015, subject to the Contract for Difference being executed and coming into legal effect. That Contract for Difference was subsequently executed on 29 September 2016, bringing the HPC FDP into full approval.

122. The compliance with, and enforcement of, the FDP provisions of the Energy Act 2008 are matters for NNB GenCo and the Government, not ONR. However ONR would hesitate to grant consent for FNSC in the absence of an approved FDP as this could potentially allow the licensee to proceed with an activity which would be in breach of the law. In such a circumstance ONR would seek advice from the relevant Government department (Business, Energy and Industrial Strategy – BEIS) before granting consent. For HPC, ONR is satisfied that an approved FDP is in place and there is therefore no need to seek the advice of BEIS before granting consent under LC19 for commencement of FNSC.

4.7.6 Liaison with the Environment Agency

123. ONR works closely with the Environment Agency to ensure that both regulators are fully aware of any matters which may affect their regulatory activities in relation to HPC or the adjacent nuclear sites. This is facilitated not only through routine working-level contacts and sharing of information, but also by virtue of the Environment Agency being an attendee at ONR's regular New Reactor Construction Sub-Programme Board..

124. Nevertheless, to ensure the Environment Agency's fullest possible awareness of, and the basis for, ONR's decision making in relation to NNG GenCo's request for consent, the Agency's views were sought on the contents of this PAR (Ref. 35). In response (Ref. 36), the Environment Agency expressed no concerns that should prevent ONR from granting consent under LC19 for commencement of FNSC.

4.7.7 Preparation of the Licence Instrument

125. The Licence Instrument giving ONR Consent (Ref. 38) follows the format of the 'model' Consents listed in NS-PER-IN-001 Revision 8 (Ref. 39). As discussed in Ref. 5, prior to ONR issuing the Specification under LC 19(4) for this hold-point, ONR sought legal advice on the wording of the Specification. To ensure consistency that legally agreed wording has also been used in the Licence Instrument for Consent (LI509).

5 NNB GENCO'S ASSESSMENT OF ITS READINESS FOR FNSC

126. The organisational capability cornerstone report summarises NNB GenCo's process for reviewing the organisation's readiness to release Hold Point 1.2.1. Under that process NNB GenCo developed a Management Expectations Document (MED) which set out 92 actions which needed to be completed in order for the hold point to be released.

127. The MED actions cover:

- project controls & governance
- resources & organisation
- pre-construction & project management
- safety case – including CSJ-01 safety justification, surveillance plans, site change control and progress on the PCSR3 safety case
- documentation & records management – including organisational learning
- site readiness – including control of changes, site organisation, mobilisation of BYLOR[3], construction surveillance plans
- health, safety, environment & security
- quality management – including organisation, processes, resourcing & independent oversight
- commercial function readiness, supply chain oversight, commercial arrangements with BYLOR, and contractual positions secured with Tier 1 contractors

128. The evidence for closure of each MED action was compiled into a Hold Point Review Document (HPRD) which formed the basis for a request for:

- advice from NNB GenCo's Nuclear Safety Committee (NSC) on 2nd November 2016; and
- agreement to the release of the hold point by the Hold Point Panel (HPP) on 4th November 2016.

129. As well as the evidence for closure of the MED actions, the HPRD includes 9 actions arising from a concurrence assessment undertaken by the independent Assurance function (IACO) that broadly covers the same scope as the MED criteria. Actions which had not been closed out at the time the HPRD was presented to the Hold Point Panel were recorded in a Residual Action Plan (RAP) with a target closure date for each outstanding action.

130. The FNSC HPRD was agreed by the Hold Point Panel subject to satisfactory completion of the RAP. As required for a Primary Hold Point, the NNB GenCo Board subsequently endorsed the Panel's recommendation for the hold point to be released. ONR's organisational capability cornerstone lead concluded (Ref. 17) that for FNSC NNB GenCo's hold point release process had been robust and appropriately implemented.

[3] BYLOR is a Joint Venture of Bouygues Travaux Publics and Laing O'Rourke. It is the main civil works contractor for HPC.

131. At the Pre-Consent Readiness Level 4 meeting with ONR and the Environment Agency on 20th February 2017, NNB GenCo confirmed that all of the actions in the RAP had been closed and the RAP signed-off by the Hold Point Panel Chair and the Head of Assurance. ONR commended NNB GenCo on the robust closure process and, in particular, the role played by the NNB GenCo independent assurance function in undertaking an effectiveness review of the RAP closure process and an audit of the evidence for closure (Ref. 37).

6 CONCLUSIONS

132. This report presents the findings of ONR's assessment of NNB GenCo's request for consent under LC19 for commencement of FNSC at Hinkley Point C.

133. The report summarises ONR's assessment in relation to the following key areas:

- status of the plant design & safety case;
- NNB GenCo's organisational capability for FNSC;
- NNB GenCo's compliance with its nuclear site licence conditions;
- conventional health & safety readiness;
- nuclear security and nuclear safeguards considerations; and
- other matters ONR considers relevant to its decision on granting consent.

134. The report also acknowledges that NNB GenCo has implemented robust and thorough processes for determining its own and its Tier 1 contractors readiness to commence nuclear safety related construction.

6.1 Design & safety case

135. ONR's design and safety case cornerstone report draws together material from several discipline-specific assessment reports covering, in particular:

- adequacy of the safety case to support commencement of FNSC;
- assessment of the proposed modifications to the HVAC systems;
- resolution of GDA Assessment Findings; and
- progress with the development of PCSR3.

136. Considering these and other relevant aspects of the design and safety case, the cornerstone lead recommended that ONR grants NNB GenCo consent under LC19(4) to commence FNSC, which is construction of the technical galleries.

6.2 Organisational Capability

137. ONR's wide-ranging assessment of NNB GenCo's organisational readiness to commence FNSC covered the 17 work-streams listed in Section 2.5.2 and reported in 7 ONR assessment reports under:

- essential organisational and Intelligent Customer capabilities;
- training & competence ;
- learning and culture;
- foundations for project delivery;
- oversight and governance;
- integrated management systems;
- essential supply chain capability

138. Considering these and other relevant aspects of the licensee's organisational capability, the cornerstone lead recommended that ONR grants NNB GenCo consent under LC19(4) to commence FNSC, which is construction of the technical galleries.

6.3 Licence condition compliance

139. The licence compliance cornerstone report draws on individual ONR assessment reports, covering:

- the adequacy of NNB GenCo's arrangements and procedures required to comply with those licence conditions relevant to construction;
- management and production of the design and safety case for the construction of the technical galleries;
- the maturity of those aspects of NNB GenCo's organisational capability required to facilitate compliance with the licence conditions.

140. From the perspective of licence condition compliance, the ONR cornerstone lead was able to recommend that ONR grants NNB GenCo consent under LC19(4) to commence FNSC, which is construction of the technical galleries.

6.4 Conventional health & safety and fire safety

141. As discussed in Section 4.5, up to now the on-site construction activities have been limited to preparatory and enabling works, including the construction of a number of concrete batching plants and aggregate stores. ONR has been assessing NNB GenCo's compliance with the relevant legislation since licensing, and is satisfied that NNB GenCo has been satisfactorily discharging all of its statutory responsibilities for conventional (i.e. non-nuclear) health and safety. Post-FNSC the site workforce will grow rapidly to several thousand and overseeing the health & safety aspects of the project will represent a significant task, but ONR is satisfied that at this stage that NNB GenCo has arrangements in place to meet this challenge.

142. Similarly, related to fire safety in the technical galleries, ONR is satisfied that NNB GenCo's fire safety arrangements are adequate.

143. From the perspective of both conventional health and safety and fire safety, there are no issues emerging that prevent ONR granting NNB GenCo consent under LC19(4) to commence FNSC, which is construction of the technical galleries.

6.5 Nuclear security and nuclear safeguards

144. Section 4.6 notes that one of ONR's key interests regarding security at HPC has been on the physical security arrangements of the construction site and the associated supply chain in accordance with NNB GenCo's Nuclear Site Security Plan. In addition ONR has assessed NNB GenCo's compliance with Information Security requirements as well as the relevant Personnel Security requirements for both NNB GenCo and the supply chain. On all of these ONR is satisfied that there are no matters that prevent ONR granting NNB GenCo consent under LC19(4) to commence FNSC, which is construction of the technical galleries.

145. On safeguards, ONR's assessment is that maintaining the current level of engagement with ONR and Euratom should ensure the safeguards arrangements implemented for HPC are both effective and efficient – and suitably aligned with approaches for such facilities elsewhere. ONR's safeguards lead sees no reason on the grounds of safeguards that prevent ONR granting NNB GenCo consent under LC19(4) to commence FNSC, which is construction of the technical galleries.

6.6 Other considerations

146. This report has also set out ONR's position on a number of other matters which it considers relevant to its decision on granting consent for the release of the FNSC hold point. These are:

- closure or satisfactory position with all GDA Assessment Findings relevant to FNSC;
- closure of all relevant Regulatory Issues;
- confirmation that there are no open NNB GenCo Commitments related to FNSC;
- confirmation of NNB GenCo security of tenure for the whole of the HPC licensed site;
- verification that an approved Funded Decommissioning Programme is in place;
- satisfactory response from the Environment Agency on the basis for ONR's decision on granting consent; and
- preparation of the Licence Instrument (LI 509).

147. As noted in Section 4.7, there are no concerns regarding any of these matters which should prevent ONR from granting NNB GenCo consent under LC19(4) to commence FNSC, which is construction of the technical galleries.

6.7 NNB GenCo's assessment of its readiness

148. Section 5 summarises the process by which NNB GenCo has undertaken its own assessment of its readiness to release Hold Point 1.2.1 and proceed to construction of the technical galleries. ONR's organisational capability cornerstone lead concluded that NNB GenCo's hold point release process, including consultation with the Nuclear Safety Committee, clearance from the Hold Point Panel and endorsement by the NNB GenCo Board, had been robust and appropriately implemented.

149. ONR is satisfied that the completion of the outstanding actions in the Residual Action Plan, and the approval of its closure by the Hold Point Panel Chair and Head of NNB GenCo Assurance, has been appropriately rigorous. The Pre-Consent Readiness Level 4 meeting gave ONR confidence that the licensee's actions to close out the outstanding RAP items were appropriate and had been rigorously undertaken. In particular, ONR considers that the involvement of the NNB independent assurance function in the licensee's oversight of the RAP closure process represents good practice.

7 RECOMMENDATION

On the basis of the request submitted by NNB GenCo and the conclusions of this report, I recommend that:

1. the Head of New Reactor Construction signs this PAR to confirm support for the ONR technical and regulatory arguments that justify granting HPC Licence Instrument 509, Consent to commence FNSC;

2. the Head of New Reactor Construction signs this PAR approving its release for publication, after redaction where appropriate; and

3. the Head of the New Reactors Programme signs HPC Licence Instrument 509, Consent to commence FNSC.

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