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Scottish Environment Protection Agency	██████████ – SEPA	29 September 14
Licensee	██████████ – Station Director, Hunterston B	29 September 14

Hunterston B Reactor 4 2014 Periodic Shutdown

EDF Energy Nuclear Generation Limited (NGL) – Hunterston B Power Station – Nuclear Site Licence No. Sc.13 – Request for consent for start up of Reactor 4 made under Licence Condition 30(3)

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EXECUTIVE SUMMARY

Title

EDF Energy Nuclear Generation Limited (NGL) – Hunterston B Power Station – Nuclear Site Licence No. Sc.13 – Request for consent for start up of Reactor 4 made under Licence Condition 30(3)

Permission Requested

EDF Energy Nuclear Generation Limited [NGL], the licensee of Hunterston B nuclear power station, has applied for Consent from the Office for Nuclear Regulation [ONR] to start-up Reactor 4, in compliance with Licence Condition (LC) 30(3) attached to Nuclear Site Licence Sc.13.

Background

Hunterston 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 shutdown. The licensee's arrangements require that periodic shutdowns [also referred to as statutory outages] are carried out every three years at each reactor at Hunterston B, providing the opportunity to undertake such activities. On completion of a periodic shutdown the reactor concerned cannot be started up without Consent from ONR under LC]30(3).

During the 2014 Reactor 4 periodic shutdown, which commenced on 1 August 2014, 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 Hunterston B Station Director wrote to ONR requesting Consent to start-up Reactor 4. In his letter, the Director confirmed that following completion of the outstanding work, as controlled by the Operational Safety Review Committee [OSRC], Reactor 4 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 4. INA has further indicated a Concurrence Part B will be issued once its assessment programme has been concluded. Release of Concurrence Part B is a requisite 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 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 inspectors 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 on an ongoing basis 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 undertaken assessments and produced reports for each specialism. I have considered these reports to assist in the compilation of this Project Assessment Report [PAR] and development of a regulatory judgement that Reactor 4 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 4 under LC 30(3).

Matters arising from ONR's work

There are no outstanding matters preventing issue of (LI) Instrument 543 arising from the work undertaken by ONR inspectors in relation to the Hunterston B Reactor 4 2014 periodic shutdown.

Conclusions

Following assessment and inspection of matters arising in relation to the 2014 periodic shutdown of Hunterston B Reactor 4, I am satisfied that the licensee's justification to start-up the reactor and operate for a further period of three years is adequate, and that consequently a Consent to start-up the reactor should be granted.

Recommendation

I recommend that in accordance with the request from the licensee, ONR should issue LI 543 under LC 30(3) Consent to start-up Hunterston B Reactor 4.

LIST OF ABBREVIATIONS

ALARP	As low as reasonably practicable
APEX	Appointed Examiner
BAP	Boiler Assessment Panel
BS	British Standards
CBIU	Channel Bore Inspection Unit
C&I	Control & Instrumentation
CNRP	Civil Nuclear Reactor Programme
CNS	Civil Nuclear Security
EBFP	Emergency Boiler Feed Pump
DHD	Diverse Hold-down
DSD	Diverse Shut-down
EC	Engineering Change
EMIT	Examination Maintenance Inspection and Testing
FME	Foreign Material Exclusion
GAP	Graphite Assessment Panel
GC	Gas Circulator
HNB	Hunterston B
HOW2	Office for Nuclear Regulation Business Management System
INA	Independent Nuclear Assurance
INSA	Independent Nuclear Safety Assessment
IR	Intervention report
IRR99	Ionising Radiation Regulations 1999
JCO	Justification for Continued Operation
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
NICIE2	New In-Core Inspection Equipment mark 2
OAP	Outage Assessment Panel
ODH	Off-load Depressurised Handling
OID	Outage Intentions Document
ONR	Office for Nuclear Regulation
OSRC	Operational Safety Review Committee
PAR	Project Assessment Report

LIST OF ABBREVIATIONS

PCPV	Pre-stressed Concrete Pressure Vessel
PRV	Pressure vessel Relief Valve
PSSR	Pressure Safety Systems Regulations 2000
RTR	Rapid Trending Review
RP	Radiological Protection
QA	Quality Assurance
SAP	Safety Assessment Principle(s) (HSE)
SACI	Significant Adverse Condition Investigation
SEPA	Scottish Environment Protection Agency
SUS	Start-Up Statement

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1 PERMISSI ON REQUESTED

1 EDF Energy Nuclear Generation Limited [NGL], the licensee of Hunterston B nuclear power station, has applied for Consent¹ from the Office for Nuclear Regulation [ONR] to start-up Reactor 4, in compliance with Condition 30(3) attached to Nuclear Site Licence Sc.13. This Project Assessment report [PAR] presents my consideration of this request and recommends issuing Licence Instrument 543, Consent to start-up Reactor 4.

2 BACKGROUND

2.1 General

- 2 Licence Condition [LC] 30 Periodic Shutdown of the nuclear site licence issued to NGL for Hunterston B power station requires the licensee to shutdown 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 Hunterston 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 undertook work associated with the requirements of Pressure Systems Safety Regulations [PSSR], previous commitments, and the installation of plant modifications etc.
- 3 The licensee requires Consent from ONR under LC30(3) to start-up Reactor 4 on completion of its periodic shutdown. The previous Consent to start-up Reactor 4, LI 531 is dated 26th August 2011². The Reactor 4 2014 periodic shutdown commenced on 1 August 2014.
- 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:
- The exchange and re-barring of four gas circulators. NGL has previously implemented a Justification for Continued Operation [JCO] which expires in 2019, but is also seeking to accelerate the gas circulator exchange programme
 - The replacement of motors associated with lubrication oil pumps for the four gas circulators exchanged
 - The repair of any boiler bifurcations or tail-pipes deemed necessary from the routine programme of visual and eddy-current inspections
 - The replacement of three phases of the generator transformer and replacement of the generator rotor
 - Extensive upgrades and refurbishment to the main, auxiliary and reactor cooling water systems
 - A major overhaul of the main boiler feed pump [MBFP], its turbine and turbine exhaust pipework.
 - Installation of new design filters and bursting discs to the five main reactor pressure vessel gas relief valves
- 5 Before the periodic shutdown, the licensee had requested agreement from ONR, through a category 1 engineering change under LC22(1), to increase the load to a stuck fuel stringer [containing a partially irradiated fuel assembly] in Channel [REDACTED] to enable its extraction. ONR issued LI 542 on 29 July 2014³, agreeing to this request. ONR's agreement was issued on the basis that the licensee would only employ this contingency in the event that initial attempts to recover the stuck fuel stringer under design loads were not successful. The licensee had also prepared further Category 2 engineering changes associated with manned vessel entry to enable inspection and debris recovery where necessary.

6 On 15 August 2014, the licensee successfully retrieved the stuck fuel stringer from Channel [REDACTED] on the first attempt⁴ without having to invoke the contingency safety case.

2.2 Outage Planning and Management

2.2.1 Licensee's management

7 NGL produced an outage intentions document⁵ [OID] for Reactor 4 periodic shutdown 2014. The document outlined the outage organisation, infrastructure and management arrangements to deliver the safety related activities being undertaken during the outage. The activities are 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 4.

8 The licensee's outage process includes a series of meetings with ONR, viz. the outage intentions meeting, mid-outage meeting and the start-up meeting.

9 NGL provided ONR with a copy of the OID prior to holding the outage intentions meeting held on 11th February 2014, during which the organisational arrangements and programme of work for the shutdown were discussed. The former nominated site inspector and lead structural integrity assessor attended the meeting⁶ and provided feedback to NGL on the document.

10 NGL held the mid-outage⁷ and start-up meetings⁸ on 2 September and 16 September 2014 respectively. ONR inspectors attended both meetings. The purpose of the first meeting was to allow ONR to review the licensee's progress in delivering the requirements of the outage. 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 4 for the next operational period.

11 On 19 September the Hunterston B Station Director wrote to ONR requesting its Consent to start-up Reactor 4. In this letter, the Director confirms that following completion of the outstanding work, as controlled by the Operational Safety Review Committee [OSRC], Reactor 4 will be safe to return to service.

12 The request letter was supported by a series of appendices detailing the outcome of inspections and PSSR requirements to date, and a memorandum for stating the internal regulator, Independent Nuclear Assurance's [INA] position on Reactor 4 2014 return to service.

13 The licensee's internal regulatory process requires that INA provide its independent support to the application for reactor start-up. 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. Details of INA activities undertaken during the Reactor 4 shutdown are presented in the start-up report⁹. On completion of these activities, INA issues a report, 'Concurrence Part B', which presents the findings of their work and includes a statement supporting the start-up.

14 INA will submit its Concurrence Part B report to Hunterston B's OSRC as part of the licensee's consideration as to whether Reactor 4 is fit for return to service, in accordance with NGL's company arrangements¹⁴. ONR accept that the report will only be issued if INA considers that there are no issues remaining with respect to the requirements of Concurrence Part A. Therefore, I am content with NGL's proposal to defer issue of the Concurrence Part B after ONR grants Consent under LC 30(3) and that this constitutes an additional internal hold-point to returning Reactor 4 to service.

2.2.2 ONR's intervention management process

- 15 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 provides the background to the proposed intervention, the anticipated outcomes, duration, prioritisation, lists specialisms assigned to the project and the intervention strategy.
- 16 As nominated site inspector for Hunterston B, I produced task sheet TS-233¹⁵ for Reactor 4 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 is 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 4 on completion of the shutdown.
- 17 The following specialisms were assigned to the project:
- Mechanical systems
 - Management systems
 - Electrical systems
 - Control and Instrumentation systems, including reactor protection systems
 - Civil engineering systems
 - Structural integrity
 - Graphite core
 - Site inspection
- 18 ONR's process for delivering a permissioning project requires preparation of a PAR for 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 a Consent for the restart of the reactor.
- 19 As nominated site inspector I have maintained a spreadsheet¹³ 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

- 20 I have considered NGL's request for ONR's Consent to start-up Hunterston B Reactor 4 on completion of its periodic shutdown in my capacity as nominated site inspector. I have followed ONR procedures for delivering a permissioning project, as detailed in HOW2¹⁶. To support my work I have utilised the services of the ONR specialist inspectors assigned to this project by the ONR Civil Nuclear Reactor Programme management team. I have taken note of the outage-associated work undertaken by NGL's internal regulator, INA.
- 21 I have consulted with the Scottish Environment Protection Agency [SEPA] to establish whether they object to ONR giving Consent to start-up Reactor 4. Their response is provided in Section 4 of this report.
- 22 I summarise below the inspection and assessment work undertaken by specialist inspectors and myself as the nominated site inspector during the course of the periodic shutdown.

3.1 Management Systems

- 23 An ONR quality management [QM] systems inspector carried out an inspection and assessment at Hunterston B to review the adequacy of the outage QM arrangements. The inspection was undertaken against LC17, Management Systems, and sampled the following activities:
- Quality assurance (QA) management systems oversight arrangements for the outage
 - QA arrangements for supply chain and contract management
 - Management of outage work closure
 - Field supervision
 - QA arrangements for portfolio project management
- 24 The inspector produced an intervention record ¹⁷ and assessment report ²¹ for his inspection. The salient points of his work are presented below:
- He judged that the licensee's risk-based targeting of quality surveillances and their implementation was adequate. He observed good cooperation between the Quality department, the outage control centre team and the Strategic Outage Manager.
 - He observed a well-managed weekly outage Quality Forum meeting and noted good attendance by contractors and station staff, with constructive interventions from the Strategic Outage Manager. This formed his view that this demonstrated the link between quality and the delivery of outage work.
 - He discussed work management arrangements for the outage with the outage management team, including the process for work closure and return of plant and systems from maintenance to operations. He was satisfied that there was a robust process for the formal closure work packages and returning plant and systems back into service. For the work packages that he inspected he considered that the management was adequate; furthermore, he observed an holistic, integrated team approach being taken to maintenance and operations.
 - He discussed supply chain management arrangements for the outage and found these to be in accordance with relevant procedures and the pre outage milestone plan.
 - He examined the contract management arrangements for one of the main contract partners and found these to be adequate and in accordance with NGL procedural requirements. He visited the main contract partner's site office and discussed their arrangements for managing work and found these to be satisfactory. He also witnessed a joint contract partner and station quality engineer surveillance of a project installation and was satisfied that the approach was robust and thorough.
 - He judged that field supervision arrangements at the station to be fully developed in that the role was understood and was being implemented in accordance with EDF fleet expectations. The overall standards of control and supervision observed during his inspection were judged to be adequate.
- 25 The inspector recommended therefore that, based on the areas examined during this intervention, that the LC17 management systems arrangements for the outage of HNB Reactor Unit R4 should be considered good to permit a return to service of the unit.

3.2 Civil Engineering

- 26 NGL has appointed an examiner [APEX] to oversee the maintenance and inspection activities related to the reactor pre-stressed concrete pressure vessel [PCPV] and associated systems, as identified within the OID. On completion of this work, the APEX provides a start-up statement, which identifies the inspections undertaken, what was found, what remediation was required and the justification for returning the reactor to service.
- 27 Examination Maintenance Inspection and Testing [EMIT] activities include examination of concrete surfaces, tendon load checks, tendon anchorage examination, examination

for indications of corrosion on tendons, PCPV settlement and tilt, pressure vessel coolant leak detection, and reactor top cap deflection.

28 An ONR civil engineering inspector visited Hunterston B prior to the shutdown and met with the APEX, reactor systems civil engineer and the reactor systems pressure vessels cooling system engineer. The purpose of her visit was to discuss and review a sample of the statutory surveillances, inspections and tests undertaken by NGL on the PCPV of Reactor 4.

29 The inspection findings are presented in her Intervention Report¹⁸. She observed that settlement and tilt survey points, E and F, have been re-established and they allow the licensee to measure any tilt of the reactor. These points were last measured in 1985. The inspector was, overall, content with Hunterston B's arrangements for the PCPV statutory surveillances and inspections under LC28, and considered these arrangements to be adequate. She placed three actions [none of which constituted restart actions] on the APEX; which were incorporated within the start-up statement.

30 The ONR civil engineering inspector has produced an assessment report¹⁹ of the APEX start-up statement [SUS]. The scope of the assessment includes findings from inspections and tests of certain key safety related components of the reactor pressure vessel including: tendon loads, tendon anchorages, concrete surfaces, foundation tilt and settlements, vibrating wire strain gauges and consideration of tendon corrosion, vessel concrete liner temperatures, reactor coolant leakage, top cap deflections, tendon tensile strength and pressure vessel cooling water leakage.

31 She noted the surveillances, inspections and tests have been compared with the requirements set out in British Standard BS4975 [specification for pre-stressed concrete pressure vessels for nuclear engineering] and meet those requirements with additional surveillances and tests included.

32 The ONR civil engineering inspector concludes that she is satisfied with the claims, arguments and evidence laid down within the licensee's safety case, and she judges that the PCPV is in an adequate condition for return to service for the next three years of operation, subject to normal in-service surveillance.

33 From the results of the surveillances, inspections and tests, as reported in the documentation provided to her, the ONR civil engineering inspector is content to support the return to service of Hunterston B PCPV for a period of three years.

34 The ONR civil engineering inspector has made eight recommendations to the APEX for consideration before Reactor 3 at Hunterston B undergoes its statutory outage in September 2015. The ONR civil engineering inspector has captured these recommendations in a single Level 4 regulatory issue for Hunterston B.

3.3 Radiation Protection

35 An ONR Radiation Protection [RP] inspector undertook a planned readiness inspection to evaluate reactor vessel man-entry process in compliance with the Ionising Radiations Regulations 1999 [IRR99]²⁰.

36 His intervention covered the following aspects of IRR99 compliance:

- Contamination control during personnel egress from the vessel entry complex. In this regard, the RP inspector was satisfied with both the construction of the vessel entry facility that had been erected at the station with assistance from its principal contractor and with the arrangements the licensee had put in place for its commissioning. Overall, he was content with the licensee's contamination control arrangements put in place for the proposed vessel entry work.

The RP inspector judged that the Hunterston B reactor vessel entry facility was short on internal space for personnel and lacked separate areas for entry and egress that involved contaminated air-fed suit undressing. Facilities of this design would not meet the standards that had been achieved with a new bespoke

facility being used at Heysham 1. He accepted NGL's argument that it would not be reasonably practicable at this stage to build a new bespoke facility at Hunterston B. He was satisfied that the radiation protection measures the licensee has put in place for the control of the spread of radioactive contamination, whilst its vessel entry facility is in use, provided adequate arrangements to minimise personal intake radiological protection.

At the time of his inspection, Hunterston B had recorded 17 exit monitor alarms on its RADOS detectors. These alarms were mostly at the trigger threshold of 80 Bq gross beta/ gamma and involved contaminated clothing rather than skin. The Licensee had, in each instance, conducted an investigation to identify the contamination source which on most occasions had been traceable to temporary C2 areas at which barrier monitoring procedures had not been wholly effective. He accepted that given the RADOS exit monitors were far more sensitive than the hand-held portable monitors typically used at C2 barriers because they integrated over a much larger surface area, improvements in contamination detection would be an ongoing challenge throughout the outage.

- Worker fitness for work in the reactor vessel. He judged that the licensee had instituted an effective system of ongoing fitness adjudication of workers undertaking vessel entries, and this was representative of relevant good practice.
- Vessel entry complex critical examination as required by Regulation 31 of IRR99. In his opinion, the licensee demonstrated an adequate set-up and evaluation of ventilation performance; mobile communications evaluation, especially regarding personal telemetric dosimetry, and implementation of an air-sampling regime. All of these matters he judged had been satisfactorily addressed by the Licensee.

37 The ONR RP inspector concluded he was satisfied that the licensee had established a robust system of man-entry management at its reactor vessel entry complex and that its systems and practices met the requirements of the IRR99, particularly in relation to its ongoing need to restrict personal radiation exposures so far as is reasonably practicable. There were no issues or actions identified that should prevent restart of Reactor 4.

3.4 Mechanical Engineering

38 An ONR Mechanical specialist inspector undertook two inspections at Hunterston B during the outage on two occasions. The inspection undertaken on 3 September 2014 was not possible owing to key licensee staff being redirected to address an emergent issue in relation to the failure of two gas circulators. The scope of inspection was therefore limited to the following topics:

- Replacement of main boiler feed pump turbine exhaust
- Testing of the emergency and stand-by feed pumps

39 Following the gas circulator failure, a revised inspection scope included an examination of some of the factors associated with their failure.

40 The ONR mechanical specialist inspector has produced an assessment report to detail his inspection and assessment findings²².

41 Based on his sampling undertaken in the first inspection, he was satisfied that from a mechanical engineering perspective, that the modifications carried out on existing plant under LC 22 arrangements were adequate and inline with his expectations. He further judged that arrangements for testing of the Emergency Boiler Feed Pump [EBFP] in accordance with LC 28 were also adequate.

42 In his assessment, the ONR mechanical specialist inspector refers to an event that resulted in two gas circulator units being damaged to the point that they were no longer capable of carrying out their duty function. Initial investigations by the station identified the direct cause to be mal-operation of the gas circulator lubricating [lub] oil system

used to supply oil to the gas circulator bearings. The mal-operation led to the lubrication oil supply being isolated to two in-service gas circulators which resulted in them tripping on low oil pressure, causing significant damage to their bearings.

43

The licensee conducted an internal significant adverse condition investigation [SACI] in accordance with its arrangements. The ONR mechanical specialist inspector inspection was informed by initial discussions with the licensee on the immediate, contributory and root causes and with due regard to short-term corrective actions put in place. He therefore focussed his inspections to secure assurance that Reactor 4 is fit for return to service whilst investigations continue; more specifically:

- To judge the adequacy of the station's short-term engineering modifications to prevent a direct recurrence. He judged that a series of administrative improvements and the use of colour-coded padlocks would provide enhanced and short-term defence-in-depth against this specific incident occurring again. He was unable to judge the adequacy of the root cause because it related to organisational design and human factors aspects, outside of his specialist competence.
- To seek evidence that such a mal-operation is not possible whilst either Reactor 3 or Reactor 4 units are at-power. He concludes that he has seen no evidence that the operational conditions needed to initiate this fault sequence exist whilst the reactor is at power.
- To seek evidence that there is adequate justification for continued operation [JCO] associated with restarting with 4A1 and 4B1 gas circulators remaining in-service. He states in his assessment that the original commitment from Hunterston B was to complete the exchange of all gas circulators [the re-barring of rotors] by 2019 [EC332445]¹¹; however an operational commitment was made to have all the units exchanged out by no later than 2014. Due to the failure of the two gas circulator units, NGL proposes to return Reactor 4 to power with a single non-exchanged gas circulator [4B1] in service. He states he is satisfied with the rationale for NGL's updated JCO case in which 4B1 will be replaced during the next statutory outage in 2017. This is because the 2014 date constituted an operational rather than nuclear safety driven target.

In his report the mechanical inspector states that Hunterston B had planned to exchange the gas circulator at 4A1 during this statutory outage. The 4A1 gas circulator was installed in 2005; accordingly continued operation with 4A1 gas circulator in-service to 2017 would result in the MITs frequency being exceeded by one year. The licensee therefore proposes to develop an engineering change at the next Reactor 4 interim outage in March 2016, to justify a MITs extension under its LC28 arrangements. This would enable the licensee to justify continuing to operate with 4A1 in operation until 2017 statutory outage.

In his report, the mechanical inspector notes that previous experience of undertaking a MITs extension on Hunterston B gas circulators when 4B1 unit became lodged in the shutter tube from damage to the sealing compound. The operating experience from the extension by a similar period showed no adverse impact on operability of the unit.

Based on the margins associated with the duty requirements of gas circulator units in the extant safety case, and the previous experience of extending MITs for a period of approximately 1 year on a single GC, he states that he is satisfied that the extension of the MITs period for the unit 4A1 GC is unlikely to adversely impact on nuclear safety. He recommends that the site inspector continues to monitor the extension and seeks assurance that due process is completed via the NGL engineering change process.

44

The ONR mechanical inspector concludes that overall, he is satisfied that arrangements for operations and maintenance carried out at Hunterston B are adequate and are consistent with ONR guidance. Whilst there is longer term work which can be done to

further improve defence-in-depth, he is satisfied the risks have been reduced so far as is reasonably practicable and he is content to support the issue of a Consent for the restart of Reactor 4.

3.5 Electrical Systems

45 An ONR electrical Systems specialist inspector undertook a planned outage inspection at Hunterston B and carried out an assessment of the supporting documentation²³. In his assessment, the specialist inspector has considered the electrical aspects outlined in the OID and supporting documentation. The assessment included an examination of a sample of outage related electrical maintenance activities and relevant documentation, that have been applied to electrical switchboard maintenance and other electrical systems that are important to the safety of Reactor 4.

46 The specialist inspector made the following judgements and conclusions during the course of his inspection and assessment:

- The licensee is maintaining the station's electrical plant and equipment in accordance with its arrangements, on the basis of the areas sampled by the inspection
- The maintenance documentation sampled was considered to have been satisfactorily completed and that any matters requiring resolution had been identified and appropriately addressed. The inspection of the documentation sampled did not identify any electrical engineering issues that would prevent the restart of the Reactor 4 outage.
- Some emergent activities remained outstanding at the time of inspection; however, the specialist inspector received confirmation that the remaining work will be completed in full, or the proposed way forward will be recorded under the station's outage arrangements.
- There was an emergent issue associated with gas circulator 4B1 stator winding. At the end of the next period of proposed operation of Reactor 4, the stator winding of gas circulator 4B1 will have exceeded its conservative projected lifetime of 30 years. He refers to the licensee's investigation and he acknowledged that its safety case anomaly process had been applied. To address this anomaly the licensee had implemented remedial measures and produced a separate safety justification for return to service of Reactor 4.
- The specialist inspector states he is content with implementation of the proposed measures subject to the submission completing station's process for plant safety case anomalies.
- During the outage several interventions with Hunterston B electrical engineering staff confirmed that the activities undertaken had been conducted in accordance with the licensee's work control system, adequately recorded in station documents and confirmed as complete by suitably qualified and experienced persons.
- Overall, The specialist inspector concludes he is satisfied there are no unresolved issues in relation to the electrical aspects of the Reactor 4 outage and he recommends that ONR should grant consent for Reactor 4 start-up.

3.6 Structural Integrity

47 An ONR structural integrity inspector has undertaken a planned outage inspection and produced an assessment report²⁴ to evaluate the fitness of Reactor 4 for return to service. In his report, the specialist inspector assesses the adequacy of the inspections of welds, pipe work, components and reactor internals [including boilers] conducted during the 2014 Reactor 4 periodic shutdown at Hunterston B nuclear power station.

48 The assessment has been conducted in three stages:

- Pre-outage activities which consisted of an assessment of the outage inspection proposals and a visit to site to discuss these proposals⁶
- An inspection visit to site²⁵ during the shutdown to assess the adequacy of the inspections performed and the compliance with the scope of the planned inspections and,
- Monitoring of the outage assessment panel [OAP] and boiler assessment panel [BAP] minutes after my visit to ensure any emergent issues were adequately addressed.

49 In his assessment, the structural integrity inspector states that weld inspections have been completed as detailed in the pre-outage intentions document or adequate justification had been provided to justify any deletions and, subsequent changes have been recorded in the outage management database. He states that NGL has followed company guidance and processes in assessing and sentencing of inspection results. He notes that NGL has found no defects that would prevent Hunterston B Reactor 4 from safely returning to service.

50 The specialist structural integrity inspector recommends that to demonstrate satisfactory completion of the weld inspection programme and completion of the work of the OAP the independent nuclear assessment [INSA] statement for the return to service engineering change [EC 349255] should be submitted as part of the application for Consent to return to service.

51 He judges that the reactor internal inspections [steel components] have been completed in accordance with the scope. This included inspections of channel [REDACTED] following successful removal of the previously stuck fuel stringer. Two 'scrape s' were detected on the guide tube assembly inner surface consistent with metal to metal contact which he judges will not affect nuclear safety.

52 The specialist inspector refers to inspections of the main reactor boilers having been completed utilising manned vessel entry in line with the requirements of the Boiler Tube Failure Safety Case. Three repairs were carried out to components that had the potential to be outside the limits identified in the boiler tube failure safety case during the next operating period. The repairs were successfully completed and no isolations of boiler tubes were required. He judges that, on the basis that the inspection results presented, the boilers are fit to re-enter service for the next operating period.

53 To demonstrate satisfactory completion of the boiler inspection programme and completion of the work of the BAP, the independent nuclear assessment statement for the engineering change [EC349254] should be submitted as part of the application for Consent to return to service.

54 To demonstrate satisfactory completion of the Pressure Systems Safety Regulations [PSSR] inspections, he recommends that statements from the Competent Persons [from the APEX and third party inspectors] should be submitted as part of the application for Consent to return to service.

3.7 Graphite Core

55 During the statutory outage, NGL has undertaken inspections, measurements and taken samples of the reactor graphite core, as required by the graphite core safety cases. An ONR specialist graphite inspector visited Hunterston B to inspect how the licensee was performing the various periodic shutdown related activities necessary to ensure the integrity of the graphite core. The findings of his inspection are given in his intervention record²⁶ and there are further developed in his assessment report²⁷.

56 The specialist inspector reports the licensee has discovered two new full height single axial cracks in graphite moderator bricks. These were in channel [REDACTED] layer 5 and channel [REDACTED] layer 4, both channels that have been inspected in the past. Discovery of

cracks is expected, a proportion of the bricks have them. It is believed that most, if not all other cracks that have been discovered at Hunterston B and the other AGRs, have originated at the brick bore. These are a consequence of early life ageing behaviour, when the contraction of the graphite is such that the bore is in tension. Most cracks are smaller than full height, some run circumferentially. Both of these categories are of lesser concern than ones that extend the full axial height. These cracks sometimes occur singly, but occasionally as double cracks normally 180° apart. The cracks in channels [REDACTED] and [REDACTED] were sentenced as keyway root cracks however.

57 The origin of keyway root cracks is different. Their occurrence has only been postulated until their detection during this outage. These cracks are characteristic of later life behaviour, when the stresses have reversed and the graphite at the outer surface of the moderator fuel bricks, rather than the inner surface, is in tension. Cracks have been predicted to start at the keyways and propagate to the inner surface and it seems likely that this is what has happened in channels [REDACTED] and [REDACTED]. A full height bore crack and a keyway root crack are believed to have the same structural significance, the importance of the latter type is that there may eventually be many more of them.

58 The specialist inspector states that the discovery of keyway root cracks is therefore of significance, as they are the first examples in all of the AGRs of a new phenomenon, that has always been predicted by the licensee to be potentially life limiting. Although this type of cracking was not predicted to have occurred yet, it is not wholly surprising. The licensee has, in his view, presented a good argument that the new cracks have occurred because the bricks are part of a small anomalous population of high shrinkage bricks. The licensee believes that these have not been manufactured in quite the same way as the others and that the high shrinkage bricks are predominantly confined to Hunterston B Reactor 4. The licensee further argues that there are sufficiently few of these bricks, that even if all of them develop cracks, there will not be enough cracks in total for the present safety case limit of 10% to be crossed. The licensee argues that the behaviour of the known crack and any other as-yet undetected similar cracks will not produce an effect on the core that presents an any significant risk that the core's safety functions could be compromised.

59 Following discovery of the first keyway root crack in channel [REDACTED] the licensee extended the outage to perform additional inspections of two additional channels, which also had apparently high shrinkage bricks in them. Thus, unusually they have inspected [REDACTED] during the outage. It was in one of these channels that the second keyway root crack was found in channel [REDACTED]. The other additional channel appears to be uncracked. The information gathered in these extra inspections will assist in further analysis and the specialist inspector therefore considered it was a responsible action for them to extend the outage to gather this data.

60 The specialist inspector states it is not yet known whether the occurrence of these cracks presages an earlier onset of keyway root cracking in the remaining bricks. The licensee's safety case includes regular inspections of the core and they had an existing safety case that accounted for the possibility of discovery of such cracks earlier than predicted. The specialist inspector states he does not therefore consider that the discovery has placed them outside the bounds of their existing safety case. He does not consider that this occurrence presents any reason to object to the return to service. In the longer term, the detection of the crack and the measurements performed on these particular bricks may allow further analysis that could facilitate better prediction methods. He judges that it will be necessary for the licensee to consider these aspects in the coming months, together with the implications for future inspections.

3.8 Control and Instrumentation [C&I] Systems

61 An ONR specialist C&I inspector carried out an inspection²⁹ and assessment²⁸ of Reactor 4 outage related C&I activities as part of the programme of outage related safety inspections.

- 62 During the course of the inspection he observed that the licensee was maintaining C&I equipment in accordance with its arrangements, on the basis of the areas sampled. His inspection considered the C&I work specified for the Reactor 4 periodic shutdown, including the planned work from OI, a sampled inspection of outage related maintenance activities and any emergent work in the area. He has judged that for those areas sampled, the commitments made in the OI for C&I systems and equipment important to nuclear safety at Reactor 4 have been satisfied. He also found that the workmanship applied was adequate and consistent with the standards expected from C&I suitably qualified and experienced persons [SQEPs].
- 63 During the inspection, the specialist inspector raised four actions addressing each of the emergent issues. These actions are described in his intervention record²⁹ and are referenced in his assessment report²⁸.
- 64 The specialist inspector has accepted a request from NGL for an extension to the first action [not a reactor restart issue]. He advises his intention to assess the results once they are and respond accordingly under normal regulatory business. The action will continue to be tracked under ONR's issue database system [issue no. 2761].
- 65 The second action was raised following his sampling of neutron flux detector [NFD] testing results. The results revealed that several NFDs had not met their testing specification. The specialist inspector requested, for any NFDs that had not met their testing specification, formal justification be provided to ONR justifying why those NFDs continue to meet their safety functional requirements. The licensee produced a formal justification. He sampled the formal justification and was content with the arguments presented.
- 66 The third action [not a reactor restart issue] is not due to be addressed until after restart. He notes his intention to assess NGL's response and to respond accordingly under normal regulatory business. The action will continue to be tracked under ONR's issue database system [issue no. 2760].
- 67 The specialist inspector has accepted a request from NGL for an extension to the fourth action [not a reactor restart issue]. He has accepted the reason for a delayed response and has agreed to the extension. He notes his intention to assess NGL's response under normal regulatory business. The action will continue to be tracked under ONR's issue database system [issue no. 2762].
- 68 He judges that the overall outcome from the safety inspection of the outage related control and instrumentation work on R4, is that the implementation of the L C28 arrangements for the C&I equipment are satisfactory.
- 69 The specialist inspector has judged, based on his inspection, assessment and subsequent dialogue with the station and fleet specialists, that no issues have been identified from Hunterston B C&I work that should delay the return to service of Reactor 4, on completion of the planned and emergent work.

3.9 Site Inspector oversight

- 70 As nominated site inspector, I undertook regulatory oversight of Hunterston B's overall outage programme, and coordinated ONR's specialist inspections during the course of the outage.
- 71 I undertook station-based regulatory activities in the following areas:
- An examination of INA's rapid trending review [RTR] undertaken in week 2
 - Inspections of licensee and contractor control and supervision
 - A joint inspection with SEPA to examine control of radioactive waste incidental to outage activities
 - Start-up inspections carried out jointly with the INA inspection team

- Response to emergent incidents and assessment of subsequent significant adverse condition investigations [SACIs]
- Mid-outage review and Reactor 4 start-up meetings

72 During week two of the statutory outage, I observed elements of the Rapid Trending Review [RTR]³⁰, undertaken by INA to establish and redress developing safety trends associated with the Reactor 4 statutory outage. I also used the process to evaluate compliance against NGL's conventional safety arrangements. The RTR identified four opportunities for improvement [OFI] and no areas for improvement [AFI]. I observed this represents a notable improvement on the RTR undertaken for Reactor 3 in 2012.

Overall, I judged the RTR to have been effective at highlighting early and emerging trends in safety performance. However, as the week progressed, the level of focus and coordination of RTR staff seemed to diminish leading to repeated oversight of individual work-faces. I consider there is an opportunity for NGL to review its arrangements for undertaking RTRs, and potentially tailor the exercise according to the specific nature of a given outage and previous outage performance as opposed to a 'one size fits all' approach. I will capture this in a post-restart review with the CNRP Corporate Inspector and the wider site inspection team.

73 I undertook compliance inspections against LC 26¹⁷, with specific emphasis on supervision of contract partner work during the early stages of the Reactor 4 statutory outage [during the RTR and general outage inspections]. I also examined aspects of work control through sampling of individual work packages. I judged contractor field supervision arrangements to be mature and aligned to well-defined company standards. I considered that overall standards of supervision observed during the inspection period to be adequate. Control of work through work planning, pre-job briefs and work-packs was broadly satisfactory.

During the outage, the SACI reports for one safety rules breach and the unexpected failure of two gas circulators highlighted shortfalls in rigour of control and supervision associated with outage organisational design. At the time of writing, Hunterston B continues to investigate the latter incident. Further regulatory intervention will be considered as part of a post-restart review with the CNRP corporate inspector and the wider site inspection team.

74 I undertook a compliance inspections against LC32³¹, jointly with SEPA. The overall intent of the inspection was to secure assurance that station has adequately addressed or demonstrably progressed shortfalls in compliance against LC32, identified during a 2013 specialist-led inspection. I undertook this inspection during the outage to secure assurance that NGL was minimising waste accumulation at source. I judged that the station is making good progress against its accelerated waste reduction plan against regulatory concerns expressed by ONR specialists in 2013 and has developed clearer through-life strategies for individual waste streams. Specifically in relation to the statutory outage, I observed that control and minimisation of waste incidental to the outage at Reactor 4 appears to be robust; the efforts made towards inventory reduction in low-level waste [LLW] have ensured the outage has not led to undue accumulations in the much-improved LLW store.

3.10 Start-up meeting

75 The Reactor 4 start-up meeting was held on 16 September 2014 and followed NGL's arrangements for such meetings. The station provided a comprehensive start-up report⁹, which formed the basis of the meeting agenda, and supplementary presentation material. 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 4 periodic shutdown TRIM folder.

76 ONR was represented by the CNRP operating reactor sub-programme lead (superintending inspector), the specialist Graphite Structural Integrity Inspector, a secondee from the Department of Energy & Climate Change [DECC] and myself. The

salient points of the meeting were added to the weekly Intervention Record³². NGL has satisfactorily addressed two actions identified by ONR. There are no outstanding actions or issues arising from the start-up meeting that would prevent Reactor 4 returning to service for a further period of three years.

4 SUMMARY OF MATTERS ARISING FROM ONR'S WORK

77 I have considered the licensee's request to ONR Consent under LC 30(3) to start-up Hunterston B Reactor 4 on completion of its periodic shutdown. I have followed ONR procedures for delivering a permitting project, as detailed in HOW2. To inform my work I have taken note of the statements associated with safety contained in the request letter¹, the findings of the outage associated work undertaken NGL's internal regulator, SRD, and the findings and opinions of ONR specialist inspectors.

78 Each ONR specialist inspector has produced an assessment report [where appropriate] that presents the inspection findings, inspector's opinions, judgements and recommendations. A number of recommendations and actions arise from the inspectors' work, resolution of which is required before ONR issues a Consent to restart Reactor 4:

1. The structural integrity specialist inspector recommends that to demonstrate satisfactory completion of the weld inspection programme and completion of the work of the Outage Assessment Panel, the independent nuclear assessment [INSA] statement for the Return to Service Engineering Change [EC 349255] should be submitted as part of the application for Consent to return to service. I confirm receipt of the INSA approved EC 349255¹¹ on 26 September 2014.
2. The structural integrity specialist inspector recommends that to demonstrate satisfactory completion of the boiler inspection programme and completion of the work of the Boiler Assessment Panel, the independent nuclear assessment statement for the Engineering Change [EC 349254] should be submitted as part of the application for Consent to return to service. I confirm receipt of the INSA approved EC 349254¹⁰ on 26 September 2014.
3. The structural integrity specialist inspector recommends that to demonstrate satisfactory completion of the Pressure Systems Safety Regulations [PSSR] inspections, he recommends that statements from the Competent Persons [from the APEX and Bureau Veritas inspectors] should be submitted as part of the application for Consent to return to service.

The specialist ONR civil engineering inspector has confirmed receipt [and has assessed] the APEX start up statement. I also confirm subsequent receipt of the Bureau Veritas letter¹ dated 18 September 2014 that notes the required statutory inspections of pressure plant associated with the R4 reactor statutory outage have been carried out in accordance with the relevant legislation. The Bureau Veritas letter further acknowledges that the Boiler main steam & hot reheat pipework; CO₂ relief valves and generator casing B1250B will be included once plant conditions allow; i.e. at pressure. I am content with Hunterston B's proposal to report outcome of all outstanding PSSR inspections as part of its post-restart 28-day report.

4. The Graphite specialist inspector recommends that the site inspector should confirm that the Graphite Return to Service EC 353747¹² is complete and has been subject to a final INSA before reaching a decision as to whether to recommend that consent to return to service is granted. I confirm receipt of the INSA approved EC 353747^{12,34} on 29 September 2014.

- 79 Other recommendations made by specialist inspectors are sufficiently captured as new Regulatory Issues, none of which have been deemed sufficiently significant for ONR to withhold Consent to start-up Reactor 4. ONR's CNRP programme will need to follow-up, through targeted regulatory intervention, the emergent findings from the inadvertent failure of two gas circulators at Hunterston B, and consider the ramifications to the wider EDF fleet.
- 80 Each specialist inspector assessment report contains a statement supporting issuing Consent to start-up Reactor 4, or there is no reason to withhold Consent.
- 81 I consulted SEPA to establish if they had any specific objections that would prevent ONR from issuing LI 543, Consent to start-up Hunterston B Reactor 4. SEPA³³ has confirmed they do not object to ONR issuing Consent.

5 CONCLUSIONS

- 82 The Hunterston B Reactor 4 periodic shut down has been undertaken in accordance with the requirements of the work scope outlined within Hunterston B's OID and start-up report.
- 83 The licensee has followed their arrangements in undertaking the outage, culminating in the Hunterston B Station Director writing to ONR requesting Consent to start-up Reactor 4. In his letter, the Director confirms that following completion of outstanding work, as controlled by the Operational Safety Review Committee [OSRC], Reactor 4 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 4 is safe to return to service.
- 84 INA will submit its Concurrence Part B report to Hunterston B's OSRC as part of the Station's consideration as to whether Reactor 4 is fit for return to service, in accordance with NGL's company arrangements. The report will only be issued if INA considers that there are no issues remaining with respect to the requirements of Concurrence Part A. Therefore, I am content with NGL's proposal to defer issue of the Concurrence Part B after ONR grants Consent under LC 30(3) and that this constitutes an additional internal hold-point to returning Reactor 4 to service.
- 85 ONR inspectors have sampled the LC28 MIs and LC22 modification activities throughout the shutdown and judged them to be adequate, and all support issuing Consent to start-up Reactor 4.
- 86 I have consulted with SEPA, which has confirmed it does not object to ONR issuing Consent.
- 87 I have prepared a Consent LI 543 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 Solicitors Office.
- 88 I judge that, based on the evidence presented within this report, the outage activities on Reactor 4 have been satisfactorily completed and there is nothing to prevent ONR granting Consent to start-up Hunterston B Reactor 4.

6 RECOMMENDATIONS

- 89 I recommend 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 543
 - Sign this Project Assessment Report approving its release for publication, after redaction where appropriate
- 90 I further recommend that the Deputy Chief Inspector signs Licence Instrument 543, which grants Consent under Licence Condition 30 (3) to start-up Hunterston B Reactor 4.

7 REFERENCES

- 1 TRIM 2014/349981 - HNB50494R - Request for start-up of reactor 4 made under licence condition 30(3) – 19 September 2014
- 2 TRIM 2011/448172 Hunterston B - Licence instrument No. 531 - CONSENT to restart reactor 4 following statutory outage - 26 August 2011 - [REDACTED] - 26 August 2011
- 3 TRIM 2014/284105 Licence Instrument No. 54 2 - HNB R4 1280 PIFA - NP/SC 7706 (EC350100) - Signed Copy of LI - 30 July 2014
- 4 TRIM 2014/347505 Notification from Hunterston B of successful retrieval of stuck fuel stringer from Channel [REDACTED] – 18 August 2014
- 5 TRIM 2014/38913 EDF NGL - Hunterston B - Unique No. HNB50482N - Outage Management Department Report (HPS/O M/DR2195) Reactor 4/TG8 Statutory Outage 2014 - ONR Intentions Report
- 6 TRIM 2014/112158 NGL - Hunterston B - Intervention Report - 13 - 014 - Planned Compliance Inspection of Hunterston B Site - 10 - 13 February 2014
- 7 TRIM 2014/336837 NGL – Hunterston B - Intervention Report - 14 - 14 2 - Planned Compliance Inspection of Hunterston B Site – 2-4 September 2014
- 8 TRIM 2014/350941 NGL – Hunterston B - Intervention Report - 14 - 14 3 - Planned Compliance Inspection of Hunterston B Site – 15-19 September 2014
- 9 TRIM 2014/339563 Hunterston B R4 2014 statutory outage ONR start-up report
- 10 TRIM 2014/357829 - Hunterston B Boiler Return to Service INSA Approved EC349254
- 11 TRIM 2014/357791 - Hunterston B Outage Return to Service INSA Approved EC349255
- 12 TRIM 2014/357798 EC 35 3747 – Justification for the Return to Service of Hunterston B Reactor 4 following the graphite core inspections at the 2014 periodic shutdown Rev 05
- 13 TRIM/335836 ONR outage action tracking spreadsheet
- 14 TRIM 2014/358565 SRD/ PROC/009 - NGL concurrence part B company arrangements
- 15 TRIM 2014/242720 Intervention Task Sheet - TS234 – Hunterston B power station reactor 4 periodic shutdown 2014
- 16 HOW2 documents:
 - 2014/261952 - NS-PER-GD-014 Revision 4 Purpose and scope of permissioning
 - 2013/324703 - AST 003 Revision 7 – Guidance on production of reports
- 17 TRIM 2014/334379 - ONR-HNB-IR-14-131 - Site Inspection to support Reactor Outage Intervention Strategy, focussing on LC17 and incorporating LC26 – [REDACTED]
- 18 TRIM 2014/242943 - Hunterston B Power Station – Review the inspection and maintenance conducted by the appointed examiner (APEX) on Reactor 4 during the 2014 periodic shutdown – [REDACTED]
- 19 TRIM 2014/327540 - ONR-HNB-AR-14-050 - Assessment of Hunterston B Reactor 4 Prestressed Concrete Pressure Vessel Start Up Statement – [REDACTED]

- 20 TRIM 2014/334369 - O NR-CNRP-IR-14-130 - EDF NGL, Hunterston B – Vessel Entry Complex Inspection (for compliance with the Ionising Radiations Regulations 1999) – [REDACTED]
- 21 TRIM 2014/348966 - O NR-HNB-AR-14-061 - Assessment of the Quality Management Systems Oversight Arrangements for the Hunterston B R4 Statutory Outage 2014 – [REDACTED]
- 22 TRIM 2014/348448 - ONR-HNB-AR-14-044 - Mechanical Assessment Hunterston B R4 2014 Statutory Outage – [REDACTED]
- 23 TRIM 2014/356067 - O NR-CNRP-AR-14-060 - Electrical Engineering Assessment – [REDACTED]
- 24 TRIM 2014/355644 - ONR-CNRP-AR-14-063 – Structural Integrity Assessment – [REDACTED]
- 25 TRIM 2014/349280 - ONR-CNRP-IR-14-128 – Structural Integrity Inspection – [REDACTED]
- 26 TRIM 2014/318727 - ONR-CNRP-IR-14-126 – Inspection of graphite related activities – [REDACTED]
- 27 TRIM 2014/356475 - O NR-CNRP-AR-14-056 – Hunterston B Reactor 4 return to service after 2014 statutory outage - graphite integrity aspects [EC 353747], including the first observation of a keyway root crack.– [REDACTED]
- 28 TRIM 2014/335511 - O NR-HNB-AR-14-55 - Hunterston B [HNB] Reactor 4 periodic shutdown 2014 - control and instrumentation [C&I] inspection and assessment – [REDACTED]
- 29 TRIM 2014/335489 - ONR-HNB-IR-14-141 - Hunterston B – Reactor 4 control and instrumentation [C&I] statutory outage inspection – [REDACTED]
- 30 TRIM 2014/313865 - ONR-HNB-IR-14-123 – Hunterston B Planned Intervention Report – [REDACTED]
- 31 TRIM 2014/328042 - ONR-HNB-IR-14-133 - Hunterston B Planned Intervention Report – [REDACTED]
- 32 TRIM 2014/350941 - ONR-HNB-IR-14-143 - Hunterston B Planned Intervention Report – [REDACTED]
- 33 TRIM 2014/351361 Response from SEPA to confirm no objection to Hunterston B request for consent to restart Reactor 4 – [REDACTED]
- 34 TRIM 2014/358446 – EC 353747 – INSA Approval