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## Hinkley Point B Reactor 3 2016 Periodic Shutdown

### EDF Energy Nuclear Generation Limited Hinkley Point B Power Station – Request for Consent for Start Up of Reactor 3 Under Licence Condition 30 (3)

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## EXECUTIVE SUMMARY

### Title

#### **EDF Energy Nuclear Generation Limited Hinkley Point B Power Station – Request for Consent for Start Up of Reactor 3 Under Licence Condition 30 (3)**

### Permission Requested

EDF Energy Nuclear Generation Limited (NGL), the licensee of Hinkley Point B nuclear power station, has applied for consent from the Office for Nuclear Regulation (ONR) to start-up Reactor 3, in compliance with Licence Condition (LC) 30 (3) attached to Nuclear Site Licence 62C.

### Background

Hinkley Point B power station is a nuclear licensed site operating two Advanced Gas-cooled Reactors, known as Reactors 3 and 4. To continue to operate safely and reliably the reactor plant requires examination, inspection, maintenance and testing. Continuous improvement also requires plant upgrades to be implemented where deemed to be reasonably practicable. Whilst some of these activities can take place when the reactor is at power, many of them require it to be shut down. The licensee's arrangements require that periodic shutdowns (also referred to as statutory outages) are carried out every three years at each reactor at Hinkley Point B, providing the opportunity to undertake such activities. On completion of a periodic shutdown the reactor cannot be started up without Consent from ONR under LC 30 (3).

During the 2016 Reactor 3 periodic shutdown, which commenced on 22 January 2016, the licensee has conducted:

- Examinations, inspections, maintenance and testing (EMIT) activities in accordance with the plant Maintenance Schedule (MS).
- Inspections to support the station safety case.
- Work to comply with statutory requirements (such as Pressure Systems Safety Regulations).
- Remedial work to rectify plant adverse conditions and emergent work
- Work to modify and/or enhance the plant where deemed appropriate.

Where inspection work revealed the potential for an adverse plant condition, the licensee has assessed the inspection results in accordance with its arrangements and taken appropriate remedial action as necessary prior to ONR granting Consent to reactor start-up.

The Hinkley Point B Station Director has written to ONR requesting consent to start-up Reactor 3. In his letter, the Station Director confirmed that following completion of the outstanding work, as controlled by the Operational Safety Review Committee (OSRC), Reactor 3 will be safe to return to service. The licensee's internal regulator, Independent Nuclear Assurance (INA), has indicated there are no issues that prevent the start-up or continued operation of Reactor 3. INA's confirmation that its assessment programme has been concluded is a necessary component that informs the OSRC's decision to authorise return to service.

The third party Pressure Systems Safety Regulations (PSSR) competent person has issued an inspection report that is included in the licensee's request for consent. The final inspection report will be included in the licensee's final outage report issued within 28 days of reactor restart. The appointed examiner for the Reactor Pre-stressed Concrete Pressure Vessel (PCPV) has issued a start-up report that concludes that the PCPV is in satisfactory condition

and fit for return to service for a further period of three years subject to normal in-service surveillance.

### **Assessment and inspection work carried out by ONR in consideration of this request**

The ONR nominated site inspector and specialist inspectors have sampled the licensee's arrangements for controlling and completing the examination, inspection, maintenance and testing requirements of the Maintenance Schedule (MS), and other plant modifications of nuclear safety significance, as identified within the outage intentions document. Inspectors have undertaken inspections throughout the periodic shutdown to:

- Inspect samples of the licensee's implementation of arrangements under LC28.
- Inspect and assess the licensee's implementation of LC22 modifications, delivered through NGL's Engineering Change process
- Assess the adequacy of control and supervision under LC26 and the Management of Health & Safety at Work Regulations (1999).
- Assess the adequacy of the licensee's quality management arrangements associated with activities carried out during the periodic shutdown.

The specialist inspectors have produced reports for each specialism. The ONR nominated site inspector for Hinkley Point B, has considered these reports to assist in the compilation of this Project Assessment Report (PAR) and development of a regulatory judgement that Reactor 3 is fit for return to service.

The regulatory interventions carried out by ONR inspectors have not identified any issues that would prevent ONR from issuing its Consent to start-up Reactor 3 under LC 30(3).

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

There are no outstanding matters preventing issue of Licence Instrument (LI) 551 arising from the work undertaken by ONR inspectors in relation to the Hinkley Point B Reactor 3 2016 periodic shutdown.

### **Conclusions**

Following assessment and inspection of matters arising in relation to the 2016 periodic shutdown of Hinkley Point B Reactor 3, the nominated site inspector was satisfied that the licensee's justification to start-up the reactor and operate for a further period of three years was adequate, and that consequently judged that consent to start-up the reactor should be granted.

### **Recommendation**

The nominated site inspector recommended that in accordance with the request from the licensee, ONR should issue LI 551 under LC 30 (3) consent to start-up Hinkley Point B Reactor 3.

## LIST OF ABBREVIATIONS

ALARP	As low as reasonably practicable
APEX	Appointed Examiner
CBIU	Channel Bore Inspection Unit
CGOT	Channel Gas Outlet Temperature
C&I	Control & Instrumentation
CNRP	Civil Nuclear Reactor Programme
CNS	Civil Nuclear Security
EA	Environment Agency
EC	Engineering Change
EMIT	Examination Maintenance Inspection and Testing
FME	Foreign Material Exclusion
GAP	Graphite Assessment Panel
GC	Gas Circulator
HNB	Hunterston B
HPB	Hinkley Point B
HOW2	Office for Nuclear Regulation Business Management System
INA	Independent Nuclear Assurance
INSA	Independent Nuclear Safety Assessment
IR	Intervention report
KRC	Keyway Root Crack
LI	Licence Instrument
LC	Licence Condition
MS	Maintenance Schedule
MITs	Maintenance Inspection Testing Schedule [EDF]
NGL	EDF Energy Nuclear Generation Limited
OAP	Outage Assessment Panel
OID	Outage Intentions Document
ONR	Office for Nuclear Regulation
OSRC	Operational Safety Review Committee
PAR	Project Assessment Report
PC	Personal Computer
PCPV	Pre-stressed Concrete Pressure Vessel
PVSRV	Pressure Vessel Safety Relief Valve
PSSR	Pressure Safety Systems Regulations 2000
RTR	Rapid Trending Review
RP	Radiological Protection
QA	Quality Assurance

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## 1 PERMISSION REQUESTED

1. EDF Energy Nuclear Generation Limited (NGL), the licensee of Hinkley Point B nuclear power station, has applied for Consent from the Office for Nuclear Regulation (ONR) to start-up Reactor 3, in compliance with Condition 30 (3) attached to Nuclear Site Licence 62C (Ref.1). This Project Assessment Report (PAR) presents the consideration of this request and recommends issuing Licence Instrument 551, Consent to start-up Reactor 3.

## 2 BACKGROUND

### 2.1 GENERAL

2. Licence Condition (LC) 30 (periodic shutdown) of the nuclear site licence issued to NGL for Hinkley Point B power station requires the licensee to shut down the reactors in accordance with its plant Maintenance Schedule (MS), to enable examination, inspection, maintenance and testing to take place in accordance with the requirements of LC28 (examination, inspection maintenance and testing). At Hinkley Point B, reactor periodic shutdowns are undertaken triennially as specified in the MS preface, which is an Approved document under LC28 (4). As part of the shutdown, the licensee also carries out work associated with the requirements of Pressure Systems Safety Regulations (PSSR), previous commitments, and the installation of plant modifications.
3. The licensee requires Consent from ONR under LC30 (3) to start-up Reactor 3 on completion of its periodic shutdown. The previous Consent to start-up Reactor 3 was LI 542 dated 6<sup>th</sup> December 2012 (Ref.2). The Reactor 3 2016 periodic shutdown commenced on 22<sup>nd</sup> January 2016, following ONR agreement to extend the operating period (Ref.3).
4. In addition to planned routine activities, the licensee also undertook a significant amount of work to improve the safety and reliability of the station. This work included:
  - Inspection of 31 graphite channels using channel bore measurement and TV systems, trepanning of graphite samples from 6 channels and eddy current inspection of others.
  - One super articulated control rod and channel inspected by remote viewing.
  - Inspection of internal parts of the pressure vessel and associated systems including boilers, structures and hangars.
  - Exchange of two gas circulators, replacement of two more pairs of IGV (inlet guide vane) couplings and repairs/exchange of lubrication oil pumps.
  - Replacement of reactor pressure relief valves.
  - Surveillance of the pre stressed concrete pressure vessel.
  - Inspection and repair of drum screens and other cooling water systems.
  - Replacement of station transformer 3.
  - Replacement of two off phase tanks on generator transformer 7.

### 2.2 OUTAGE PLANNING AND MANAGEMENT

#### 2.2.1 Licensee's Management

5. NGL produced an outage intentions document (OID) for the Reactor 3 periodic shutdown 2016 (Ref.4). The document outlined the NGL outage organisation, infrastructure and management arrangements to deliver the safety related activities being undertaken during the outage. The activities were in accordance with the MS, statutory inspections, modifications and significant work in order to meet the requirements of the relevant sections of LC22, 28 and 30. The document, together with

the referenced scope related supporting documents, comprised the outage intentions proposals for Reactor 3.

6. The licensee's outage process includes a series of meetings with ONR such as:
  - NGL provided ONR with a copy of the OID prior to holding the outage intentions meeting held on 11<sup>th</sup> August 2015, during which the organisational arrangements and programme of work for the shutdown were discussed. The nominated site inspector attended the meeting (Ref.5) and provided feedback to NGL on the document. Minutes of the meeting were provided by NGL (Ref 6) which remained at draft status until formally accepted as being accurate at the later start-up meeting.
  - The start-up meeting was held on 17<sup>th</sup> & 18<sup>th</sup> February 2016 and was attended by the CNRP Operating Reactors Delivery Lead and the nominated site inspector (Ref.7). The purpose of the start-up meeting was for the licensee to demonstrate it had adequately met its statutory outage objectives, dealt with emergent issues and demonstrated the safety of Reactor 3 for the next operational period. A start-up meeting report (Ref.8) was provided prior to the meeting and additional information was presented at the meeting (Ref.9).
7. On 8<sup>th</sup> March 2016 the Hinkley Point B Station Director wrote to ONR requesting its Consent to start-up Reactor 3 (Ref.1). In his letter, the Station Director confirmed that following completion of the outstanding work, as controlled by the Operational Safety Review Committee (OSRC), Reactor 3 would be safe to return to service. The request letter was supported by a series of appendices:
  - At the Reactor 3 Start Up meeting held on 18<sup>th</sup> February 2016 it was agreed that certain actions had to be completed prior to start-up of Reactor 3. Responses to these actions have been tracked via the "R3 2016 Statutory Outage ONR Action Tracker" (Ref.10).
  - All Maintenance Schedule work was complete, with the exception of those items which could only be carried out during the return to service of the unit.
  - Confirmation that all the plant will be in satisfactory condition for return to service, listing all of the outage associated Category 1 and Category 2 submissions.
  - A statement from INA that there were no issues remaining with respect to the requirements of Concurrence, and that the Concurrence Part B would be provided for start-up.
8. ONR has been provided with details of the INA position on the Reactor 3 2016 return to service. INA demonstrates its assurance by undertaking a series of surveillance activities both before and during the outage. This includes inspections, oversight of management processes and document reviews as defined in the Concurrence Part A report (Ref.11). On completion of these activities, INA issues a further report, (Concurrence Part B) which presents the findings of their work and includes a statement supporting the start-up. INA will submit its Concurrence Part B report to the Hinkley Point B OSRC as part of the licensee's consideration as to whether Reactor 3 is fit for return to service, in accordance with NGL's company arrangements.

### **2.2.2 ONR's Intervention Management Process**

9. ONR business management process within the Civil Nuclear Reactor Programme (CNRP) requires that a task sheet is produced for activities exceeding five man days' work. The task sheet provided the background to the proposed intervention, the anticipated outcomes, duration, and prioritisation and listed the ONR specialisms assigned to the project and the intervention strategy.

10. The nominated site inspector for Hinkley Point B produced task sheet TS344 (Ref.12) for the Reactor 3 periodic shutdown. The task sheet was endorsed by the CNRP sub programme management board. The anticipated outcomes of the project included the licensee delivering:
  - An outage that was safely managed and appropriately regulated.
  - Closeout of significant issues raised by Interventions to the satisfaction of the Inspector raising the issue, prior to the conclusion of the outage (wherever possible), or an acceptable plan is made to address the issue beyond the outage).
  - Safe delivery of the required work activities, enabling ONR to produce a PAR that considers NGL's request to start up Reactor 3 on completion of the shutdown.
11. The following ONR specialisms were assigned to the project:
  - Graphite.
  - Management systems & QA.
  - Civil engineering systems.
  - Electrical systems.
  - Structural integrity.
  - Control and Instrumentation systems, including reactor protection systems.
  - Conventional safety.
  - Site inspection oversight.
12. Prior to the start of the outage it was agreed that vessel entry for boiler inspections was not required in this outage, and consequently no specific contribution from ONR specialists in radiological protection or radioactive waste would be required. In addition, following a review it was concluded that mechanical engineering support would not be required apart from consideration of any emergent work items (Ref.13).
13. ONR's process for delivering a permissioning project requires preparation of a Project Assessment Report (PAR) to support the permissioning decision by the Delegated Authority. The PAR is informed by the intervention findings of the inspectors assigned to the project to allow the Delegated Authority to consider issuing Consent for the restart of the reactor.
14. The nominated site inspector has maintained a spread sheet R3 2016 Statutory Outage ONR Action Tracker (Ref.10) to monitor progress and status of all restart and non-restart related actions.

### **3 ASSESSMENT AND INSPECTION WORK CARRIED OUT BY ONR IN CONSIDERATION OF THIS REQUEST**

15. The nominated site inspector has considered the NGL request for ONR's Consent to start-up Hinkley Point B, Reactor 3 on completion of its periodic shutdown. He has followed ONR procedures for delivering a permissioning project, as detailed in HOW2 (Ref.14). To support his work he utilised the services of the ONR specialist inspectors assigned to this project by the ONR CNRP management team. He also acknowledged the outage-associated work undertaken by the NGL internal regulator, INA.
16. He consulted with the Environment Agency (EA) and Civil Nuclear Security to establish whether they objected to ONR giving Consent to start-up Reactor 3 and their response is provided in Section 4 of this report.

17. A summary of the inspection and assessment work undertaken by specialist inspectors and the nominated site inspector during the course of the periodic shutdown is given below.

### 3.1 GRAPHITE CORE

18. During the statutory outage, NGL undertook inspections, measurements and samples of the reactor graphite core, as required by the graphite core safety cases.
19. Two ONR graphite inspectors visited site to inspect how NGL was performing the activities relating to the graphite core inspection (Ref.15). The intervention focused on arrangements for graphite core examination, inspection and testing and the observations made during these periodic shutdown activities. At the time of the visit, the licensee had completed one visual inspection and bore measurement, out of a target requirement of 31. The ONR graphite inspectors were satisfied that:
- The licensee was in an adequate position to complete all the planned inspections and measurements.
  - The personnel involved in undertaking inspections and measurements had sufficient training to perform the various tasks.
  - That the visual inspection data was of the necessary quality.
20. An assessment report was produced later when all of the graphite inspection data was available (Ref.16). This noted that:
- In January 2016 Hinkley Point B Reactor 3 began its periodic shutdown for examination, maintenance, inspection and testing in compliance with Licence Condition (LC) 30. One key NGL objective was to demonstrate that the condition of the graphite core was in accordance with the relevant safety cases.
  - The assessment considered the findings of NGL's inspection programme on the graphite core and their safety case that had been supplied to ONR as a commitment necessary for the return to service (RTS).
  - During the last periodic shutdown of Hunterston B (HNB) Reactor 3 in 2015, three keyway root cracks (KRCs) were observed in the main population of graphite fuel bricks. This observation resulted in a shortened period of operation before the next graphite inspections in order to build confidence in the predicted rate of progression of this new cracking mechanism. Given that the core irradiation at HPB Reactor 3 was similar to that of HNB Reactor 3 it would not have been surprising to have observed KRC during the inspections at HPB Reactor 3 during the present shutdown. In the event, no KRCs were observed, however the result was still judged to be consistent with the possibility that HPB Reactor 3 had a similar KRC onset time as HNB Reactor 3. This was because the amount of inspection performed (10% of the core) is unable to demonstrate that the core does not contain KRCs. NGL's assumption that the lead reactors, in terms of cumulative irradiation (HPB Reactor 3 and HNB Reactor 3), would lead in terms of progression of KRC is not disproven by this observation. Therefore, the ONR graphite inspector judged NGL's proposal that the operating period of HPB Reactor 3 should be consistent with that of HNB Reactor 3 is appropriate until a better understanding of the rate of progression of cracking is gained from future inspections.
  - NGL proposed a total operating period of approximately 13 months contingent on satisfying number of internal hold points defined in the HPB return to service graphite core EC. The ONR graphite inspector judged that these hold points were adequately conceived and consistent with the operation of HNB Reactor 3; he added the proposed hold points to ONR Issues 153 and 163.

- The ONR graphite inspector considered that the progression of average core weight loss at HPB did not present any challenge to safety over the next three year period of consent. However, he considered it unacceptable that trepanned data from a previous shutdown in 2012 had not yet been used to recalibrate the prediction of graphite core weight loss. Therefore, he will write to NGL about his expectations for timely recalibration of weight loss models using the new trepanned data.
21. The ONR graphite inspector made a number of recommendations during his assessment:
- **Recommendation 1:** that this Project Assessment Report (PAR) reflected the need for NGL to incorporate the 2012 HPB trepanned data into their model predictions of graphite core weight loss within 1 year of restart of HPB Reactor 3 from its 2016 periodic shutdown and to confirm that this is within the current safety case.
  - **Recommendation 2:** that this PAR reflected the need for NGL to introduce measures to ensure that all trepanned data is incorporated into their weight loss models within a period of three years from collection in order to reduce uncertainty in the prediction of weight loss.
  - **Recommendation 3:** that the HPB nominated site inspector confirmed that NGL had completed the relevant return to service EC that details the results of the graphite inspections and that it has been subject to INSA before finalising the PAR.
  - **Recommendation 4:** based on his assessment of the Hinkley Point B Reactor 3 2016 Graphite Core Inspection Results and Justification for Return to Service, the ONR graphite inspector did not find any reason to prevent him recommending that Consent be given to return Hinkley Point B Reactor 3 back to service.
22. To conclude, the ONR graphite inspector was broadly satisfied with the claims, arguments and evidence made within the HPB Reactor 3 return to service graphite core safety case and, subject to the document completing due process (Recommendation 3), he had no objection to Consent being given to return Hinkley Point B Reactor 3 back to service. The other recommendations are recorded in this PAR and will be progressed with NGL after the outage has concluded. These matters were added to the R3 2016 Statutory Outage ONR Action Tracker (Ref.10) and are considered in Section 4 of this report.

### 3.2 MANAGEMENT SYSTEMS

23. An ONR quality management (QM) systems inspector carried out an inspection and assessment at Hinkley Point B to review the adequacy of the outage QM arrangements. This focussed on the adequacy of the outage quality management oversight arrangements including:
- Audit & surveillance.
  - Supply chain & contract management.
  - Management of outage work quality.
24. The QM inspector produced an assessment report (Ref.17) for the assessment/inspection. The main points from this work were:
- HPB had a risk based, intelligence-driven approach to targeting of surveillances for the outage. A review of previous operational experience and interaction with the work management groups had been used to inform the surveillance

programme. He was satisfied that the programme was being well managed and supported, and based upon the example reviewed, that the surveillances were of adequate standard.

- He observed the weekly Safety and Quality Forum which was attended by the contract partners and a number of EDF representatives. He noted that the meeting was well-structured and that all parties were engaged in the discussions.
  - He witnessed a joint Safety and Quality Surveillance undertaken by the Station Quality Engineer (SQE) and the Industrial Safety Lead and found this to be adequate.
  - He discussed management of outage work quality with the strategic outage manager and was satisfied that the arrangements were adequate. He also discussed outage supply chain management arrangements with the supply chain manager and his team and found these to be in accordance with fleet practice and relevant procedures.
  - He was satisfied that the quality management oversight arrangements for the outage were adequate.
25. The ONR quality management (QM) systems inspector recommended, based on the areas and activities sampled during this inspection, that the Management Systems arrangements for the outage should be considered adequate to permit a return to service of the unit.
26. The ONR quality management systems inspector also confirmed that he had no issues that would affect the re start of Reactor 3 (Ref.18).

### **3.3 CIVIL ENGINEERING**

27. An ONR civil engineering inspector carried out an assessment of the supporting documentation relating to the Reactor 3 statutory outage (Ref.19). He noted that prior to ONR granting Consent for this reactor to return to service, the Appointed Examiner (APEX) for the pre-stressed concrete pressure vessel (PCPV) produced a progress report (or 'start-up' report) on the scheduled inspections and tests that had been carried out on this vessel since the previous statutory outage in 2012.
28. The ONR civil engineering inspector's report presented the findings of his assessment of the start-up report and the surveillance tasks reported within it. He noted that:
- The start-up report documented the progress of the statutory surveillance inspections prescribed in Section 3.1 of the Hinkley Point B Station Maintenance Schedule. This had been produced by a suitably qualified and experienced person for the role of Appointed Examiner and provided statements on each of the Maintenance Schedule surveillance items namely; concrete surface examination, tendon load checks, tendon anchorage examination, tendon corrosion examination, PCPV settlement and tilt, vibrating wire strain gauges, vessel temperature, main reactor coolant loss, pressure vessel cooling system and top cap deflection.
  - Tendon load checks had been carried out during the previous operating period and consisted of a 1% sample of the top tendon anchorages in November and December 2013, and the Maintenance Schedule requirement of a 1% sample of both top and bottom tendon anchorages during June and July 2014. The load check data was assessed by the APEX who concluded that the residual pre-stress level was adequate to satisfy the minimum design load for the next 3-year period of planned operation.
  - A full and detailed report of the surveillance results and their assessments will be provided to ONR within 28 days of the consent to restart the reactor.

- The APEX concluded that the Hinkley Point B Reactor 3 PCPV was in a satisfactory condition for returning to service for a further period of operation of three years, i.e. until 2019.
29. The ONR civil engineering inspector used ONR's Safety Assessment Principles and BS4975:1990: PCPVs for nuclear engineering as primary assessment references. From his assessment of the results of the surveillance inspections (as reported in the documentation provided), discussions held with the Appointed Examiner, and his acceptance of the judgements made by the APEX, he was content to support the return to service of the Reactor 3 pre-stressed concrete pressure vessel for the next operating period of three years.
30. The ONR civil engineering inspector also confirmed that he had no issues that would affect the re start of Reactor 3 (Ref.20).

### 3.4 ELECTRICAL SYSTEMS

31. Two ONR electrical systems inspectors carried out an inspection and assessment at Hinkley Point B (Ref.21) to review the adequacy of the outage related electrical activities including the planned work from the Outage Intentions Document and any emergent work in this area. The main points of this work were:
- The inspection of outage related electrical activities confirmed that the planned examination, maintenance, inspection, test and modification activities, were undertaken during the outage period.
  - During the course of the inspection it was found that site was maintaining its electrical plant and equipment in accordance with its arrangements, on the basis of the areas sampled by the inspection.
  - The overall outcome from the safety inspection of the outage related electrical activities was that implementation of arrangements for the electrical equipment was deemed to be adequate.
32. During the inspection the ONR inspectors were informed that site had, over recent years, experienced anomalous behaviour with several 11kV and 3.3kV circuit breakers and that further instances of this were encountered during the Reactor 3 shutdown. The main anomalous behaviour exhibited was slow operation of circuit breaker operating mechanisms caused by stiffness attributed to lubricant build-up and hardening and a number of initiatives to enhance future breaker performance were identified including:
- Revised maintenance procedures to ensure that, in addition to the removal and checking of solenoids and cleaning of electrical insulators and contacts, the 11kV and 3.3kV circuit breaker operating mechanisms were completely stripped, examined, cleaned and re-lubricated, or where necessary replaced.
  - Use of a revised specification of lubricant on 11kV circuit breakers.
  - A revised strategy of exercising circuit breakers more frequently.
  - Installation of additional cooling capacity in the switch rooms to reduce effects associated with the build-up and hardening of lubricant on operating mechanisms.
33. At the time of the inspection the site advised that an investigation was in progress into the anomalous behaviour of circuit breakers during the Reactor 3 shutdown and agreed to provide ONR with the following information:
- Prior to the return to service of Reactor 3, an update on progress with investigations into anomalous behaviour of 11kV and 3.3kV circuit breakers during the Reactor 3 trip.

- In the longer term, copies of relevant investigation reports together with remedial measures implemented, and remedial measures proposed for future implementation, to address the anomalous behaviour of the 11kV and 3.3kV circuit breakers.
34. These matters were added to the R3 2016 Statutory Outage ONR Action Tracker (Ref.10) and are considered in Section 4 of this report.
35. The overall outcome from the electrical inspection was that apart from the issues raised above, no electrical issues were identified that should affect the return to service of Reactor 3, on completion of the planned and emergent work (Ref.22).

### 3.5 STRUCTURAL INTEGRITY

36. Two ONR structural integrity inspectors undertook a planned outage inspection and assessment to determine the adequacy of: the inspections of welds, reactor internals, essential cooling water systems, pipe hangers and thermal movement supports; and compliance with Pressure Systems Safety Regulations (PSSR) undertaken during Hinkley Point B Reactor 3 periodic shutdown. The assessment was conducted in three stages:
- Pre-outage review of the outage intents proposal.
  - A visit to site during the outage to assess the adequacy of the inspections in progress and how the licensee is complying with the commitments provided in the outage intents document.
  - Monitoring of the Outage Assessment Panel (OAP) minutes throughout the outage to identify how the inspections were progressing and how any issues identified were managed and resolved.
37. The intervention report for the site visit is found at Ref.23 whilst the assessment report is contained at Ref.24
38. Prior to the start of the Reactor 3 outage NGL submitted an Engineering Change document to justify deferral of vessel entry inspections during this outage until the next periodic shutdown, currently planned for 2019. ONR assessed this submission and concluded (Ref.25) that it was satisfied with the claims, arguments and evidence laid down within the Licensee's safety case. As a result the work scope requiring vessel entry for boiler inspections was removed from the outage scope.
39. The structural integrity inspectors' report considered the adequacy of the structural integrity inspection of welds, pipework, vessels, components and metallic reactor internal structures completed during the Reactor 3 2016 periodic shutdown and concluded that:
- The inspections had been undertaken in line with the Reactor 3 2016 outage intentions documents and that Hinkley Point B had followed corporate procedures in the assessment and sentencing of inspection results.
  - Based upon the sampling undertaken, and the evidence presented, they judged that the licensee had completed sufficient inspection and assessment to support the safe return to service of Hinkley Point B Reactor 3 from a structural integrity perspective, and no issues were found that would prevent Hinkley Point B Reactor 3 from returning to service for the next operational period.
40. These conclusions were contingent upon receiving a number of additional documents and assurances that were not available at the time of the inspection, namely:



- To demonstrate satisfactory completion of the steam system inspection programme and completion of the work of the OAP, the Independent Nuclear Safety Assessment (INSA) certificate for the Return to Service Engineering Change report should be submitted as part of the NGL application for Consent to return to service.
  - To demonstrate satisfactory completion of the PSSR inspections, a return to service statement from the Competent Person (CP) should be submitted as part of NGL's application for consent to return to service.
  - To demonstrate satisfactory completion of the inspections not covered by the Appointed Examiner (APEX) and PSSR CP, namely the gas side penetrations of the reactor pressure boundary, the Return to Service Engineering Change report must include a statement from NGL design authority supporting the fitness for return to service.
  - The Project Inspector should ensure that the licensee provides ONR with an approved copy of the Return to Service Engineering Change report and the 28 day report, when available.
41. These matters were added to the R3 2016 Statutory Outage ONR Action Tracker (Ref.10) and are considered in Section 4 of this report.
42. Thus, from a structural integrity perspective, and contingent on resolution of the matters raised above, it was recommended that ONR should issue the Licence Instrument to grant Consent for start-up of Reactor 3 at Hinkley Point B Nuclear Power Station, following the 2016 Periodic shutdown.
43. The ONR structural integrity inspectors confirmed that no other issues were identified that should affect the return to service of Reactor 3 (Ref.26).

### **3.6 CONTROL AND INSTRUMENTATION (C&I) SYSTEMS**

44. Two ONR control and instrumentation (C&I) inspectors carried out an inspection of the Reactor 3 outage related C&I activities as part of the overall programme of outage related safety inspections (Ref.27). The main focus of the inspection was to verify that relevant work activities had been carried out in relation to C&I equipment and systems important to safety in order to confirm that they remained fit for their intended purpose. The inspection included a review of progress made on various work items and projects associated with C&I equipment and systems important to safety.
45. The main observation from the inspection was that the commitments made in the Reactor 3 Outage Intentions Document (OID) for C&I equipment and systems important to nuclear safety had been satisfied including the completion of the Channel Gas Outlet Temperature (CGOT) neoprene replacement programme.
46. One action was raised during the inspection which required resolution prior to return to service of Reactor 3:
- EDF NGL to confirm a sweep of site has been undertaken to identify computers on site to ensure they had been through the due process for cyber security and any necessary nuclear safety measures are addressed prior to return to service.
47. This action arose from a plant walk-down in the Reactor 3 Gas Circulator (GC) hall where an individual was using a portable computer which was connected using an ethernet cable to an instrumentation cabinet containing gas circulator vibration monitoring equipment. When asked if the computer had been through the necessary IT computer registration process and anti-virus scanning process he replied that it had not been tested as he considered that it was not connected to a network. The ONR

C&I inspectors did not think this was correct. The issue was discussed with the Station Director who arranged for a sweep of site to be undertaken to identify computers on site to ensure they had been through the due process for cyber security. During subsequent discussions within ONR it was agreed that this action should be sub divided as follows:

48. Before return to service of Reactor 3:
- NGL to address safety implications for Reactor 3 re start from this specific PC in the GC hall.
  - NGL to provide details of PC sweep to determine if any other similar portable computers had been used during the Reactor 3 outage, and if so to address safety implications for Reactor 3 re start.

and, unrelated to the Reactor 3 start up:

- NGL to provide details of portable computer sweep to determine if any were present and address safety implications for continued operation of Reactor 4.
  - NGL to investigate how this matter arose and identify areas for improvement.
49. These matters were added to the R3 2016 Statutory Outage ONR Action Tracker (Ref.10) and are considered in Section 4 of this report.
50. On the basis of this inspection the ONR C&I inspectors' recommended that support be given for a Consent to allow Reactor 3 to return to service pending the satisfactory resolution of the Reactor 3 return to service actions noted above. They confirmed that they had no other issues relating to the return to service of Reactor 3 (Ref.28).

### **3.7 CONVENTIONAL SAFETY**

51. An ONR conventional health and safety inspector carried out an inspection to review the adequacy of the outage arrangements (Ref.29). This focussed mainly on the arrangements for managing work at height activities during the statutory outage with particular focus on scaffolding, as this is the main method of providing temporary work at height access for outage activities.
52. An inspection to evaluate arrangements for controlling risks from working at height took place. This included an inspection in the Turbine Hall to sample outage activities underway at the time of the visit and an inspection of the management arrangements that were in place. A number of locations were seen featuring both scaffolding and rope access. The inspection identified:
- Areas of good practice seen during the inspection included integrated safety team meetings, appropriate use of scaffolding to facilitate work at height activity in the turbine hall and the practical implementation of NGL arrangements covering temporary grating removals.
  - An area for improvement was judged to be the supervision of scaffolding modification work activities.
53. The overall impression gained from the inspection of work at height was generally a positive one and the ONR conventional health and safety inspector had no issues that would affect the re start of Reactor 3 (Ref.30).

### **3.8 SITE INSPECTOR OVERSIGHT**

54. The nominated site inspector undertook regulatory oversight of Hinkley Point B's overall outage programme, and worked closely with ONR's specialist inspectors and

NGL to maintain effective communications during the course of the outage. He undertook station-based regulatory activities in the following areas:

### 3.8.1 INA RAPID TRENDING REVIEW

55. An examination of INA's rapid trending review (RTR). RTR was undertaken by INA to establish and redress developing safety trends associated with the Reactor 3 statutory outage (Ref.31). No Areas for Improvement were identified although two opportunities for improvement were determined relating to traffic/road control and laydown/housekeeping standards. Overall, the nominated inspector judged the RTR to have been effective at highlighting early and emerging trends in safety performance and did not identify any issues that would affect the return to service of Reactor 3.

### 3.8.2 PRESSURE VESSEL SAFETY RELIEF VALVES (SRV)

56. During the outage the five SRVs on Reactor 3 were removed from their manifold and tested. The weather caps on two valves had become displaced and rain water had entered the system. Both of the affected valves were found to have corrosion/deposit present in the area of the valve and one of these two valves failed to lift at 34 psi above the required lift pressure when tested. Another valve (which was not affected by corrosion/deposit and had intact weather caps) was tested and lifted slightly outside the normal drift allowance. At the time of the discovery the reactor was depressurised, therefore, the function of the SRVs was not significant but two issues relating to this matter were raised:

- Identification of work to be undertaken prior to the restart of Reactor 3.
- The consequences for the continued operation of Reactor 4 (which was also known to have two displaced weather caps).

57. The matter was reported to ONR initially in Ref.32. These matters were added to the R3 2016 Statutory Outage ONR Action Tracker (Ref.10) and are considered in Section 4 of this report.

### 3.8.3 GAS CIRCULATOR EXCHANGES

58. The outage plans were to exchange two Gas Circulators (GC) and four pairs of Inlet Guide Vanes (IGV). The successful completion of this scope of work was confirmed by NGL (Ref 33). During the outage a number of emergent work items associated with GC and IGV arose:

- GC13A IGV. It was noted that the GC13A IGVs were not responding from the station's central control room. The issue was investigated briefly by a plant engineer who tried to operate them locally with no apparent result. Further investigation identified that the apparent loss of drive was due to a position transmitter fault leading to a total loss of IGV position indication. An EDM (Engineering Decision Meeting) was held to discuss options and this decided to remove the 13A End Cover Plate during the second boiler pair and replace the position sensor. This work is now complete and all GC 13A IGV indications have been fully restored.
- GC16B IGV indication and motor winding temperatures. During testing it was noted that the GC winding temperatures were higher than expected, but had not exceeded the limiting temperatures. The temperatures dropped rapidly after the reactor was purged and pressurised and was no longer an issue. IGV position indications from one position sensor were lost during the outage. NGL followed its processes via an Operational Decision Making meeting and decided that the remaining positional indicator was capable of providing the

function. This results in a loss of redundancy for the IGV indications, but this has been done in the past without any problem.

59. The nominated site inspector discussed these issues with ONR Mechanical, Electrical and Control/Instrumentation Engineers who considered that this may be a matter that might affect the return to service of Reactor 3. These matters were added to the R3 2016 Statutory Outage ONR Action Tracker (Ref.10) and are considered in Section 4 of this report.

#### **3.8.4 CONTROL ROD DROP TIMES**

60. During the outage a number of inspections of control rod performance were carried out, including:
- A drop test of all control rods when the reactor was tripped. Subsequent analysis showed that the final approach velocity and total insertion time for all control rods was within specification (Ref 8).
  - A control rod channel (3MN04) was inspected using a TV camera. This channel had previously contained the control rod that failed to fully insert during a previous Reactor 3 trip in August 2015 due to the presence a misplaced closure locking ball in the braking mechanism. Inspection of the upper region of the standpipe (steel components) confirmed witness marks as expected. The markings are minor in nature and judged to be of no concern.
  - Inspection of graphite in channel 3MN04 has found no unusual indications.
  - The temporarily removed control rod and actuator, which was a Super Articulated Control Rod, was subjected to the normal outgoing test regime with no issues arising. The same rod and actuator will be recharged to the channel before return to power.
61. The nominated site inspector discussed these matters with an ONR mechanical engineer who expressed no concerns about the observations (Ref.34) and no issues that would affect the return to service of Reactor 3 were identified.

#### **3.8.5 DEMONSTRATION OF NEW NITROGEN PLANT INJECTION CAPABILITY**

62. During the outage the new Nitrogen supply system was functionally tested by carrying out a post shutdown injection test. This was the first end to end demonstration of the system and it was successfully completed just after the reactor was shut down (Ref.35). The nominated site inspector considered this to be a successful demonstration of a new safety system and did not identify any issues that would affect the return to service of Reactor 3.

#### **3.8.6 IRRADIATED FUEL DISMANTLING CELL FLOODING EVENT**

63. During maintenance of the Irradiated Fuel Dismantling (IFD) Cell emergency flood system a quantity of Boronated water entered the IFD Dismantling tube, wetting the integral winding gear. A pre-requisite of this test was that the IFD was not in use and was empty of irradiated components. As a result there were no Nuclear Safety issues associated with the release of the water into the dismantling tube and the cell.
64. However, the Boronated water in the dismantling tube had to be removed from the cell and recovery operations were carried out to protect the in-cell equipment for future use by flushing with clean demineralised water. An Event Recovery Team was established specifically to address the potential damage to the IFD cell equipment and to implement prompt actions to recover the facility.

65. The details of how the event occurred are being investigated by NGL. A defective valve has been identified as a contributor to the event but the investigation will also consider work management and preparation phases, identification of the potential risk of the task, overall control of the testing and the reliability of the equipment and the need for of operator actions (Ref.36).
66. The nominated site inspector was satisfied with the recovery work that had been carried out to return the IFD to operation and will follow up on the outcome of the investigation when it is complete. The matter was added to the R3 2016 Statutory Outage ONR Action Tracker (Ref.10) and is considered in Section 4 of this report.
67. He did not identify any issues that would affect the return to service of Reactor 3.

### **3.8.7 CLEAN PURGE AIR EVENT ON PILE CAP**

68. During outage operations to connect a purge air pipe work to Reactor 3, a steel cover plate was being removed by hand from temporary flexible pipe work (Ref.37). During these operations the cover plate was ejected from the flexible pipe work resulting in injuries to two Technicians. Both individuals were then sent home and returned to work on the next shift on light duties.
69. The cover plate ejection was caused by a release of stored energy within the pipe work as a result of a build-up of clean air due to passing valves and the seal provided by the cover plate. No plant damage occurred and no contamination was released as a result of this event. Operations to connect purge air pipe work to Reactor 3 were completed successfully the following day. NGL has begun an investigation into the cause of the event and to identify any areas for improvement.
70. The nominated site inspector has discussed the event with site and will follow up when the investigation has been completed. The matter was added to the R3 2016 Statutory Outage ONR Action Tracker (Ref.10) and is considered in Section 4 of this report.
71. He was satisfied with the work that was carried out to recover from the event and did not identify any issues that would affect the return to service of Reactor 3.

### **3.8.8 SPALLED CONCRETE REACTOR 3 GAS CIRCULATOR HALL**

72. Shortly after the start of the outage a large amount of concrete debris was found in the Reactor 3 Circulator Hall. Visual inspection confirmed that it had fallen from underside of the roof where a boiler safety relief pipe work penetrated through the roof. The debris had the potential to cause serious injury to personnel and damage to plant.
73. Following the event access to the Reactor 3 Circulator hall was prohibited and an inspection was carried out to determine the extent of concrete spalling and identify other areas in the R3 Circulator Hall that may be at risk. Temporary netting was installed beneath each affected area and access restrictions were lifted.
74. The event could have caused significant injury to operators and damage to safety related plant and it was discussed with an ONR Civil Engineer. The ONR nominated inspector and Civil Engineer were satisfied with the immediate work that was carried out to secure the area, but it was agreed that enhancements were required in the longer term (Ref.38). It was noted that NGL had begun an investigation and this will be reviewed when complete. The matter was added to the R3 2016 Statutory Outage ONR Action Tracker (Ref.10) and is considered in Section 4 of this report. The ONR nominated inspector and Civil Engineer will follow up on this matter in conjunction with another planned intervention on civil structures on the site in May 2016.

75. The ONR Civil Engineer and nominated inspector agreed that this was not an issue that should affect the restart of Reactor 3.

### 3.9 START-UP MEETING

76. The Reactor 3 start-up meeting was held on 17<sup>th</sup> & 18<sup>th</sup> February 2016 and followed NGL's arrangements for such meetings. The station provided a comprehensive site visit, start-up report (Ref.8), which formed the basis of the meeting agenda, and supplementary presentation material (Ref.9). Start-up meetings are classified as Level 3 interactions and NGL took minutes of the meeting, which will be provided to ONR in due course and filed in the Reactor 3 periodic shutdown TRIM folder.
77. ONR was represented by the CNRP Operating Reactors Delivery Lead and the nominated site inspector. The main points of the meeting were recorded in an intervention report (Ref.7). There were no outstanding actions or issues arising from the start-up meeting that would prevent Reactor 3 returning to service for a further period of three years.

## 4 MATTERS ARISING FROM ONR'S WORK

78. The nominated site inspector considered the licensee's request to ONR to issue Consent under LC 30 (3) to start-up Hinkley Point B Reactor 3 on completion of its periodic shutdown. He followed ONR procedures for delivering a permissioning project, as detailed in HOW2. He has taken note of the statements associated with safety contained in the request letter, the findings of the outage associated work undertaken by NGL's internal regulator (INA) and the findings and opinions of ONR specialist inspectors.
79. Each ONR specialist inspector has produced a report that presented the inspection findings, inspector's opinions, judgements and recommendations. A number of recommendations and actions arose from the inspectors' work, resolution of which was required before ONR issues a Consent to restart Reactor 3:

### 4.1 GRAPHITE MATTERS ARISING

80. The ONR graphite inspector made three substantive recommendations:
- **Recommendation 1:** that this Project Assessment Report (PAR) reflected the need for NGL to incorporate the 2012 HPB trepanned data into their model predictions of graphite core weight loss within 1 year of restart of HPB Reactor 3 from its 2016 periodic shutdown. This matter will be addressed as a routine interaction between NGL and ONR.
  - **Recommendation 2:** that this PAR reflected the need for NGL to introduce measures to ensure that all trepanned data is incorporated into their weight loss models within a period of three years from collection in order to reduce uncertainty in the prediction of weight loss. This matter will be addressed as a routine interaction between NGL and ONR.
  - **Recommendation 3:** that the HPB nominated site inspector confirms that NGL has completed the relevant return to service EC that details the results of the graphite inspections and that it has been subject to INSA before finalising the PAR. The INSA certificate has now been issued and is provided as Ref.39.
81. It is considered that a way forward on Recommendations 1 – 3 has been identified. The ONR graphite inspector did not find any other reason to prevent him recommending that Consent be given to return Hinkley Point B Reactor 3 back to service.

## 4.2 ELECTRICAL MATTERS ARISING

82. The main anomalous behaviour exhibited was slow operation of circuit breaker operating mechanisms caused by stiffness attributed to lubricant build-up and hardening and a number of initiatives to enhance future breaker performance were identified including:

- Prior to the return to service of Reactor 3, an update on progress with investigations into anomalous behaviour of 11kV and 3.3kV circuit breakers during the Reactor 3 trip. This information was supplied as Ref.40 and the ONR electrical engineers were satisfied with the information provided.
- In the longer term, copies of relevant investigation reports together with remedial measures implemented, and remedial measures proposed for future implementation, to address the anomalous behaviour of the 11kV and 3.3kV circuit breakers. This matter is being reviewed by NGL and the ONR electrical inspectors plan to visit site in the next few months to inspect the enhancements that have been proposed to switch rooms and switch gear. It has been recorded on the R3 2016 Statutory Outage ONR Action Tracker” (Ref.10) and will remain open until completion.

## 4.3 STRUCTURAL INTEGRITY MATTERS ARISING

83. The ONR structural integrity team made a number of recommendations during the assessment:

- To demonstrate satisfactory completion of the steam system inspection programme and completion of the work of the OAP, the Independent Nuclear Safety Assessment (INSA) certificate for the Return to Service Engineering Change report should be submitted as part of the EDF Energy Nuclear Generation Limited (NGL) application for consent to return to service. This has now been supplied as Ref.41.
- To demonstrate satisfactory completion of the PSSR inspections, a return to service statement from the Competent Person (CP) should be submitted as part of NGL’s application for consent to return to service. This statement is contained in Ref.1 which has recently been received.
- To demonstrate satisfactory completion of the inspections not covered by the Appointed Examiner (APEX) and PSSR CP, namely the gas side penetrations of the reactor pressure boundary, the Return to Service Engineering Change report must include a statement from NGL design authority supporting the fitness for return to service. This statement is contained in Ref.1 which has recently been received.
- The Project Inspector should ensure that licensee provides ONR with an approved copy of the Return to Service Engineering Change report and the 28 day report, when available. This is routine business for NGL and the 28 day report will be produced in due course. This matter has been recorded on the R3 2016 Statutory Outage ONR Action Tracker” (Ref.10) and will remain open until completion.

## 4.4 CONTROL & INSTRUMENTATION MATTERS ARISING

84. Four actions arose from a plant walk-down in the Reactor 3 GC Hall where an individual was using a portable computer which was connected using an Ethernet cable to an instrumentation cabinet containing gas circulator vibration monitoring equipment.

- NGL to address safety implications for Reactor 3 re start from this specific portable computer in the GC hall.

- NGL to provide details of PC sweep to determine if any other similar portable computers had been used during the Reactor 3 outage, and if so to address safety implications for Reactor 3 re start.

and, unrelated to the Reactor 3 start up:

- NGL to provide details of portable computer sweep to determine if any were present and address safety implications for continued operation of Reactor 4.
- NGL to investigate how this matter arose and identify areas for improvement.

85. NGL has now provided a response to this matter which summarised the position:

- The PC that was in use in the Reactor 3 GC hall did in fact have up to date virus protection.
- NGL carried out a full sweep of the site to identify other PCs that had been brought onto site. One issue was identified on one PC (out of forty six on site). This was a clerical matter regarding briefing of the operation site practices regarding IT. The sweep related to both Reactor 3 and Reactor 4.

86. The ONR C&I inspector has reviewed the recent information and was satisfied that the first three actions had been addressed (Ref.42). So the only matter to be resolved concerned the NGL investigation into how this matter arose and what enhancements can be made. This was not judged to be a matter affecting the re start of Reactor 3 and the nominated site inspector will follow up on this when the NGL investigation is complete.

#### **4.5 SITE INSPECTION OVERSIGHT MATTERS ARISING**

87. Two issues arose with Pressure Vessel Safety Relief Valves (SRV):

- Identification of work to be undertaken prior to the restart of Reactor 3.
- The consequences for the continued operation of Reactor 4 (which was also known to have two displaced weather caps).

88. The first of these issues was clearly a matter for consideration prior to return to service of Reactor 3 and NGL has responded to ONR questions on the issue. The response has been considered by an ONR mechanical engineer (Ref.43). He considered that the actions taken by the station return the PVSRV to its intended design were sufficient to enable the system to deliver its nuclear safety function, and he supported the decision to return Reactor 3 to service. The second matter was addressed by NGL via an EC justifying the continued operation of Reactor 4. This has been reviewed by an ONR mechanical engineer who was content with the information provided, but would like to visit site to see the affected equipment and talk through the issue directly with NGL staff (Ref.44). This visit is being arranged for April 2016.

89. As part of the oversight process the nominated site inspector identified a number of matters during the outage which were being investigated by NGL, specifically:

- Irradiated fuel dismantling cell flooding event.
- Clean Purge Air event on pile cap.
- Spalled concrete Reactor 3 Gas Circulator Hall.

90. He was satisfied that these issues should not affect the return to service of Reactor 3, but he will follow up on each matter when the NGL investigation is complete. It was noted that the ONR civil engineer will be on site for a system based inspection in May 2016, and the issue of spalling concrete will be covered in more detail during that intervention.



91. A final emergent item arose towards the end of the outage and concerned GC 16B IGV position indication. Site reviewed the situation and the decision was taken via ODM to patch all the indications to the remaining positional functioning unit. ONR discussed the matter with NGL and was satisfied with the work suggested by NGL. The nominated site inspector discussed this matter with the ONR C&I inspector and agreed that this was not a re start issue for reactor 3 (Ref.45). It was noted that NGL is carrying out an internal investigation and ONR will follow up on his in due course. The matter has been recorded on the R3 2016 Statutory Outage ONR Action Tracker (Ref.10) and will remain open until completion.

#### **4.6 OTHER MATTERS ARISING**

92. The nominated site inspector has consulted with the Environment Agency (EA) to establish if they had any specific objections that would prevent ONR from issuing LI 551, Consent to start-up Hinkley Point B Reactor 3. EA has confirmed they do not object to ONR issuing Consent (Ref.46).
93. The nominated site inspector has consulted with ONR Civil Nuclear Security (CNS) to establish if they had any specific objections that would prevent ONR from issuing LI 551, Consent to start-up Hinkley Point B Reactor 3. CNS has confirmed they do not object to ONR issuing Consent (Ref.47).
94. Other recommendations made by specialist inspectors were sufficiently captured and none were deemed sufficiently significant for ONR to withhold Consent to start-up Reactor 3. Work that will continue beyond the outage and after the re start of Reactor 3 includes:
- Graphite: incorporation of historical data from trepanning programmes into the current data base.
  - Electrical: longer term enhancements to switchgear and switch rooms.
  - Structural integrity: provision of 28 day report.
  - C&I: review of station procedures regarding use of PCs on site.
  - Mechanical engineering: ONR to visit site regarding PVS RV matters early in 2016/17.
  - Site inspector oversight: the nominated inspector to follow up on NGL investigations into IFD flooding event, Clean Purge Air event and concrete spalling from GC hall roof.
95. These matters will be addressed routinely and will remain open on the "R3 2016 Statutory Outage ONR Action Tracker" (Ref.10) until completion.
96. Each specialist inspector has produced a statement supporting issuing Consent to start-up Reactor 3, or has agreed that there is no reason to withhold Consent.

#### **5 CONCLUSIONS**

97. The Hinkley Point B Reactor 3 periodic shutdown has been undertaken in accordance with the requirements of the work scope outlined within the outage intentions document and start-up report.
98. NGL has followed its arrangements in undertaking the outage, culminating in the Hinkley Point B Station Director writing to ONR requesting Consent to start-up Reactor 3. In his letter, the Station Director confirms that following completion of outstanding work, as controlled by the Operational Safety Review Committee (OSRC), Reactor 3 will be safe to return to service and operate for a further period. He commits to personally review the OSRC recommendation prior to sanctioning the commencement

of start-up and will perform a walk-down prior to start-up to satisfy himself that Reactor 3 is safe to return to service.

99. INA will submit its Concurrence Part B report to Hinkley Point B's OSRC as part of the Station's consideration as to whether Reactor 3 is fit for return to service, in accordance with NGL's company arrangements. INA considers that there are no issues remaining with respect to the requirements of Concurrence Part B (Ref.1).
100. ONR inspectors have sampled the LC28 MITs and LC22 modification activities throughout the shutdown and judged them to be adequate, and all support issuing Consent to start-up Reactor 3.
101. The nominated site inspector has consulted with EA and CNS and both bodies have confirmed that they do not object to ONR issuing Consent.
102. Consent LI 551 has been prepared for review in conjunction with this PAR. The licence instrument is one of the standard formats given within ONR procedures and does not require review by the Government Legal Department.
103. The nominated site inspector judged that, based on the evidence presented within this report, the outage activities on Reactor 3 have been satisfactorily completed and there is nothing to prevent ONR granting Consent to start-up Hinkley Point B Reactor 3.

## **6 RECOMMENDATIONS**

104. This Project Assessment Report recommends that the Superintending Inspector should:
  - Sign this Project Assessment Report to confirm acceptance for the ONR technical and regulatory arguments that will help to justify issuing Licence Instrument 551.
  - Sign this Project Assessment Report approving its release for publication, after redaction where appropriate.
105. The nominated site inspector also recommended that the Deputy Chief Inspector signed Licence Instrument 551, to grant Consent under Licence Condition 30 (3) to start-up Hinkley Point B Reactor 3.

## 7 REFERENCES

1. Request for start-up of reactor 3 made under licence condition 30(3) – 8<sup>th</sup> March 2016 - HPB51356R TRIM 2016/108725.
2. Hinkley Point B - Licence instrument No. 542 – Consent to restart reactor 3 following statutory outage - December 2012 - TRIM 2012/478602.
3. Hinkley Point B - Licence instrument No. 549 – Agreement to an extension of operating period of HPB Reactor 3 from 6 December 2015 to 26 February 2016. TRIM 2015/428113.
4. NGL – Hinkley Point B – Outage Intentions Document – Unit R3/TA7, 2016 Statutory Outage, Unique No. HINB/R/MOZ/308. TRIM 2015/480357.
5. Intervention Record ONR-HPB-IR-15-061; planned compliance inspection of Hinkley Point B site – August 2015. TRIM 2015/312823.
6. Outage Intentions Meeting Minutes TRIM 2015/480359.
7. Intervention Record ONR-HPB-IR-14-159; planned intervention including start-up meeting 17-18 February 2016. TRIM 2016/91359.
8. Start-up meeting report. TRIM 2016/95273.
9. Start-up meeting presentation. TRIM 2016/95287.
10. HPB R3 Statutory Outage 2016, ONR action tracker spread sheet. TRIM 2016/103528.
11. INA Concurrence Part A. R3 Statutory Outage 031 2016 Return to Service. TRIM 2016/109558.
12. Outage task sheet for Hinkley Point B Reactor 3 outage 2016. TRIM 2014/441694.
13. Email regarding Mechanical Engineering support during HPB Reactor 3 outage. TRIM 2016/107024.
14. HOW2 Guidance NS-PER-GD-014 Revision 4 Purpose and scope of permissioning. TRIM 2014/261952.
15. Intervention Record ONR-CNRP-HPB-IR-15-155 Hinkley Point B Reactor 3 inspections of the graphite integrity aspects during the 2016 periodic shutdown. TRIM 2016/66651.
16. Assessment Report; Assessment of EC357426 Hinkley Point B Reactor 3 2016 graphite core inspection results and justification for return to service. ONR-CNRP-AR-15-076. TRIM 2016/105082.
17. Intervention Record ONR-HPB-IR-15-162 QMS oversight arrangements for HPB statutory outage 2016. TRIM 2016/74059.
18. Email regarding QMS support during HPB R3 outage. TRIM 2016/100057.
19. Assessment Report; Assessment of the Appointed Examiners start up statement for the Pre-stressed concrete pressure vessel. ONR-CNRP-AR-15-074. TRIM 2016/84725.
20. Email regarding civil engineering support during HPB R3 outage. TRIM 2016/95269.
21. Intervention Record ONR-HPB-IR-15-161 Hinkley Point 'B' Power Station Reactor 3 periodic shutdown – inspection of electrical related aspects electrical engineering assessment. TRIM 2016/77877.
22. Email regarding electrical support during HPB Reactor 3 outage. TRIM 2016/98129.
23. Intervention Record ONR-CNRP-IR-15-160 Hinkley Point B Power Station – Reactor 3 statutory outage 2016 – LC28 compliance inspection in support of structural integrity. TRIM 2016/79547.
24. Assessment Report; EDF NGL Hinkley Point B Nuclear Power Station: Assessment of structural integrity in support of the restart of Reactor 3 following the 2016 periodic shutdown. ONR-CNRP-AR-15-075. TRIM 2016/82955.
25. Assessment Report; Structural integrity assessment of EC356036: R3 2016 outage (031): 3 year vessel entry deferral to 2019 (035) ONR-CNRP-AR-15-070. TRIM 2015/475110.
26. Email regarding structural integrity support during HPB R3 outage. TRIM 2016/109491.

27. Intervention Record ONR-CNRP-IR-15-166 EDF Nuclear Generation Limited (EDF NGL) Hinkley Point B power Station (HPB) Reactor 3 (R3) 2016 Statutory Outage: Control and Instrumentation (C&I) Inspection. TRIM 2016/93322.
28. Email regarding control and instrumentation support during HPB R3 outage. TRIM 2016/107610.
29. Intervention Record ONR-COP-IR-15-75 EDF Hinkley B site (HPB). Investigation of a RIDDOR reportable accident within the CRAWD building and Inspection of health and safety (CHS) arrangements for managing work at height activity. TRIM 2016/76192.
30. Email regarding conventional health and safety support during HPB R3 outage. TRIM 2016/95255.
31. INA Rapid Trending Review presentation. TRIM 2016/113663.
32. ONR incident notification form, incident 2016/71 (HPB Safety Relief Valves).
33. Email: SU consent information wrt GC & IGV. TRIM 2016/103401.
34. Email: SU consent information for 3MN04. TRIM 2016/98179.
35. Email: Information relating to N2 injection test. TRIM 2016/103485.
36. Email: FW: IFD Boronated Water. TRIM 2016/112220.
37. Email: FW: Information regarding Purge Hose incident. TRIM 2016/98192.
38. Email: FW: Info for SU consent (spalled concrete). TRIM 2016/95170
39. INSA Certificate for Graphite Assessment Panel and return to service EC357426. TRIM 2016/109142.
40. Email: SU consent matters switchgear. TRIM 2016/98129.
41. INSA Certificate for Outage Assessment Panel and return to service EC354324. TRIM 2016/103504.
42. Email: FW: TRIM: Re: HPB Laptop follow-up. TRIM 2016/107610.
43. Email: FW: HPB SRVs (R3 RTS statement). TRIM 2016/94807.
44. Email: FW: HPB - Reactor 4 - Gas Safety Relief Valves. TRIM 2016/111399.
45. Email: FW: Summary of discussion on IGV on GC16B. TRIM 2016/112382.
46. Email: FW: Request to return HPB R3 to service following statutory outage (EA response). TRIM 2016/94837.
47. Email: FW: Request to return HPB R3 to service following statutory outage (CNS response). TRIM 2016/100112.