



| PROJECT ASSESSMENT REPORT | | | |
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Hinkley Point C Construction

ONR Assessment of a request by NNB GenCo (HPC) Ltd for Agreement to commence construction of Unit 1 pumping station

Project Assessment Report ONR-NR-PAR-17-003
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12 July 2018

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EXECUTIVE SUMMARY

COMMENCEMENT OF CONSTRUCTION OF THE PUMPING STATION AT HINKLEY POINT C

This Project Assessment Report (PAR) summarises the findings of ONR's assessment of NNB GenCo's request for agreement under Licence Condition 19(1) to allow the start of construction of Unit 1 pumping station at Hinkley Point C.

PERMISSION REQUESTED

NNB Generation Company (HPC) Limited (NNB GenCo) is constructing 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, granted by ONR in November 2012. In December 2016 ONR issued a Specification under Licence Condition (LC)19(1) of the HPC site licence requiring NNB GenCo to seek ONR's agreement before commencing construction of unit 1 pumping station, defined by its Hold Point 2.2.1.

The pumping station is a partially buried reinforced concrete structure. The pumping station building houses a number of systems which supply filtered sea water to the nuclear island and conventional island cooling systems. Each of the two pumping station buildings (one for each reactor unit) is fed by an adjoining fore-bay to ensure a supply of cooling water for a reactor unit. The fore-bay and pumping station form one integral structure. The pumping station and fore-bay are safety class 1 structures.

On 30th May 2018, NNB GenCo requested ONR's agreement under LC 19(1) to allow it to commence construction of unit 1 pumping station, as defined by Hold Point 2.2.1.

ASSESSMENT AND INSPECTION WORK CARRIED OUT BY ONR

This PAR summarises ONR's assessment in relation to the following key areas:

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

The PAR also considers NNB GenCo's processes for determining its own readiness, and that of its Tier 1 contractors, for the commencement of pumping station construction.

CONCLUSIONS

Design & safety case

Taking cognisance of ONR's earlier HPC safety case assessments, ONR's consideration of the safety case for the start of construction of the pumping station focused on:

- the structural integrity of the civil structure;
- the safety justification for the pumping station design; and
- the adequacy of margins in the sizing of the safety related cooling water system pipework, pumps and heat exchangers, such that if subsequent detailed design demonstrates the need for increases in flow-rates that this can be accommodated within the pumping station civil structure.

Based on sampling of NNB GenCo's documentation and a review of each of ONR's discipline-specific assessment reports, ONR's safety case and design cornerstone lead reported no outstanding concerns that would preclude ONR issuing an agreement for the start of construction of the pumping station. The cornerstone lead therefore recommended that ONR issues an agreement under LC 19 for NNB GenCo to commence construction of the pumping station (unit 1) at HPC.

Organisational Capability

The scope of ONR's Organisational Capability cornerstone report covers the development of NNB GenCo's organisational capability arrangements since the lifting of the First Nuclear Safety Concrete (FNCS) hold point (HP1.2.1) in March 2017. The cornerstone report considers NNB GenCo's immediate readiness for the start of the pumping station construction as well as its broader progress and readiness for the start of the Nuclear Island later in 2018. The cornerstone report draws on insights from a number of work-streams, with its assessment focused primarily on:

- Site capability & readiness – ensuring that the resourcing, site processes & interaction/control of contractors are adequate for the permissioned activities; and how well they are maturing towards the start of Nuclear Island construction;
- Project delivery readiness - ensuring that the key foundation processes & organisational capabilities are sufficiently well progressed to give confidence that they can support both the immediate construction activities, and also appear robust to match the expansion to the completion of the nuclear island common raft;
- Governance & oversight – the organisational capability cornerstone report notes that at FNCS, NNB GenCo had established effective governance processes which were appropriate to that stage in the project. For the start of pumping station construction ONR's assessment focused on the development of NNB GenCo's governance & oversight processes since FNCS;
- Supply chain readiness – the state of preparation of the supply chain and NNB GenCo's supply chain arrangements to match the growing demands of the HPC project schedule.

Considering these and other relevant aspects of the licensee's organisational capability and readiness, ONR's cornerstone lead recommended that ONR issues an agreement under LC 19 for NNB GenCo to commence construction of the pumping station (unit 1) at HPC.

Licence condition compliance

ONR's licence compliance cornerstone report covers the adequacy of NNB GenCo's licence condition compliance arrangements which impact its ability to demonstrate appropriate control of the site activities associated with the commencement of construction of the pumping station, focusing on:

- NNB GenCo's First Nuclear Safety Concrete (FNCS) Substitution Concrete Improvement Plan activities;
- ONR's crosscutting and construction specific interventions (Including Chief Nuclear Inspector's Inspection on supply chain management);
- Routine non construction-specific licence compliance interventions;
- Conventional health & safety;
- Safety case related licence compliance (LC14 and 20);
- Application of NNB GenCo's Hold Point and Organisation Capability Assessment processes for the pumping station.

Based on sampling of NNB GenCo's documentation and ONR's interventions undertaken since FNCS, ONR's licence compliance lead did not identify any significant areas which would

preclude ONR issuing an agreement for NNB GenCo to commence construction of the pumping station. The cornerstone lead therefore recommended that ONR issues an agreement under LC19 for NNB GenCo to commence construction of the pumping station (unit 1).

Conventional health & safety and fire safety

From the perspective of NNB GenCo's arrangements for managing both conventional health and safety and fire safety, ONR's specialist inspectors confirmed that there are no issues that prevent ONR from issuing an agreement under LC19 for NNB GenCo to the start of construction of the unit 1 pumping station.

Nuclear security and safeguards

There are no nuclear security or safeguards considerations relevant to ONR's decision on issuing its agreement for the start of pumping station construction.

Other ONR considerations

This PAR sets out ONR's position on a number of other matters which it considers relevant to its decision on giving its agreement to the release of Hold Point 2.2.1. These are:

- closure or satisfactory position with all GDA Assessment Findings relevant to Hold Point 2.2.1;
- closure or adequate progress with of all relevant Regulatory Issues;
- confirmation that there are no open NNB GenCo Commitments related to Hold Point 2.2.1; and
- the Environment Agency's views on the basis for ONR's decision giving its agreement.

This report concludes that there are no concerns regarding any of these matters which should prevent ONR from giving its agreement to NNB GenCo under LC 19 to commence construction of the pumping station.

NNB GenCo's process for release of the Hold Point

Regarding NNB GenCo's process for the release of Hold Point 2.2.1, this PAR notes that although ONR found the original draft Management Expectations Document to be inadequate, subsequent improvements to it made by NNB GenCo were sufficient to address ONR's concerns.

The outcome of NNB GenCo's hold-point release process was a Hold Point Management Document (HPMD) with a Residual Action Plan (RAP) which was subject to review by NNB GenCo's Hold Point Panel (HPP). Having reviewed the document and the cited evidence, the HPP recommended that the hold point could be lifted, subject to the satisfactory closure of the items identified in the RAP.

I have examined NNB GenCo's application of its hold point release process for the start of the pumping station and I consider this to have been carried out in an appropriately rigorous manner, and that its decision to lift the hold point is fully supported by the evidence cited in the HPMD.

RECOMMENDATIONS

On the basis of the request submitted by NNB GenCo and the conclusions of this PAR, I recommend that the Head of ONR's EPR sub-Division:

1. signs this PAR to confirm support for the ONR technical and regulatory arguments that justify issuing HPC Licence Instrument 511: *Agreement to commence the start of the pumping station*;

2. signs this PAR approving its release for publication, after redaction where appropriate;
and
3. signs HPC Licence Instrument 511.

LIST OF ABBREVIATIONS

| | |
|-----------|---|
| ALARP | As low as reasonably practicable |
| AR | Assessment Report |
| BMS | (ONR) How2 Business Management System |
| BoSC | Basis of Safety Case |
| C&I | Control and Instrumentation |
| CDM | Construction (Design and management) Regulations 2015 |
| CNI | Chief Nuclear Inspector |
| CSJ | Construction Safety Justification |
| DA | Design Authority |
| DSR | Design Substantiation Report |
| EDF | Électricité de France |
| EPR™ | The generic design of pressurised water reactor submitted for GDA |
| FA3 | Flamanville-3 |
| FNSC | First Nuclear Safety Concrete |
| GDA | Generic Design Assessment |
| GDAF | Generic Design Assessment Finding |
| HF | Human Factors |
| HP | Hold Point |
| HPC | Hinkley Point C |
| HPMD | Hold Point Management Document |
| HPP | Hold Point Panel |
| HPRD | Hold Point Release Document |
| HSE | Health and Safety Executive |
| HVAC | Heating, Ventilation and Air Conditioning |
| IACO | Independent Assessment Challenge and Oversight |
| ITA | Independent Technical Assessment |
| J0 | The completion of Unit 1 nuclear island common raft |
| LC | Licence Condition |
| MED | management Expectations Document |
| MODEM | Monitoring & Decision Meeting |
| NIC | Nuclear Island Concrete |
| NNB GenCo | NNB Generation Company (HPC) Limited |
| NSC | Nuclear Safety Committee |
| NSL | Nuclear Site Licence |
| OCA | Organisational Capability Assessment (NNB GenCo) |
| 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 |
| PDM | Project Delivery Model |
| PRODEM | Procurement Decision Meeting |
| PSA | Probabilistic Safety Assessment |
| QA | Quality Assurance |
| QM | Quality Management |
| RAP | Residual Action Plan |
| RC1 | Reference Configuration 1 |
| RC2 | Reference Configuration 2 |
| RD | Responsible Designer |
| SAP | Safety Assessment Principle(s) (ONR) |
| SCLLAP | Substitution Concrete Lessons Learned Action Plan |
| SHPR | Secondary Hold Point Report |
| SPB | ONR EPR Sub-Division Board |
| SQEP | Suitably Qualified and Experienced Person |
| SSC | System, Structure or Component |
| TAG | Technical Assessment Guide(s) (ONR) |
| TIG | Technical Inspection Guide(s) (ONR) |
| UK | United Kingdom |

TABLE OF CONTENTS

| | | |
|---|---|----|
| 1 | PERMISSION REQUESTED | 12 |
| 2 | DETAILS OF REQUEST | 12 |
| | 2.1 BACKGROUND | 12 |
| | 2.2 HPC CONSTRUCTION HOLD POINTS | 12 |
| | 2.3 HOLD POINT 2.2.1 – START OF PUMPING STATION | 12 |
| | 2.4 NNB GENCO CASE FOR ONR’S AGREEMENT TO PROCEED | 13 |
| | 2.5 SCOPE OF THIS REPORT | 13 |
| 3 | ONR ASSESSMENT OF NNB GENCO’S REQUEST | 17 |
| | 3.1 METHODOLOGY | 17 |
| | 3.2 ONR’S ASSESSMENT OF NNB GENCO’S DESIGN AND SAFETY CASE | 17 |
| | 3.3 ONR’S ASSESSMENT OF NNB GENCO ORGANISATIONAL CAPABILITY | 20 |
| | 3.4 LICENCE COMPLIANCE | 23 |
| | 3.5 CONVENTIONAL HEALTH & SAFETY AND FIRE SAFETY ASSESSMENTS | 25 |
| | 3.6 NUCLEAR SECURITY AND NUCLEAR SAFEGUARDS ASSESSMENTS | 26 |
| | 3.7 OTHER ONR CONSIDERATIONS | 26 |
| 4 | NNB GENCO’S PROCESS FOR RELEASE OF THE HOLD POINT | 29 |
| 5 | CONCLUSIONS | 30 |
| | 5.1 DESIGN & SAFETY CASE | 31 |
| | 5.2 ORGANISATIONAL CAPABILITY | 31 |
| | 5.3 LICENCE CONDITION COMPLIANCE | 31 |
| | 5.4 CONVENTIONAL HEALTH & SAFETY AND FIRE SAFETY | 32 |
| | 5.5 NUCLEAR SECURITY AND SAFEGUARDS | 32 |
| | 5.6 OTHER ONR CONSIDERATIONS | 32 |
| | 5.7 NNB GENCO’S PROCESS FOR RELEASE OF THE HOLD POINT | 32 |
| 6 | RECOMMENDATIONS | 33 |
| 7 | REFERENCES | 34 |

1 PERMISSION REQUESTED

1. NNB Generation Company (HPC) Limited (NNB GenCo) has requested (Ref. 1) the Office for Nuclear Regulation's (ONR) agreement under Licence Condition (LC) 19(1) to commence the start of construction of the pumping station at Hinkley Point C (HPC), as defined by its Hold Point 2.2.1 (Ref.2). The activity constrained by this hold-point is the start of concrete pour for the unit 1 pumping station foundation raft.

2 DETAILS OF REQUEST

2.1 BACKGROUND

2. NNB GenCo, the nuclear site licensee, is constructing 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 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 as 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 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 (FNCS) and Hold Point 1.2.2 - Nuclear Island Concrete (NIC). In March 2017, ONR issued LI509 giving its consent for NNB GenCo to proceed to FNCS (Ref. 6).

2.3 HOLD POINT 2.2.1 – START OF PUMPING STATION

7. The pumping station is a partially buried reinforced concrete structure. The pumping station building houses a number of systems which supply filtered sea water to the nuclear island and conventional island cooling systems. Each of the two pumping station buildings (one for each reactor) is fed by an adjoining fore-bay to ensure a supply of cooling water for a reactor unit. The fore-bay and pumping station form one integral structure. The pumping station and fore-bay are safety class 1 structures.
8. Version 7.0 of NNB GenCo's Hold Point list (Ref. 2) describes the activity constrained by HP 2.2.1 as the start (for unit 1) of "major construction activity for the pumping

station”. NNB GenCo’s Hold Point Management Document for HP2.2.1 elaborates the constrained activity as being “pouring of concrete for the pumping station raft”.

9. NNB GenCo has defined Hold Point 2.2.1 as a ‘secondary hold point’ and the process for the release of such hold points is set out in its Define, Manage, and Release Key Hold Points procedure (Ref. 7). ONR’s considerations of NNB GenCo’s hold-point release process are discussed later in this report.
10. In view of the expected significant gap between HP 1.2.1 (FNCS) and HP 1.2.2 (NIC), in late 2016 ONR decided that it would be appropriate to permission a further construction hold-point, interim between HP1.2.1 and HP 1.2.2, using powers derived from the licensee’s own arrangements under LC 19(1). The hold point chosen was HP 2.2.1, the start of the Unit 1 pumping station. ONR issued Licence Instrument LI508 (Ref. 33) which specifies that NNB GenCo shall not commence the construction of the HPC pumping station without the agreement of ONR.

2.4 NNB GENCO CASE FOR ONR’S AGREEMENT TO PROCEED

11. On May 30th 2018, the licensee, NNB GenCo, submitted a request (Ref. 1) for ONR to give agreement to the start of construction of unit 1 pumping station. That request was supported by a number of accompanying documents (Ref. 1):
 - NNBGEN-XX-000-REP-100448 Hold Point Management Document (HPMD) – Start of Pumping Station;
 - NNB-103-DIR-000037 Independent Assurance Challenge and Oversight (IACO) Concurrence Part B;
 - Minutes of NNB GenCo Hold Point Panel meeting no. 93, NNB-201-MOM-000140
12. Additionally, the request identified some further supporting information:
 - Pumping Station Secondary Hold Point Report HPC-HPC-NNBOSL-U1-HPA-REP-100000, Version 1.0, May 2017 (Ref. 9)
 - Minutes of Nuclear Safety Committee meeting No. 40, 10th April 2018 (Ref. 37)
13. This PAR provides a summary of ONR’s assessment of the information provided by NNB GenCo in support of its request for agreement. This information includes not only that referenced in NNB GenCo’s request for agreement, 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 and elsewhere.
14. 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

15. This PAR draws on ONR’s cornerstone reports and additional evidence available up to the end of June 2018 relevant to NNB GenCo’s request for agreement. ONR’s

consideration of the case for giving its agreement primarily covers the areas described in the remainder of this section.

2.5.1 Design and safety case

16. The safety case supporting NNB GenCo's request for ONR agreement to commence construction of the pumping station is covered by the following:
 - Pre-construction safety report (PCSR): The baseline safety justification for the construction of HPC is provided in HPC PCSR version 3 (PCSR3, Ref. 8). However, due to the timing of the production of PCSR3 it does not include a complete safety justification or design substantiation for the pumping station.
 - Pumping station Secondary Hold Point Report (SHPR) (Ref. 9): This SHPR supplements the baseline safety justification presented in PCSR3 and provides the nuclear safety justification and civil design substantiation, as far as available, for the construction of the pumping station.
17. As the SHPR was issued before the Design Substantiation Report (DSR) was produced for the pumping station raft, it refers to the design process for producing DSRs. Ref. 10 outlines NNB GenCo's strategy for producing DSRs for the pumping station. Since the pumping station SHPR was issued, two versions of the DSR have been produced:
 - DSR version 1 (Ref. 11) – this is a global DSR, that covers items that are global to the pumping station building, and includes confidence in the civil margins of the pumping station design.
 - DSR version 2 (Ref. 12) – this is a complete DSR for the raft and contains the detailed design of the pumping station raft.
18. Further versions of the DSR will be produced for the upper floors of the pumping station, ahead of construction of those aspects, as the detailed design progresses.
19. The Design & Safety Case cornerstone report (Ref.13) provides a summary of technical assessments carried out under a number of ONR topic streams. Those individual topic stream assessments identify the standards and criteria that have been applied, the use of technical support contractors, the integration with other assessment topics and those areas outside the scope of ONR's assessment.

2.5.2 Organisational capability

20. The scope of the Organisational Capability cornerstone report (Ref.14) covers the development of NNB GenCo's organisational capability arrangements since the ONR assessment undertaken for the lifting of the First Nuclear Safety Concrete hold point (HP1.2.1) in March 2017. The cornerstone report considers NNB GenCo's immediate readiness for the start of the pumping station construction as well as its progress towards readiness for the start of the nuclear island later in 2018. The cornerstone report draws on insights from a number of work-streams, with its assessment focused primarily on:
 - **Site capability & readiness** – ensuring that the resourcing, site processes & interaction/control of contractors are adequate for the permissioned activities; and how well they are maturing in towards the start of the nuclear island.
 - **Project delivery readiness** - this focuses on ensuring that the key foundation processes & organisational capabilities are adequately progressed to give confidence that they can support both the immediate construction activities, and

are sufficiently robust to match the expansion of project scale and complexity to J0³. Key areas include:

- Programme management including risk & quality management
 - Maturity of the command centres
 - Delivery processes & underlying Information Management systems
 - Maturity of key enabling processes and capabilities supporting project delivery
 - Overall resourcing & nuclear baseline
- **Governance & Oversight** – The organisational capability cornerstone report notes that at FNSC NNB GenCo had established effective governance processes which were appropriate to that stage in the project. For the start of the pumping station ONR's assessment has focused on the development of NNB GenCo's governance processes since FNSC in order to match the increasing demands of the project.
 - **Supply chain readiness** – the state of preparation of the supply chain and NNB GenCo's supply chain arrangements to match the schedule requirements up to J0, and potentially beyond for some longer lead items/systems. This includes:
 - Adequacy of the supply chain management policy and its deployment
 - Identification of supply chain risks & mitigation
 - Quality management arrangements for supply chain
21. The organisational capability cornerstone lead notes that assessment of supply chain readiness has included inputs from the Chief Nuclear Inspector's (CNI) themed inspection of NNB GenCo/Areva in autumn 2017 (Ref. 15).

2.5.3 Licence Condition compliance

22. As discussed in the Licence Condition Compliance cornerstone report (Ref. 16), the scope of ONR's compliance assessment spanned the following areas:
- NNB GenCo's FNSC substitution concrete improvement plan activities
 - ONR crosscutting interventions and construction-specific interventions
 - routine non-construction specific licence compliance
 - conventional health & safety
 - safety case related licence compliance (LC14 and 20)
 - NNB GenCo's application of its hold point process for the pumping station
 - application of NNB hold point and Organisation Capability Assessment processes
23. The cornerstone report notes that NNB GenCo has been able to maintain adequate compliance with routine LCs during the significant increase in activity associated with the construction of the technical galleries following ONR's consent to FNSC.

³ J0 is an NNB GenCo construction milestone which marks the completion of the concrete pours for the nuclear island common raft

2.5.4 Conventional health & safety and fire safety

24. The reports from ONR's conventional health and safety, and fire safety specialists (Refs. 17 and 18) cover:
- NNB GenCo's arrangements for fire protection during the pumping station construction;
 - NNB GenCo's important roles as client and principal contractor under the Construction (Design & Management) Regulations 2015, for all activities on the HPC site.

2.5.5 Nuclear security and nuclear safeguards

25. ONR's nuclear security and safeguards assessors have confirmed that there are no security or safeguards issues relating to the construction of unit 1 of the pumping station (Ref. 19 and Ref. 20). Therefore, neither security nor safeguards matters are considered in this report.

3 ONR ASSESSMENT OF NNB GENCO'S REQUEST

3.1 METHODOLOGY

26. The assessments referenced in this PAR, as well as the preparation of the report itself, were undertaken in accordance with the requirements of ONR's How2 Business Management System (BMS) procedure (Ref. 21).
27. The ONR Safety Assessment Principles (SAPs) (Ref. 22), together with supporting Technical Inspection and Assessment Guides (TIGs and TAGs) (Refs. 23 and 24), have been used as the basis for ONR's technical assessment and interventions.

3.2 ONR'S ASSESSMENT OF NNB GENCO'S DESIGN AND SAFETY CASE

28. The Design & Safety Case cornerstone report (Ref. 13) notes that the scope of ONR's assessment of the safety case and design associated with the pumping station was based on:
- learning from earlier ONR assessments of the HPC safety case, e.g. where ONR had raised most questions;
 - where the areas have the greatest impact on nuclear safety (e.g. relating to the main cooling chain); and
 - where early design and construction activities foreclose later changes to the design.
29. Thus ONR's assessment was limited to four main technical areas:
- civil engineering;
 - external hazards;
 - mechanical engineering; and
 - fault studies.
30. This led to ONR's consideration of the safety case being focused on:
- the structural integrity of the pumping station civil structure;
 - the safety justification for the pumping station design; and
 - the adequacy of margins in the sizing of the safety related cooling water system pipework, pumps and heat exchangers.

3.2.1 Civil engineering assessment

31. The ONR civil engineering assessment considered:
- the accuracy of the most important technical claims made within the safety case, insofar as they apply to civil engineering;
 - the technical basis of pumping station design activities remaining to be undertaken after the release of Hold Point 2.2.1; and
 - the risks to nuclear safety associated with the current immaturity of the design and those associated with NNB GenCo's arrangements for managing the design and construction to completion.
32. The cornerstone report notes that one Level 4 Issue was raised by ONR's civil engineering inspector in the course of his assessment. This related to the resilience of unprotected, buried structural concrete and the potential for reinforcement corrosion. However, the cornerstone report notes that although this issue requires resolution

during the course of construction of the building, it does not impact the construction of the pumping station raft and therefore does not affect the decision whether ONR should permission the start of construction of the pumping station.

33. Overall, the inspector concluded that, *“from a civil engineering design perspective, nuclear safety risks pertaining to the pumping station are currently sufficiently controlled by NNB GenCo, and that ONR should issue an agreement under LC 19 for NNB GenCo to commence construction of the HPC pumping station”*.
34. The cornerstone report notes, however, that following completion of the inspector’s civil engineering assessment, ONR was made aware of an issue regarding the modelling of frictional effects of soil / concrete backfills surrounding the pumping station. The cornerstone report notes that NNB GenCo subsequently carried out a sensitivity study to investigate the impact of this issue on the pumping station raft and starter bars, and has confirmed that there is sufficient design margin, for both design basis events and beyond design basis events. Considering this, ONR’s civil engineering inspector concluded that *“the judgements made in the original ONR assessment remain valid. NNB GenCo’s on-going work related to the superstructure and floor response spectra will continue to be monitored by the inspector, and regulatory issues will be raised, if necessary, for resolution before specific points in NNB GenCo’s design process and before construction of later parts of the pumping station.”*

3.2.2 External Hazards assessment

35. The ONR external hazards assessment considered:
- whether the pumping station is protected against suitably screened external hazards with the same design basis and site challenge as provided in PCSR3; and
 - whether the external hazards that primarily affect the function of the pumping station (relating to loss of ultimate heat sink), are adequately considered.
36. The cornerstone report notes that the ONR external hazards inspector was satisfied with the position reached, and recommended from the perspective of this technical area that ONR issues an agreement under LC 19 for NNB GenCo to commence construction of the pumping station.

3.2.3 Fault Studies assessment

37. The ONR fault studies assessment considered the following areas:
- design basis and beyond design basis events leading to loss of cooling chain faults that relate to the design of the pumping station;
 - safety classification of relevant systems; and
 - progress with the GDA assessment findings and ONR regulatory issues related to the pumping station.
38. ONR’s fault studies inspector concluded that based on assessment of the adequacy of NNB GenCo’s safety justification in the SHPR, and progress on GDA assessment findings:
- scenarios that lead to failures within the pumping station have been adequately considered by NNB GenCo; and
 - the safety functional requirements placed upon the systems housed within, or dependent upon, the pumping station do not present a significant design risk.

39. The inspector recommended from the perspective of fault studies that ONR issues an agreement under LC 19 for NNB GenCo to commence construction of the HPC pumping station.

3.2.4 Mechanical engineering assessment

40. The ONR mechanical engineering assessment considered:
- cooling chains (the pumping station provides the interface between the ultimate heat sink (sea water) and the nuclear island cooling systems).
 - the pumping station heating, ventilation and air conditioning system, whose failure could lead to failure of safety related systems.
 - the seismic floor response spectra used for the design of systems and components within the pumping station.
 - the effects of siltation on the safety related cooling water flows.
 - the safety classification of the pumping station cranes.
 - provision for the installation of large items of mechanical equipment and NNB GenCo's arrangements for ensuring the maintenance and protection of installed equipment throughout the pre-commissioning phase.
 - resolution of relevant GDA assessment findings and regulatory issues.
41. Overall, the ONR mechanical engineering inspector concluded that the claims, arguments and evidence laid down within NNB GenCo's safety case and supporting references, as well as evidence obtained through interventions, and responses to queries were satisfactory.
42. The inspector recommended from the perspective of mechanical engineering that ONR issues an agreement under NNB GenCo's arrangements under LC 19 for NNB GenCo to commence construction of the HPC pumping station, with the caveat that prior to commencement of construction NNB GenCo should adequately address the open points and conditions identified in its own SHPR assessment (see paras 43-45 below).

3.2.5 NNB GenCo safety case governance

43. The design and safety case cornerstone report (ref. 13) notes that the pumping station SHPR and the supporting references have been subjected to NNB GenCo governance, which has included review and acceptance by the NNB GenCo Design Authority, Independent Technical Assessment (ITA) and consideration by the Nuclear Safety Committee.
44. The SHPR identifies nine open points⁴, seven of which were required to be addressed before NNB GenCo lifts the pumping station hold point. The Hold Point Management Document (Ref.1) provides evidence that these open points have been adequately managed. Furthermore, ITA raised five conditions of acceptance from its assessment of the pumping station SHPR that also needed to be addressed prior to NNB GenCo lifting the pumping station hold point.
45. ONR's cornerstone lead was satisfied that resolution of ITA's conditions has been considered by ITA and closed out as part of its concurrence process. Furthermore, the cornerstone lead was satisfied that governance has been applied consistent with NNB GenCo's arrangements and any outstanding SHPR open points will be adequately progressed by NNB GenCo's arrangements, and where necessary closed before NNB GenCo releases the hold point.

⁴ Open points are items where further work is required in order to complete the safety argument being made.

3.2.6 Conclusion on Design and Safety Case

46. Considering the various aspects of the design and safety case cornerstone summarised above, the cornerstone lead recommended that ONR issues an agreement under LC 19 for NNB GenCo to commence construction of the pumping station (unit 1).

3.3 ONR'S ASSESSMENT OF NNB GENCO ORGANISATIONAL CAPABILITY

47. ONR's organisational capability cornerstone report (Ref. 14) summarises developments in NNB GenCo's organisational capability since the FNSC hold point. It considers NNB GenCo's immediate readiness for the start of construction of the pumping station as well as its broader progress and readiness for activities after that hold point, up to the start of construction of the nuclear island common raft.
48. 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, as well as from the CNI's themed inspection of NNB GenCo/Areva in autumn 2017 (Ref. 15). This inspection examined aspects of the supply chain management arrangements for HPC, and was prompted by records falsification issues that emerged in 2016 at Areva's Creusot Forge facility - a key supplier to the project.

3.3.1 Site capability & readiness

49. The organisational capability cornerstone report records that the FNSC substitution concrete intervention (Ref. 25) and NNB GenCo's own investigation (Ref. 26) led to ONR raising three Level 3 issues (see section 3.7.2). In response, NNB GenCo developed a comprehensive action plan (the Substitution Concrete Lessons Learnt Action Plan - SCLLAP) addressing all the findings, as well as other relevant learning reports. This included 16 priority 1 actions – those directly aligned to ONR's Level 3 issues and an additional 18 priority 2 actions that in many instances complement and reinforce the priority 1 actions. ONR has engaged with both the scope and adequacy of the proposed response and judged that the action plan fully addresses the three issues.
50. Effective control of site identified changes is essential for both nuclear and conventional safety. Strengthening of these processes (including Field Change Requests and Non-Conformance Reports) and their implementation has been covered by the priority 1 actions in the SCLLAP.
51. ONR's FNSC intervention, the CNI inspection and other engagements, identified a range of deficiencies in NNB GenCo's Quality Management (QM) arrangements, including clarity of roles and resourcing. In response NNB GenCo has taken considerable measures to improve its overall QM arrangements. These have primarily formed part of the SCLLAP action plan and the response to the CNI findings.
52. The organisational capability cornerstone report notes that NNB GenCo's contractor management has been strengthened by many elements of the SCLLAP action plan (see above) and the response to the CNI inspection findings. NNB GenCo has also demonstrated its commitment to ensuring that contractors meet the required standards and expectations for work on site (e.g. evidenced by the requirements for, and monitoring of contractor improvement programmes). Additionally, in the light of experience of site activities to date, NNB GenCo is strengthening the site co-ordination of work by introducing area co-ordination construction leads. With the increasing level of activity and complex geographical breakdown to facilitate construction, this should provide enhanced control of construction.
53. With regard to site capabilities, the routine engagement by the site inspector and site interventions (including FNSC concrete and CNI) have provided information on the overall state of site capabilities. NNB GenCo's response to the various findings and its own learning from early site construction has enabled the enhancement and evolution

of site capabilities to match the increasing level of site activity. The ONR cornerstone lead judged that overall the site has maintained and evolved its capabilities to match the current work demands, while identifying areas where further progress needs to be made before ONR will be able to issue its consent for the start of the nuclear island later in 2018.

54. The cornerstone report notes that in response to Level 3 issues relating to the FNSC substitution concrete, NNB GenCo has undertaken significant activities to set expectations and enhance nuclear safety culture on-site. The active involvement of the Site Director in a range of briefings and supervisor forums on safety and quality is noted. The report notes that site work has been stopped if required to ensure all expectations have been met. As part of the SCLLAP, all key short-term measures have been completed and there is an overarching culture programme that includes an appropriate site programme. ONR's site interventions, including the CNI inspection and observation of the site lead team meetings, have confirmed a satisfactory position.
55. ONR's organisational capability cornerstone lead concludes that in relation to site capability and readiness for the start of the pumping station construction:
- satisfactory progress has been made on the identified improvement plans –all required items have either been completed or are on track to complete before release of the pumping station hold point.
 - the current processes and resourcing are satisfactory for site control at present, including for the start of construction of the pumping station; however, increasing site activity requires adequate resources to be maintained to match demands. ONR will expect NNB GenCo to continue to demonstrate the availability of necessary SQEP resources (especially for key functions e.g. Site surveillance and Quality Leads) as the project proceeds.
 - NNB GenCo's proposals for area co-ordination and appointments of Senior Construction and Quality Lead roles are likely to strengthen the existing arrangements and hence better address increasing demands.
 - the current site work management arrangements are satisfactory and appear scalable to match the anticipated demands of starting construction of the nuclear island common raft later in 2018.

3.3.2 Project delivery capability & readiness

56. The organisational capability assessment report notes that NNB GenCo has continued to develop its Project Delivery Model (PDM) and its command centres operation arrangements. These are being refined in the light of early delivery experience and planning for the next phases of the project.
57. With regard to quality management (QM) the cornerstone report notes that ONR has given this topic considerable focus in this period due to the immaturity in NNB GenCo's QM arrangements (evidenced in Level 4 meetings) and deficiencies identified in their implementation (for example in the CNI inspection). The cornerstone report acknowledges that NNB GenCo has taken considerable measures to address the identified issues via the SCLLAP action plan and response to the CNI inspection findings.
58. Regarding the overall position on project delivery capability & readiness, the organisational capability cornerstone report concludes that this is adequate for the start of pumping station construction, but that the nuclear safety culture, the PDM and project support capabilities (documents & records management, competence management, project controls) will need to be continually developed and strengthened

as the project complexity and demands increase with the start of construction of the nuclear island and other nuclear safety related structures.

3.3.3 Governance & oversight

59. The organisational capability assessment report notes that the governance processes established by NNB GenCo at FNSC, which ONR judged to be effective at that time, have continued to operate and evolve to match the increasing demands of the project. It is noted that the new NNB GenCo Managing Director had undertaken a review of the project and instigated a re-organisation to strengthen project delivery, and that this will be implemented progressively during 2018.
60. Since FNSC, ONR has continued its routine monitoring of the main project governance processes including: the Nuclear Safety Committee; the Monitoring & Decision Meeting (MODEM); the Procurement Decision Meeting (PRODEM); hold points process; and notably the overarching Project Review meeting. ONR has also continued routine engagement with NNB GenCo's Assurance function on its work programme, findings and impact.
61. The organisational capability report notes ONR's view that although NNB GenCo's hold point process had ensured satisfactory control over release of hold points up to now, the process had limitations in addressing overall organisational readiness at key milestones. It is noted that NNB GenCo has developed an Organisational Capability Assessment (OCA) approach in response to one of the Level 3 issues raised following the FNSC intervention, and this has been trialled for the pumping station milestone. NNB GenCo's intention is to adopt the process for major milestones including the start of the nuclear island. In its report on the use of the OCA process for the pumping station (Ref. 38), NNB GenCo's IACO gave an assurance rating of 'compliant' but identified a number of areas for improvement prior to the start of nuclear island concrete.
62. Overall, on governance and oversight, ONR's organisational capability lead concludes that:
 - the governance processes and implementation are satisfactory for pumping station construction agreement;
 - there has been an increased maturity of project management;
 - there will be challenges arising for effective management of equipment supply chain but these will not impact the start of the pumping station;
 - there is potentially useful strengthening of the NNB GenCo Assurance function with recent organisational changes to include Quality Auditors;
 - the use of the OCA alongside the current hold-point process should provide both NNB GenCo and ONR with improved confidence in overall readiness for future major milestones.

3.3.4 Supply chain readiness

63. ONR's organisational capability lead's conclusions on NNB GenCo's supply chain readiness is based on routine engagement on the supply chain work stream, interventions on NNB GenCo's deployment of its supply chain policy, and on the findings of the Chief Nuclear Inspector's themed inspection.
64. As reported in Section 3.3.1 above, the CNI inspection and other engagements identified a range of deficiencies in NNB GenCo's Quality Management (QM) arrangements relevant to its supply chain oversight. NNB GenCo's response to the CNI inspection and its own self-assessments has been to produce an improvement

plan that follows a similar process to that used effectively for SCLLAP with a director level steering group (chaired by the Safety & Assurance Director).

65. ONR's organisational capability lead concluded that, with regard to NNB GenCo's supply chain oversight:
- control of on-site contractors is now satisfactory following strengthening in response to the FNSC substitution concrete intervention findings;
 - preparations for major equipment supply chain activity are satisfactory. This is a key area where ONR will seek further confidence prior to the nuclear island consent.
66. Although it was noted that further development of the implementation of NNB GenCo's supply chain management arrangements will be required to address the outstanding CNI and self-assessment findings, ONR's cornerstone lead concluded that the position of supply chain readiness is nevertheless acceptable for pumping station agreement.

3.3.5 Overall conclusions on Organisational Capability

67. The organisational capability cornerstone lead was satisfied that NNB GenCo has established the organisational capability necessary for construction of the pumping station and is progressing organisational capability development to match post-pumping station demands before the start of the nuclear island.
68. The organisational capability lead therefore recommended that ONR issues an agreement under LC 19 for NNB GenCo to commence construction of the pumping station (unit 1) at HPC.

3.4 LICENCE COMPLIANCE

69. The scope of the Licence Compliance cornerstone report (Ref. 16) was set out in Section 2.5.3 and covers:
- NNB GenCo's FNSC substitution concrete improvement plan activities
 - ONR crosscutting interventions and construction specific interventions (including the CNI inspection on supply chain management)
 - routine non-construction specific licence compliance
 - conventional health and safety
 - safety case related licence compliance (LC14 and 20)
 - NNB GenCo's application of its hold point process for the pumping station
 - application of NNB hold point and OCA processes
70. In coming to a judgement on the adequacy of NNB GenCo's licence compliance activities, ONR's licence compliance cornerstone lead (the nominated HPC Site Inspector) drew on the findings from a number of site visits carried out during 2017, as well as from Level 4 meetings held elsewhere and from examination of relevant NNB GenCo and Tier 1 contractor documents.

3.4.1 NNB GenCo's FNSC substitution concrete improvement plan activities

71. As discussed in section 3.3.1 above, on site preparedness, ONR raised three Level 3 issues regarding deficiencies in the laying of substitution concrete at the site of the FNSC construction. Section 3.3.1 considers the organisational capability aspects of NNB GenCo's progress with the associated improvement plan whereas the licence compliance cornerstone report considers the consequences for the site's licence compliance arrangements.

72. Having considered the outcomes of specific interventions, the licence compliance cornerstone lead concluded NNB GenCo had made adequate progress with those areas for improvement identified in ONR's FNCS intervention and the associated Level 3 regulatory issues. Nevertheless, the report notes that further evolution and maturity of a number of the underpinning processes such as NNB GenCo's Field Change Request and Non-Conformance Report processes will be required to ensure they remain scalable and effective given the increasing level of activity during pumping station construction and beyond.

3.4.2 ONR crosscutting interventions and construction specific interventions

73. The licence compliance cornerstone report notes that, with the exception of FNCS related issues and the Chief Nuclear Inspector's supply chain management inspection, ONR's crosscutting and construction related interventions have not identified any significant issues which would challenge ONR issuing the pumping station agreement. The report notes, however, that in a number of areas ONR has identified that NNB GenCo's arrangements will require further development to ensure that they remain adequate during the significant increase in activities released by the nuclear island consent.
74. With regard to the CNI's themed inspection of NNB GenCo's supply chain management, the cornerstone report notes the identified shortfalls against LC 17 (Management systems). The cornerstone lead concluded, however, that given the relatively limited impact of the pumping station construction activities, and since NNB GenCo's current arrangements are in general ensuring that delivery at site is being appropriately controlled and overseen, it would be disproportionate to recommend withholding ONR's agreement to the start of pumping station construction due to these shortfalls.

3.4.3 Routine non-construction specific licence compliance

75. In the period following ONR's consent to the commencement of construction of FNCS ONR carried out routine licence compliance inspections covering the following non-construction specific LCs:
- LC06 – Documents, records, authorities and certificates
 - LC07 – Incidents on the site
 - LC09 – Instructions to persons on the site
 - LC11 – Emergency arrangements
 - LC13 – Nuclear safety committee
 - LC14 – Safety documentation
 - LC12 – Duly authorised and other suitably qualified and experienced persons
76. ONR's cornerstone lead judged that NNB GenCo has been able to demonstrate continued adequate compliance with these licence conditions. ONR did identify a shortfall in record keeping relating to LC05 (Consignment of Nuclear Matter), but the cornerstone lead was content that this was not due to any wider systemic failings nor due to the impact of increased site workload/activity.

3.4.4 Conventional Health & Safety

77. For completeness, the licence compliance cornerstone report notes that ONR's conventional health and safety team had not identified any significant concerns in respect to on-site conventional health safety which would preclude ONR issuing an agreement to commence construction of the pumping station. Conventional health and safety is discussed separately in Section 3.5 below.

3.4.5 Safety Case related licence compliance (LC14 and 20)

78. Due to the importance of there being a sufficiently advanced design and safety case at the HP 2.2.1 milestone, ONR's licence compliance cornerstone lead reported separately on the adequacy of NNB GenCo's licence compliance arrangements for LC14 (Safety Documentation) and LC20 (Modification to design of plant under construction).
79. The cornerstone lead noted that the adequacy of the pumping station safety justification was assessed in the design and safety case cornerstone report (Ref. 13) which concluded that the submitted safety documentation is adequate to support NNB GenCo's request to commence construction of the pumping station. The safety case cornerstone concluded that NNB GenCo's LC 14 arrangements and their implementation are adequate for this hold point, although improvements need to be considered for future hold points. ONR's expectations have been set out in letter HPC50295N (Ref. 27) and this is being taken forward through routine level 3 and 4 meetings.
80. With regard to LC20, it was noted that the ONR safety case cornerstone report confirmed that no concerns had been raised by ONR inspectors regarding modifications that impact the pumping station.

3.4.6 Application of NNB hold point and Organisation Capability Assessment processes

81. The licence compliance cornerstone lead reported that he was satisfied that NNB GenCo had appropriately applied its hold point and OCA processes, and that no significant issues had been identified which would preclude issuance of the pumping station agreement.
82. ONR's overall views on the adequacy of NNB GenCo's application of its processes for the release of Hold Point 2.2.1 are considered separately in Section 4 below.

3.4.7 Overall conclusions on Licence Compliance

83. From the perspective of licence condition compliance, based on sampling of NNB GenCo's documentation and the interventions undertaken since FNSC, ONR's cornerstone lead concluded that there were no significant areas which would preclude ONR issuing an agreement for the commencement of construction of the unit 1 pumping station.
84. The cornerstone lead noted, however, that there are number of areas where NNB GenCo will need to mature its arrangements to ensure they are sustainable as project activity increases.

3.5 CONVENTIONAL HEALTH & SAFETY AND FIRE SAFETY ASSESSMENTS

3.5.1 Conventional health & safety

85. 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.
86. 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.

87. As discussed in the report from the conventional health and safety cornerstone lead (Ref. 17), ONR has continued to assess compliance with the Construction (Design and Management) Regulations 2015 (CDM) and other relevant legislation since FNCS and will continue to do so throughout the construction phase.
88. The cornerstone lead notes that ONR is alert to increasing conventional health and safety challenges as the level of construction work activity on site rapidly expands. Commencement of the pumping station work will pose additional and significant impact. Potentially complex risks arising from the pumping station build include deep excavations, slope stability, temporary works design and management, vehicle movements, and occupational health challenges associated with extensive concreting operations.
89. Overall, the cornerstone lead concludes that with regards to conventional health and safety on the construction site, there are no significant concerns which would preclude ONR issuing an agreement to NNB GenCo to start construction of the pumping station.

3.5.2 Fire Safety

90. The ONR fire safety inspector noted (Ref. 18) that the pumping station presented a challenging case due to the absence of vertical fire compartmentalisation; however the inspector noted that after detailed examination he was satisfied with NNB GenCo's fire protection arrangements for life safety. The inspector raised no objections to the release of Hold Point 2.2.1 and the start of construction of the pumping station.

3.5.3 Conclusions on conventional and fire safety

91. There are no issues emerging from ONR's regulation of conventional health and safety, and fire safety that should prevent ONR from issuing its agreement under LC19 for NNB GenCo to commence construction of unit 1 pumping station.

3.6 NUCLEAR SECURITY AND NUCLEAR SAFEGUARDS ASSESSMENTS

92. As explained in Section 2.5.5 above there are no nuclear security or nuclear safeguards matters relevant to this PAR.

3.7 OTHER ONR CONSIDERATIONS

93. The above sections have considered the conclusions from the five cornerstone themes regarding the readiness of NNB GenCo to release Hold Point 2.2.1 and commence construction of the unit 1 pumping station. These are ONR's primary considerations in making a judgement on whether to give its agreement under LC 19(1).
94. This section considers some other matters which are pertinent to the release of this hold point, and on which ONR needs to be satisfied; namely:
- closure or satisfactory position with all GDA Assessment Findings relevant to Hold Point 2.2.1;
 - closure or adequate progress with all relevant ONR Issues;
 - closure of NNB GenCo Commitments related to HP 2.2.1;
 - liaison with the Environment Agency; and
 - preparation of the Licence Instrument.

3.7.1 GDA Assessment Findings

95. In ONR's EPR™ Generic Design Assessment (GDA) Step 4 reports and GDA issue close-out reports (Ref. 28) there were no Assessment Findings identified by ONR for resolution by the start of the construction of the pumping station. This is not surprising as, at the time of GDA closure, the start of the pumping station had not been identified

by ONR as a suitable construction milestone by which certain Assessment Findings would need to be resolved.

96. Nevertheless, as noted in the ONR design and safety case cornerstone report (Ref. 13), the SHPR identified a number of GDA assessment findings that had not previously been closed and which NNB GenCo considered to partially impact the civil engineering design of the pumping station. During their assessment of the safety case, the ONR fault studies and mechanical engineering specialists also identified a number of open assessment findings which were considered to be partially associated with the safety case for the pumping station.
97. The design and safety case cornerstone lead reports (Ref. 13) that closure forms have been received from NNB GenCo proposing closure of all of the identified AFs, and several have been noted as closed by ONR. The cornerstone lead reports that for those assessment findings identified as relevant and which remained open, the ONR specialist inspector was satisfied with progress. The cornerstone lead concluded that NNB GenCo has made adequate progress towards resolution of GDA assessment findings for ONR to give its agreement to the commencement of the pumping station.

3.7.2 Regulatory Issues

98. 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 licensee’s 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.
99. For HPC, ONR inspectors had raised a number of level 3 and level 4 issues which identified the start of the pumping station as a 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 EPR Sub-Division Board (SDB). The status of regulatory issues identified for closure by the commencement of pumping station construction is discussed in the design and safety case, organisational capability and licence compliance cornerstone reports. ONR’s view on NNB GenCo’s progress with the three Issues raised by ONR in relation to deficiencies in the substitution concrete at the site of the FNSC activity (Ref. 25) is covered in both the licence compliance and organisational capability reports.
100. The design and safety case cornerstone (Ref. 13) lists 7 regulatory issues had been raised in previous ONR assessments (for example of HPC PCSR 2012 and CSJ-01) that relate to the pumping station, and that five of these issues had been closed. With regard to the two remaining, open, issues ONR’s design and safety case cornerstone lead concluded that NNB GenCo had made adequate progress towards resolution of those issues to allow commencement of pumping station construction.
101. The three level 3 issues raised by ONR in relation to the FNSC substitution concrete were:
 - Issue 5409 on deficiencies with LC17 – notably on leadership, quality management and escalation processes;
 - Issue 5410 on deficiencies with LC19 – notably on NNB and Tier I contractors discharging their duties under the LC19 arrangements
 - Issue 5411 on deficiencies with LC20 – notably on site change control processes
102. NNB GenCo developed a comprehensive improvement plan – the Substitution Concrete Lessons Learned Action Plan (SCLLAP) – to address these 3 issues (Ref. 29). This included 16 priority 1 actions – those directly aligned to ONR’s L3 issues –

and an additional 18 priority 2 actions that in many instances complement and reinforce the priority 1 actions.

103. Regarding these issues, ONR's organisational capability cornerstone lead noted (Ref. 14) that ONR has undertaken routine monitoring of progress with NNB GenCo's improvement plan from mid-2017 and undertaken interventions to judge progress and satisfactory implementation of the proposed improvements. The cornerstone lead noted that all relevant priority 1 actions required to be completed in advance of ONR's permissioning of the commencement of the pumping station had been completed. Additionally progress and completion of SCLLAP actions was included in NNB GenCo's own hold point requirements for release of the pumping station hold point. Consequently, the ONR cornerstone lead concluded that NNB GenCo has satisfactorily addressed the concerns raised by the Level 3 issues for the pumping station milestone. The cornerstone lead noted that the issues will be closed when the remaining longer-term actions are completed by NNB GenCo during 2018.
104. Since the completion of the cornerstone reports, the ONR EPR Sub-Division Board has closed Issues 5410 and 5411, and has agreed to downgrade Issue 5409 to a level 4. Subject to the outcome of a quality management level 4 meeting in mid-August 2018, ONR's quality management specialist anticipates that this issue will be able to be closed.

3.7.3 NNB GenCo Regulatory Commitments

105. 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.
106. Examination of the relevant Commitments log (Ref. 30) has shown that in relation to the start of unit 1 pumping station 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 issuing its agreement under LC19 for commencement of the pumping station.

3.7.4 Liaison with the Environment Agency

107. 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 EPR SDB.
108. 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 agreement, the Agency's views were sought on the draft contents of this PAR (Ref. 31). In response (Ref. 32), the Environment Agency expressed no concerns that should prevent ONR from giving agreement under LC19 for commencement of the pumping station.

3.7.5 Preparation of the Licence Instrument

109. As discussed in ONR-NR-PAR-16-004 Revision 1 (Ref. 33) ONR has sought and obtained GLD's agreement to the proposed use of the derived powers contained in LC19 to permission selected stages of construction. The Licence Instrument giving ONR's agreement to the start of pumping station construction (LI 511) follows the approved standard format of a derived power specification set out in the relevant ONR Instruction (Ref. 34).
110. This PAR will be subject to peer review in accordance with ONR's procedure (Ref. 34) and amended as necessary prior to submission to the Head of ONR's EPR sub-

Division for approval. The preparation of the Licence Instrument will also be subject to a standard check-list, signed and countersigned in accordance with the requirements of Ref. 39.

4 NNB GENCO'S PROCESS FOR RELEASE OF THE HOLD POINT

111. As discussed in Section 2.3 above, NNB GenCo has defined Hold Point 2.2.1 as a 'secondary hold point' and the process for the release of such hold points is set out in its *Define, Manage, and Release Key Hold-Points* procedure (Ref. 7). That process requires the production of a Management Expectations Document (MED) setting out those actions which need to be completed in order for the hold point to be released. An MED is an integral part of the Hold Point Management Document (HPMD) which consists of the MED, a Hold Point Review Document (HPRD) and a Residual Action Plan (RAP). The HPRD sets out the evidence that NNB GenCo considers necessary to close each of the actions and this will be submitted to the NNB GenCo Hold Point Panel (HPP) for approval before the hold point is released. Any outstanding actions that cannot be completed before the HPRD is submitted to the panel will be included in the RAP. The RAP must, in due course, be signed off by the HPP Chair and the head of Assurance prior to the start of the constrained activity.
112. For information, ONR was provided with a draft version of the pumping station MED in March 2017. ONR provided a number of comments on the MED highlighting a number of areas which it considered fell short of regulatory expectations (Ref. 35). Following a Level 4 meeting to discuss ONR's concerns, NNB GenCo raised a Learning Report to ensure that necessary improvements to the hold point process were implemented. Following discussion of ONR's comments at the August 2017 HPP, NNB GenCo issued a revised hold point management handbook and associated guidance document. At a further Level 4 meeting in December 2017 ONR confirmed that it was satisfied that NNB GenCo had satisfactorily addressed the concerns raised regarding the hold point management process (Ref. 36). The revised pumping station MED/HPRD, taking into account ONR's comments, was submitted to the October 2017 HPP. A substantially completed HPRD was submitted to the 30th April 2018 HPP which recommended that the hold point be released subject to:
- amendments to the HPRD proposed by the Panel; and
 - completion of the RAP.
113. I have reviewed the HPP minutes and the amendments proposed by the Panel which arose from its consideration of the evidence cited for the closure of each MED action. The amendments proposed by the HPP are, in general, intended to improve clarity of the evidence cited and, in some instances, propose further information to supplement the evidence for closure of particular MED actions.
114. In the RAP reviewed by the HPP there were 5 items, whereas the HPMD submitted to ONR contained an additional three items arising from NNB GenCo's considerations subsequent to the HPP meeting. All of the RAP items are targeted for closure by NNB GenCo prior to the start of the constrained activity. The RAP items identified are:
- RAP 1.1: Pumping Station Secondary Hold Point Report Issued and all relevant ONR comments / issues progressed to support Hold Point release
 - RAP 2.1: Demonstration that consideration has been given to the learning from previous site activities
 - RAP 3.1: Confirmation that assets (Systems Structures, Components) will be maintained during the construction phase prior to handover to the operator
 - RAP 4.1: Emergency response and incident management procedures in place (including an exercise to demonstrate the emergency arrangements for the construction phase of the pumping station)

- RAP 5.1: Provision of slope monitoring surveillance programme
 - RAP 5.2: Provision of suitable and sufficient risk assessments to ensure that the significant risks and hazards arising from working in the deep dig area are addressed
 - RAP 6.1: No regulatory issues preventing ONR to provide its agreement for HPC to proceed with the constrained activity
 - RAP 7.1: Improve systems that support managerial accountability which give greater visibility to essential training compliance, timely review of training role profiles and that deliver accurate organisation charts through Management of Change (MoC) changes.
115. The final RAP item (RAP 7.1) arose from NNB GenCo's independent concurrence review of the case for lifting the hold point, undertaken by IACO (Ref. 1).
116. At the point of writing this PAR, only RAP item 3.1 remains outstanding. This action should be complete once NNB GenCo has accepted the main civil contractor's (Bylor) Care and Maintenance Plan for the pumping station. The requirement for this arises from level 3 Regulatory Issue 6168, which requires NNB GenCo to improve its arrangements for the care and maintenance of SSCs during the construction phase. The proposed maintenance plan comes in two parts: a general Bylor care and maintenance Procedure, which in turn informs a care and maintenance plan specific to the pumping station. The procedure has been issued and NNB GenCo envisages the care and maintenance plan will be issued by mid-July 2018, well before the project demand date for the start of the constrained activity.
117. On the basis of the above, I am satisfied that NNB GenCo has a robust hold-point management process in place and that it has been properly applied to the release of the pumping station Hold Point 2.2.1.

5 CONCLUSIONS

118. This PAR presents the findings of ONR's assessment of NNB GenCo's request for its agreement under LC19 for commencement of construction of unit 1 pumping station at HPC.
119. 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;
 - 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 giving agreement for the start of construction of the pumping station.
120. The report also considers NNB GenCo's processes for determining its own and its Tier 1 contractor's (Bylor) readiness to commence construction of the pumping station.

5.1 DESIGN & SAFETY CASE

121. Taking cognisance of ONR's earlier HPC safety case assessments, ONR's assessment of the safety case for the start of construction of the pumping station was focused on:
- the structural integrity of the civil structure;

- the safety justification for the pumping station design; and
 - the adequacy of margins in the sizing of the safety related cooling water system pipework, pumps and heat exchangers such that if subsequent detailed design demonstrates the need for increases in flow-rates that this can be accommodated within the pumping station civil structure.
122. Based on sampling of NNB GenCo's documentation and a review of each of ONR's discipline-specific assessment reports, ONR's safety case and design cornerstone lead reported no outstanding concerns that would preclude ONR issuing an agreement for the start of construction of the pumping station. The cornerstone lead therefore recommended that ONR issues an agreement under LC 19 for NNB GenCo to commence construction of unit 1 pumping station.

5.2 ORGANISATIONAL CAPABILITY

123. The scope of the Organisational Capability cornerstone report covers the development of NNB GenCo's organisational capability arrangements since the ONR assessment undertaken for the lifting of the FNSC hold point in March 2017. The cornerstone report considers NNB GenCo's immediate readiness for the start of the pumping station construction as well as its broader progress and readiness for the start of the Nuclear Island later in 2018. The cornerstone report draws on insights from a number of work-streams, with its assessment focused primarily on:
- Site capability & readiness – ensuring that the resourcing, site processes & interaction/control of contractors are adequate for the permissioned activities; and how well they are maturing in advance of Nuclear Island consent.
 - Governance & Oversight – The organisational capability cornerstone report notes that at FNSC NNB GenCo had established effective governance processes which were appropriate to that stage in the project. For the start of the pumping station ONR's assessment focused on the development of NNB GenCo's governance processes since FNSC.
 - Supply chain readiness – the state of preparation of the supply chain and NNB GenCo's supply chain arrangements to match the growing demands of the project schedule.
124. Considering these and other relevant aspects of the licensee's organisational capability and readiness, ONR's cornerstone lead recommended that ONR issues an agreement under LC 19 for NNB GenCo to commence construction of the pumping station (unit 1).

5.3 LICENCE CONDITION COMPLIANCE

125. ONR's licence compliance cornerstone report covers the adequacy of NNB GenCo's licence compliance arrangements that impact its ability to demonstrate appropriate control of the site activities following the release on Hold Point 2.2.1, focusing on:
- NNB GenCo's FNSC Substitution Concrete Improvement Plan activities
 - ONR's crosscutting and construction specific interventions (Including Chief Nuclear Inspector's Inspection on supply chain management)
 - routine non construction-specific licence compliance interventions
 - conventional health & safety
 - safety case related licence compliance (LC14 and 20)
 - application of NNB GenCo's Hold Point and OCA processes for the pumping station

126. Based on sampling of NNB GenCo's documentation and ONR's interventions undertaken since FNSC, ONR's licence compliance lead did not identify any significant areas which would preclude ONR issuing an agreement for NNB GenCo to commence construction of the pumping station. The cornerstone lead therefore recommended that ONR issues an agreement under LC19 for NNB GenCo to commence construction of the pumping station (unit 1).

5.4 CONVENTIONAL HEALTH & SAFETY AND FIRE SAFETY

127. From the perspective of NNB GenCo's arrangements for managing both conventional health and safety and fire safety, there are no issues of which ONR is aware that prevent ONR from giving agreement under LC19 to the start of construction of the Unit 1 pumping station.

5.5 NUCLEAR SECURITY AND SAFEGUARDS

128. There are no nuclear security or safeguards considerations relevant to ONR's decision on issuing its agreement for the start of the pumping station.

5.6 OTHER ONR CONSIDERATIONS

129. This report sets out ONR's position on a number of other matters which it considers relevant to its decision on giving its agreement to the release of Hold Point 2.2.1. These are:

- closure or satisfactory position with all GDA Assessment Findings relevant to Hold Point 2.2.1;
- closure or satisfactory progress with all relevant Regulatory Issues;
- confirmation that there are no open NNB GenCo Commitments related to Hold Point 2.2.1; and
- the Environment Agency's views on the basis for ONR's decision giving its agreement.

130. This report concludes that there are no concerns regarding any of these matters which should prevent ONR from giving its agreement under LC 19 for NNB GenCo to commence construction of the unit 1 pumping station.

5.7 NNB GENCO'S PROCESS FOR RELEASE OF THE HOLD POINT

131. Regarding NNB GenCo's application of its governance process for the release of Hold Point 2.2.1, ONR found the original draft MED to be inadequate, but subsequent improvements made by NNB GenCo were sufficient to address ONR's concerns.
132. This PAR notes that the outcome of NNB GenCo's hold-point release process was a Hold Point Management Document (HPMD) with a Residual Action Plan (RAP) which was subject to review by NNB GenCo's Hold Point Panel. Having reviewed the HPMD, the HPP recommended that the hold point could be lifted, subject to the satisfactory closure of the items identified in the RAP.
133. I have examined NNB GenCo's application of its hold point release process for the start of the pumping station and I consider this to have been carried out in an appropriately rigorous manner, and that its decision to lift the hold point is fully supported by the evidence cited in the HPMD.

6 RECOMMENDATIONS

134. On the basis of the request submitted by NNB GenCo and the conclusions of this report, I recommend that the head of the EPR sub-Division:
1. signs this PAR to confirm support for the ONR technical and regulatory arguments that justify issuing HPC Licence Instrument 511, Agreement to commence construction of Unit 1 pumping station;
 2. signs this PAR approving its release for publication, after redaction where appropriate; and
 3. signs HPC Licence Instrument 511.

7 REFERENCES

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- 7 NNB GenCo document: Define Manage and Release Key Hold Points. NNB-209-PRO-000025 Ver. 4.0. March 2015
- 8 NNB GenCo, Hinkley Point C (HPC) Pre-Construction Safety Report Version 3 (PCSR3), ONR-HPC-21048N, June 2017, TRIM 2017/252891
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- 15 ONR-NR-IR-17-014 CNI Inspection - Supply Chain Management Arrangements - NNB GenCo (HPC) – December 2017. TRIM 2018/7288
- 16 ONR-NR-AR-17-053 Revision 0. Licence condition compliance cornerstone assessment report – Hinkley Point C Pumping Station. TRIM 2018/34160
- 17 Note on Conventional Health & Safety aspects of HPC Pumping Station TRIM 2018/157605
- 18 Note on Construction Fire Safety for the HPC Pumping Station Agreement TRIM 2018/157620
- 19 Email: Note on security considerations for start of Pumping Station TRIM 2018/157680
- 20 Email: Note regarding Safeguards: Start of Pumping Station TRIM 2018/157685

- 21 ONR How2 Business Management System, Guidance on Production of Reports, NS-PER-GD-015 Revision 0 (NS-TAST-GD-084). TRIM 2016/448248
- 22 Safety Assessment Principles for Nuclear Facilities, 2014 Edition Revision 0, ONR. November 2014. <http://www.onr.org.uk/saps/saps2014.pdf>.
- 23 ONR Technical Inspection Guides, www.onr.org.uk/operational/tech_insp_guides.
- 24 ONR Technical Assessment Guides, www.onr.org.uk/operational/tech_asst_guides
- 25 ONR-NR-IR-17-001 Revision 0. Hinkley Point C: NNB GenCo decision to proceed with First Nuclear Safety Concrete. TRIM 2017/163461
- 26 NNB GenCo HPC-NNBGEN-XX-000-PAP-100007. FNSC Lessons Learned Action Plan Version 2.0 November 2017 TRIM 2017/369319
- 27 ONR Letter HPC50295N. Level 3 and above Regulatory Issues endorsed by the EPR Sub-Division Board. Licence Condition 14 – Safety Documentation. TRIM 2017/453356
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- 35 Define Manage and Release Hold Point: HP 2.2.1 - Start of Pumping Station. ONR comments on Draft Management Expectations Document, 22 March 2017. TRIM 2018/157927
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