Office for Nuclear Regulation

Heysham 1 Reactor 1 Periodic Shutdown 2020
Consent to Start-Up Reactor 1 Following Periodic Shutdown

Project Assessment Report ONR-OFD-PAR-20-020
Revision 0
29 December 2020

Published 02/2021

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EXECUTIVE SUMMARY

Title

Heysham 1 Reactor 1 Periodic Shutdown 2020 - Consent to Start-Up Reactor 1 Following Periodic Shutdown

Permission Requested

EDF Energy Nuclear Generation Limited (NGL) [the 'licensee'] has requested that the Office for Nuclear Regulation (ONR) grants Consent under Licence Condition (LC) 30(3) to start-up Heysham 1 Reactor 1 following completion of the 2020 Periodic Shutdown carried out in accordance with the requirements of the Plant Maintenance Schedule made under LC 28(4). The licensee has confirmed that the required outage work has been completed and the reactor is safe to restart.

Background

LC 30(1): Periodic Shutdown states that for the purpose of enabling any examination, inspection, maintenance or testing of any plant or process to take place, the licensee shall, when necessary, ensure that any such plant or process is shut down in accordance with the requirements of the Plant Maintenance Schedule as referred to in LC 28: Examination, Inspection, Maintenance and Testing (EIMT).

LC 30(3) states that the licensee shall, if so specified by ONR, ensure that when a plant or process is shut down in pursuance of LC 30(1) it should not be started up again thereafter without the Consent of ONR. ONR specified, under LC 30(3) of Heysham Nuclear Site Licence 60, that the licensee shall seek ONR's Consent to start-up a reactor at Heysham 1 Power Station following shutdown under LC 30.

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

ONR inspection and assessment activities during a power reactor outage are to establish that:

- requirements set out in the Station's Plant Maintenance Schedule (PMS) have been complied with;
- work has been carried out in accordance with arrangements for identified Structures, Systems and Components (SSC) to the required quality by competent persons;
- safety issues identified during the reactor outage have been adequately addressed with suitable and sufficient justification provided to allow a regulatory judgement to be made that start-up of the reactor is safe.

ONR has assessed NGL documentation produced from the outage and EIMT of SSC important to nuclear safety. Site inspections were conducted to confirm work was carried out by competent individuals and to required quality standards.

Matters arising from ONR's work

No issues were identified by NGL to prevent the return to service of Heysham 1 Reactor 1. A number of intervention findings were made by ONR specialist inspectors during the outage that have been recorded within respective inspection records and reported to NGL.

An ageing management inspection, unrelated to the outage, found that inspections for examinations of a number of safety relief valves within the nitrogen storage and vaporisation plant had not been completed. This resulted in a Direction being issued to the station relating

to Pressure Systems Safety Regulations (PSSR) compliance. To support return to service NGL has carried out a review of Reactor 1 and its shared pressure systems focussed on the implementation of relevant written schemes of examination. A structural integrity specialist inspector has reviewed the evidence provided by NGL and did not find any issues that would prevent the safe return to service of the systems covered. Consequently, ONR is satisfied that there are no implications for the return to service of Reactor 1.

All matters have now been addressed to allow Consent to start-up Reactor 1 and any other matters will be followed up by ONR through routine business.

Conclusions

ONR's assessment and inspection of the Heysham 1 Reactor 1 periodic shutdown confirms that NGL has carried out EIMT in accordance with the requirements of its Plant Maintenance Schedule. Work has been conducted to the required quality standards and by competent personnel. No issues of such significance have been identified by NGL or ONR that prevent the start-up of Heysham 1 Reactor 1 following its 2020 periodic shutdown.

Recommendation

The ONR outage project inspector recommends that Licence Instrument 631 is issued to grant ONR's Consent to start-up Heysham 1 Reactor 1, following its 2020 periodic shutdown.

LIST OF ABBREVIATIONS

AGR	Advanced Gas Cooled Reactor
ALARP	As Low As Reasonably Practicable
APEX	Appointed Examiner
BCDS	Burst Can Detection System
COVID	Corona Virus Disease
CIP	Chloride Ingress Protection
CPP	Condensate Polishing Plant
CRCS	Control Rod Control System
C&I	Control and Instrumentation
DPCS	Data processing and control system
EC	Engineering Change
EDF	Électricité de France
EIMT	Examination, Inspection, Maintenance and Testing
EOR	Early Outage Review
FAC	Flow Accelerated Corrosion
FSC	Fire Safety Coordinator
GAMS	Gaseous Activity Monitoring System
GAP	Graphite Assessment Panel
GC	Gas Circulator
GCCS	Gas Circulator Control System
HoRP	Head of Radiological Protection
HYA	Heysham 1
INSA	Independent Nuclear Safety Assessment
ISI	In Service Inspection
IRR'17	Ionising Radiations Regulations 2017
LC	Licence Condition
LI	Licence Instrument
LOLER	Lifting Operations and Lifting Equipment Regulations
MGL	Main Guard Lines
mSv	milli Sieverts
MUWTP	Make-up Water Treatment Plant
NFD	Neutron Flux Detectors
NGL	Nuclear Generation Ltd
NSG	Nuclear Safety Group
OAP	Outage Assessment Panel
ONR	Office for Nuclear Regulation
PAR	Project Assessment Report

PCPV	Pre-stressed Concrete Pressure Vessel
PMS	Plant Maintenance Schedule
PSSR	Pressure Systems Safety Regulations
RCA	Radiation Controlled Area
RP	Radiological Protection
RPTLS	Reactor Post Trip Logic System
RTS	Return to Service
SI	Structural Integrity
SQEP	Suitable Qualified and Experienced Persons
SSC	Structure, System and Component
SSS	Secondary Shutdown System
TOPS	Time Out for Personal Safety
WSE	Written Scheme of Examination

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1 PERMISSION REQUESTED

1. This Office for Nuclear Regulation (ONR) Project Assessment Report (PAR) has been produced to support ONR's decision to issue a Licence Instrument (LI) granting Consent to start-up EDF Energy Nuclear Generation Limited (NGL) Heysham 1 Reactor 1 following periodic shutdown, as required under Nuclear Site Licence Condition (LC) 30(3): Periodic Shutdown.

2 BACKGROUND

2. NGL has requested ONR's Consent to start-up Heysham 1 Reactor 1 (Ref. 1) as required under Nuclear Site Licence Condition (LC) 30(3): Periodic Shutdown. Heysham 1 Nuclear Power Station has two Advanced Gas-cooled Reactors (AGR), identified as Reactor 1 and Reactor 2. The normal shutdown period for Reactor 1 is 3 years based upon the safety justification set out in the Station's Safety Case and Plant Maintenance Schedule (PMS) requirements.

3. LC 30(1): Periodic Shutdown states that for the purpose of enabling any examination, inspection, maintenance or testing of any plant or process to take place, the licensee shall when necessary ensure that any such plant or process be shut down in accordance with the requirements of the PMS as referred to in LC 28: Examination, Inspection Maintenance and Testing (EIMT).

4. LC 28(1) requires the Licensee to make adequate arrangements for the regular and systematic examination, inspection, maintenance and testing of all plant that may affect safety. LC 28(4) states that these arrangements shall provide for the preparation of a PMS. The PMS draws together requirements from a range of sources, including the facility's Safety Case, regulatory requirements such as Pressure Systems Safety Regulations (PSSR 2000), Lifting Operations and Lifting Equipment Regulations (LOLER 1998) and equipment manufacturer's guidance etc.

5. LC30(3) states that the licensee shall, if so specified by ONR, ensure that when a plant or process is shut down in pursuance of LC 30(1) it should not be started up again thereafter without the Consent of ONR. This is the case for Heysham 1 Power Station reactors as ONR specified under LC 30(3) by issuing Licence Instrument (LI) No 10, dated 25 March 1996, Unique Document Ref HYA 70566N under Heysham Nuclear Site Licence 60 (Ref. 2).

6. NGL formally engaged with ONR in November 2019 through the Outage Intentions meeting (Ref. 3). At this meeting NGL set out its intended scope of work through its Reactor 1 Outage Intentions Document (Ref. 4). This set out PMS requirements as well as identifying other work to be carried out in support of safety. The document also identified the Heysham 1 approach for managing safety and quality during the outage which was to be delivered by processes set out in corporate and local arrangements (Refs 5 to 9).

7. There have been two outage deferrals prior to the commencement of this outage. The first deferral was from 06 April to no later than the 16 June 2020 (Ref. 10). This deferral was requested because of delays with completing post Reactor 2 defueling outage activities as a result of the necessity to exchange the west side fuelling machine long travel wheels and outage overlap with Heysham 2. The second deferral was requested to defer the outage from 16 June 2020 to no later than the 31 October 2020 (Ref. 11). This deferral was due to the impact of the COVID-19 pandemic and indications that supply chain and contractor availability would be affected, posing a challenge to the safe execution of the outage. Both deferrals were examined by specialist inspectors to ensure that there were no safety concerns preventing ONR Agreement.

8. The Heysham 1 Reactor 1 outage commenced on 28 September 2020. At the start-up meeting on 11 November 2020 (Ref. 12), NGL presented findings from the outage. NGL did not identify any issues that would prevent start-up of Reactor 1 and no significant incidents occurred during the outage period. An issue was raised regarding the pressure systems safety regulations (PSSR) which NGL were advised needed to be addressed prior to the restart of Reactor 1. This is discussed in more detail in section 4.12. A number of conventional safety and contamination events did occur during the outage which NGL recorded and investigated to identify learning and prevent further occurrences. Regulatory matters identified during ONR's outage assessment and inspection activities are discussed in the ONR Matters Arising section of this report.

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

9. The purpose of ONR inspection and assessment activities during a power reactor outage is to establish that:

- requirements set out in the station's PMS have been complied with;
- work has been carried out in accordance with arrangements for identified Structures, Systems and Components (SSC) and conducted to required quality by competent persons, and:
- any safety issues identified during the reactor outage have been adequately addressed with suitable and sufficient justification provided to allow a regulatory judgement to be made that start-up of the reactor is safe.

10. ONR's mission is "To protect society by securing safe nuclear operations". To this aim, the primary focus in carrying out assessment and inspection activities during the Heysham 1 Reactor 1 outage was to confirm that nuclear safety requirements have been suitably addressed.

11. Prior to the commencement of the periodic shutdown, ONR specialist inspectors reviewed the outage intentions document (Ref. 4) together with operational experience gained from other ONR outage assessments and NGL's own event recording system. This informed the production of inspection scopes for the various specialist discipline inspections and assessments carried out during the Heysham 1 Reactor 1 outage:

- Civil Engineering
- Structural Integrity
- Graphite
- Mechanical Engineering
- Electrical Engineering
- Control and Instrumentation
- Internal Hazards - Fire
- Radiological Protection
- Conventional Safety

12. Inspections and assessments were undertaken in line with ONR internal guidance set out in ONR Technical Inspection and Assessment Guidance.

13. The ONR project inspector had an oversight role during the outage including maintaining oversight of the work undertaken by ONR specialist inspectors, monitoring events and providing regulatory input as necessary.

4 MATTERS ARISING FROM ONR'S WORK

14. The following sections provide summaries of the ONR specialist inspectors' inspection and assessment findings for each of the technical discipline areas evaluated during the Heysham 1 Reactor 1 outage. These summaries provide the information and evidence to underpin ONR's considerations and judgment to Consent to start-up of Heysham 1 Reactor 1.

4.1 CIVIL ENGINEERING INTERVENTION AND ASSESSMENT

15. The ONR civil engineering specialist inspector's opinion and judgement from a remote intervention and assessment of the appointed examiner (APEX) pre-stressed concrete reactor pressure vessel (PCPV) report are recorded in Refs 13 and 14.

16. The remote inspection was carried out with the aid of the station APEX and site engineer. The purpose of the inspection was to judge the compliance of the site outage works against Licence Condition 28; Examination, inspection, maintenance and testing and to gather early information relating to the APEX examination of the pre-stressed concrete pressure vessel (PCPV).

17. The inspection covered aspects relating to the civil engineering inspection carried out by the APEX in support of the production of their return to service / APEX 28-day report for the statutory outage, in compliance with the Pressure Systems Safety Regulations 2000 (PSSR).

18. The scope of the remote inspection was to sample the civil engineering aspects of the examination, inspection, maintenance and testing activities (LC28) being undertaken. The scope also included the extent to which the personnel controlling, supervising and undertaking the Maintenance Schedule activities are suitably qualified and experienced with the appropriate level of control and quality surveillance given the potential impact on safety.

19. With respect to Licence Condition 28 relating to examination, inspection, maintenance and testing the following judgements were made:

- The specialist inspectors considered that the work had been pre-planned and generally followed the relevant guidance and procedures.
- There was evidence of good interactions with third parties and an ability to be flexible to meet ongoing demands.

20. The specialist inspectors judged that for the sample inspected the Licensee had, in general, adequate arrangements. Whilst the examination, inspection, maintenance and testing were being carried out regularly, systematically and generally by suitably qualified and experienced personnel they were not content with some cultural issues. There was an issue with the welding qualifications of one of the contractors however, this was a potential conventional safety issue present whilst the task was being carried out and therefore not deemed to affect restart of Reactor 1. The site inspector agreed to follow this up with both the site and ONR internal conventional health and safety inspector.

21. The Statutory Examination Report (Ref. 15) has been produced by the Appointed Examiner (APEX) for Heysham 1 Reactor 1 and is presented by the licensee in support of its request for permission to return Reactor 1 to service following the 2020 periodic shutdown. The Appointed Examiner is NGL's nominated, suitably qualified and experienced person, responsible for ensuring the provision of in-service inspection and surveillance activities relating to the pre-stressed concrete pressure vessel. A full report of the statutory surveillances, inspections and tests will be presented by the

licensee in an updated Statutory Examination Report within 28 days of the agreed return to service date.

22. The specialist inspector considered that the quality and detail in the statutory examination report was adequate. Several issues were discussed, and clarification was obtained from the APEX who addressed them promptly and appropriately. Not all information required to fully complete the statutory examination report was available at the time of this assessment. The specialist inspector noted a commitment by the APEX that outstanding works will be satisfactorily completed prior to return to service and the relevant information will be included in the “28 day” statutory examination report.

23. Based upon an assessment of the surveillance activities, the APEX concluded that the Heysham 1 Reactor 1 pre-stressed concrete pressure vessel is satisfactory for return to service, subject to normal in-service surveillance, until the next scheduled statutory examination due in 2023. The APEX conclusion is subject to the satisfactory completion of some outstanding activities prior to return to service.

24. The specialist inspector is therefore content to support the return to service of the Reactor 1 PCPV for the next operating period of three years, subject to the satisfactory completion of the identified activities highlighted within the APEX report during the remainder of the outage.

25. The outage project inspector has received confirmation from the specialist inspector that they are now content that these activities have been completed (Ref 16).

4.2 STRUCTURAL INTEGRITY INTERVENTION AND ASSESSMENT

26. The ONR structural integrity specialist inspector’s view and judgements from a remote compliance intervention and assessment are recorded in References 17 and 18.

27. The remote inspection commenced 36 days through the periodic shutdown, according to the licensee’s programme. The status of the inspections highlighted satisfactory progress on the reactor external inspection programme, with 450 out of the 496 inspections completed at that time.

28. The specialist inspector sampled the inspection work that had been undertaken as part of the reactor external inspection programme, looking at both the inspection work itself and the categorisation of the results, and was satisfied with what was found. Steel pipework weld and Flow Accelerated Corrosion (FAC) inspections were progressing to programme with no significant issues identified.

29. Operation of the NGL outage assessment panel (OAP) was sampled by observing OAP meeting on 28 October 2020. The OAP meets to review the inspection work undertaken during the periodic shutdown and sentences the inspection findings. The specialist inspector was satisfied that the OAP was following due process and that the inspection items raised were sentenced appropriately.

30. Digital images and video footage from the inspections of the reactor internal components was sampled. The specialist inspector judged that due process was being followed satisfactorily. No significant issues that could affect the planned work were reported and no significant issues have been reported with the internal inspections to date.

31. Progress was discussed on inspection, maintenance and testing activities associated with the key systems related to nuclear safety. The inspections were, generally, progressing according to programme with no significant issues identified.

32. Progress on examinations and inspections undertaken during the periodic shutdown, as required by the Pressure Systems Safety Regulations (PSSR) were discussed. At the time of the inspection the PSSR competent person was satisfied with the work progress.

33. It was noted that the system engineer for flow assisted corrosion is currently working remotely on a permanent basis. It was judged that the interaction that the system engineer is having on site, combined with the processes and staff on site was adequate and that this is a workable situation.

34. During the intervention relating to the essential cooling water systems, the specialist inspector noted that the experience and knowledge of the system engineer was below expectations. This was not considered to reflect badly on the individual; they had only been in post for three months at the time of the inspection and had no handover with the outgoing SQEP. The specialist inspector concluded that the systems were being maintained in a manner sufficient to bring them back to service following the outage. Issue 8425 has been raised to track resolution of this matter.

35. Based on the information sampled during the inspection the specialist inspector did not identify any nuclear safety significant issues of concern. The specialist inspector is satisfied that the licensee is adequately managing any defects or anomalies identified.

36. The specialist inspector judged that, from a structural integrity perspective, NGL has performed the examination, inspection, maintenance and testing work to an adequate standard against the requirements of LC28. At the time of the intervention, the remediation work identified as part of these routine inspections was being progressed satisfactorily and will be subject to further inspections in accordance with the licensee's internal arrangements before a request for consent to return to service is made.

37. The structural integrity specialist inspector also assessed the adequacy of the inspections of welds, metallic reactor internal structures and components, main cooling water system, pipe hangers and thermal movement supports in line with Licence Condition 28; and compliance with Pressure Systems Safety Regulations (PSSR) undertaken during the Reactor 1.

38. The specialist inspector reviewed a broad selection of inspection activities completed by the licensee during the shutdown. The information gathered was used to judge the adequacy of the licensee's inspection of items that are considered important to nuclear safety, including metallic component welds, pipework, vessels and support structures located internally and externally of the reactor pressure vessel.

39. The specialist inspector is satisfied that the inspections have been undertaken in line with the outage inspection documentation and that EDF has followed corporate procedures in the selection, assessment and sentencing of component inspections and subsequent results.

40. Based upon the items sampled, and the evidence presented, the specialist inspector judged that the licensee has undertaken sufficient inspection and assessment to support the safe return to service of Heysham 1 Reactor 1.

41. The judgements and conclusions were based on an amount of information that had yet to complete due process and was therefore contingent on receiving a number of additional documents and assurances as outlined in the recommendations below.

42. From a structural integrity perspective, the specialist inspector recommended that ONR should issue a Licence Instrument to grant consent for start-up of Heysham 1 Reactor 1, following the 2020 periodic shutdown. However, this recommendation was contingent on receiving the following information to demonstrate:

- That 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 (EC) should be submitted as part of the licensee's application for consent to RTS.
- That satisfactory completion of the PSSR inspections, a return to service statement from the Competent Person (CP) should be submitted as part of the licensee's application for consent to RTS.
- That satisfactory completion of the inspections not covered by the and PSSR CP, namely the gas side penetrations of the reactor pressure boundary, the RTS EC364964 report must include a statement from the licensee's design authority supporting the fitness for return to service.

43. The specialist inspector has now confirmed that they have received and are content with the above information (Ref.19).

44. Separately from the outage work carried out by the specialist inspector it became clear that the written schemes of examination under Pressure Systems Safety Regulations 2000 were not necessarily fully being implemented at site. The specialist inspector therefore made the following recommendation:

45. I recommend that the project inspector, in conjunction with suitable Structural Integrity specialists, agree a strategy to be implemented by EDF at HYA that ensures sustained PSSR 2000 compliance.

46. This is discussed in more detail in section 4.1.2.

4.3 GRAPHITE INSPECTION AND ASSESSMENT

47. ONR's graphite specialist inspector's views and judgements from the assessment of Heysham 1, Reactor 1 graphite return to service safety case and remote inspection are recorded in References 20, and 21.

48. The specialist inspector carried out an LC 28 compliance inspection focussing on arrangements for graphite core examination, inspection and testing and the observations made during these periodic shutdown activities.

49. The objectives of this intervention were:

- To examine the adequacy of the licensee's arrangements with regards to graphite core inspection during this outage;
- To establish confidence that the various safety case commitments for core inspection and trepanning would be met;
- To consider the quality of the examinations performed, both in terms of data quality and the adequacy of the training and understanding of those involved in the work being carried out.

50. Due to the current COVID-19 arrangements, a site visit was not conducted. Instead the specialist inspector conducted a remote intervention which was conducted in two parts:

- A discussion with site to understand the activities ongoing and collect evidence of procedural compliance and quality of results.
- A discussion with the Jacobs team members, (who review the information obtained from the inspections offsite in more detail), to understand the procedures in place, training completed and sentencing of defects.

51. The target requirement for this periodic shutdown was to carry out 21 fuel channel inspections of the bore and one control rod channel inspection. At the time of this

intervention, the NGL had completed 14 channel inspections which included visual and bore measurements.

52. The specialist inspector spoke to several personnel who were involved in the graphite core inspections during the periodic shutdown. The personnel involved in the intervention appeared knowledgeable and the training records sampled were up to date. From the training records sampled, the specialist inspector considered that the personnel involved in undertaking the graphite core inspections had adequate training and experience to perform their various tasks.

53. The specialist inspector identified that difficulties in the hand over process due to COVID-19 restrictions caused shortfalls in the capability of the in-service inspection (ISI) Lead. NGL accepted this and agreed to review the definition of the ISI Lead role and hand over guidance to identify where improvements could be made. The specialist inspector was content that at the time of the intervention, the ISI Lead has been managing the graphite inspection activities adequately with support from the wider team.

54. During inspection the specialist inspector was content that there is an adequate process in place to ensure procedural compliance and quality of graphite inspections. However, they were aware of processes in place at other stations within the AGR fleet that are, in their opinion, more robust than that observed during the intervention. NGL accepted this and stated that they would consult with the wider AGR fleet to determine what learning could be gained.

55. Following the intervention, the specialist inspector concluded that the licensee's arrangements with regards to graphite core inspection during this outage are suitable and adequate. In the specialist inspector's opinion, the visual records and the data sampled were of adequate quality for NGL to form an accurate judgement and sentence any cracks observed in the graphite bricks.

56. A specialist graphite inspector also assessed the Heysham 1 Reactor 1 2020 periodic shutdown inspection results relating to the graphite core. The specialist inspector compared the findings against the claims and limits in the current graphite safety case and assessed them against the expectations laid down by the relevant Safety Assessment Principles. During the periodic shutdown, NGL inspected the bore of 21 fuel channels. Seven bricks were found to contain full height axial bore cracks:

- 5 new observations of single full height bore cracked bricks, including 2 defects which appeared to extend 80% of the brick without reaching the upper interface.
- 1 new observation of a doubly full height bore cracked brick.
- 1 repeat inspection of a previously observed doubly full height bore cracked brick.

57. NGL stated that the results of the graphite core inspections at Heysham 1 Reactor 1 2020 periodic shutdown are acceptable and do not challenge safe operation. NGL concluded that all the cracks observed have initiated from the bore of the bricks earlier in the life of the reactor and do not challenge the current graphite safety case. No keyway root cracks were observed in the graphite inspections.

58. The specialist inspector is content that the evidence presented during the periodic shutdown supports NGL's conclusions that the findings of the graphite core inspections do not challenge the Heysham 1 graphite safety case and do not present any impediment for the return to service of Heysham Reactor 1. An Independent Nuclear Safety Assessment certificate was not available at the time of the assessment. The specialist inspector therefore raised a recommendation that "the ONR Project Inspector

should therefore ensure that this certificate is available and in agreement with the views in the Engineering Change document".

59. The specialist inspector has now seen this certificate and is content that these changes are only minor and do not change the conclusions and the views expressed in their assessment (Ref. 22).

60. A recent update of NGL's models predict onset of keyway root cracking for Heysham 1 Reactor 1 in the next operating period. NGL has therefore provided a justification to increase the number and the frequency of the graphite inspections as part of the documentation presented to support return to service of the reactor. In the specialist inspector's opinion, NGL has provided satisfactory evidence that the safety case limits are unlikely to be challenged for the next six months operating period with a high level of confidence. Operation beyond this period is dependent on the inspection strategy justification that NGL has provided. This inspection strategy justification will be considered as part of future normal regulatory interactions. The specialist inspector is therefore of the opinion that the recent update of the model predictions for the onset of keyway root cracking should not prevent Heysham Reactor 1 from being returned to service following the periodic shutdown.

61. From a graphite perspective, the specialist inspector supports the return to service of Heysham 1 Reactor 1 to operation following its periodic shutdown.

4.4 MECHANICAL ENGINEERING INTERVENTION

62. An ONR specialist mechanical engineering inspector carried out a remote inspection against the requirements of Licence Condition 28: examination, inspection, maintenance and testing to inform the ONR decision relating to the issue of a licence instrument for consent for return to service of Heysham 1 Reactor 1 following its periodic shutdown (Licence Condition 30) (Ref. 23). The activities examined were selected due to their nuclear safety significance.

63. The intervention included examination, inspection, maintenance and testing of:

- Gas Circulators
- Control Rod Drop times
- Secondary Shutdown System Nitrogen Injection Valves

64. Based the items sampled, the specialist inspector is satisfied from a mechanical engineering perspective that during the Heysham 1 Reactor 1 2020 periodic shutdown:

- Examination, inspection, maintenance and testing associated with gas circulators, control rod drop times and secondary shutdown system nitrogen injection valves is being adequately controlled, in line with the requirements of the safety case.
- Sufficient records are being kept and monitored to identify problems both reactively and proactively.

65. During discussions on examination, inspection, maintenance and testing of the secondary shutdown system nitrogen injection valves, the specialist inspector found that the level of knowledge of valve design variants and progress with an Engineering Change was not adequate. This was judged not to affect nuclear safety but was not to the expected standard.

66. A level 4 regulatory issue (8434) has been raised related to visibility of configuration control of the Secondary Shutdown System nitrogen injection valves and monitoring of the Engineering Change to modify these valves.

67. Based on the sampling undertaken as part of this intervention, the specialist inspector is satisfied that the Licence Condition 28 arrangements in place are adequate and have been adequately implemented with no significant shortfalls.

68. From a mechanical engineering perspective, the specialist inspector supports the return to service of Heysham 1 Reactor 1 to operation following its periodic shutdown.

4.5 ELECTRICAL ENGINEERING INTERVENTION

69. ONR specialist electrical engineering inspectors performed a series of remote inspections of the Heysham 1 electrical systems. These inspections were used to judge the electrical systems' performance against their safety functions and the adequacy of maintenance activities completed during the R1 statutory outage (Ref. 24).

70. The inspections covered a sample of the electrical engineering plant and equipment that are relevant to Reactor 1:

- Short break supplies system;
- No-break system;
- Transformers,
- Grid and main electrical system;
- Emergency generation system.

71. Hereinafter these systems are referred to as the electrical systems.

72. Through remote examination of the electrical systems, an assessment of adequacy was made on the safety case functional requirements and how they were being fulfilled; the configuration of the systems; and compliance with the Licence Conditions.

73. The inspections were based on sampling the implementation of the licensee's arrangements provided by NGL against the LCs and their outage intentions documentation. The objective of the inspections was to determine whether the licensee's arrangements were adequately implemented and in accordance with the systems' safety case requirements.

74. From these interventions, the specialist inspectors consider that NGL demonstrated that they have arrangements to ensure that the electrical systems sampled are inspected, maintained and operated in accordance with the safety case. The arrangements examined complied with the licensee's legal duties on the areas sampled during the inspection. The inspections did identify a number of areas for potential improvement, and although the specialist inspectors judged that none gave rise to significant concern, relevant station staff have agreed to take action to address them.

75. From the evidence sampled during the inspections the specialist inspector considers that the Heysham 1, electrical systems and their associated arrangements are in line with regulatory expectations and that the aspects of the electrical systems sampled met the requirements of the safety case.

76. In relation to Heysham 1 Reactor 1 statutory outage electrical engineering related activities there were no issues identified from the sample of the work at the time of writing that would affect the return to service of Reactor 1, subject to the completion of the planned and emergent work.

77. From an electrical engineering perspective, the specialist inspectors support the return to service of Heysham 1 Reactor 1 to operation following its periodic shutdown.

4.6 CONTROL AND INSTRUMENTATION INTERVENTION

78. An ONR specialist control and instrumentation (C&I) inspector carried out an LC 28 compliance inspection (Ref. 25). The inspection included a sample review of Heysham 1 Reactor 1 statutory outage activities carried out in relation to C&I equipment and systems important to nuclear safety and, considered compliance of the associated arrangements in relation to Licence Condition 28 – examination, inspection, maintenance and testing (EIMT).

79. During the inspection the specialist inspector sampled the following equipment and systems:

- Main guardlines (MGLs);
- Neutron flux detectors (NFDs);
- Control rod control system (CRCS);
- Reactor post trip logic system (RPTLS);
- Data processing and control system (DPCS);
- Reactor thermocouples;
- Make-up water treatment plant (MUWTP) / condensate polishing plant (CPP) / chloride ingress protection (CIP);
- Secondary shutdown system (SSS);
- Gas circulator control system (GCCS);
- Burst can detection system (BCDS) / gaseous activity monitoring system (GAMS).

80. The specialist inspector found that the C&I equipment and systems important to nuclear safety maintenance schedule activities identified in the outage intentions document for the Heysham 1 Reactor 1 outage, which were sampled had been completed, and had been undertaken appropriately. Based on the information provided the specialist inspector was also confident that the outstanding C&I related maintenance schedule activities would also be satisfactorily undertaken.

81. During the inspection the specialist inspector held discussions with several C&I equipment and system stakeholders and found that they had a good understanding of the systems and equipment they were responsible for and appreciated the importance of the statutory outage work being undertaken. The specialist inspector also observed two maintainers undertaking static reversing contactor testing and found that they had a clear understanding of the associated work specification.

82. A small number of maintenance record keeping shortfalls were identified, these were raised with Heysham 1, who agreed to address them. The specialist inspector considered them to be minor in nature and that they did not pose an immediate or significant risk to nuclear safety. The specialist inspector noted that none of these issues would prevent Reactor 1 from returning to service.

83. During the plant walkdown, the specialist inspector found the operating conditions and lighting levels afforded a comfortable working environment for maintainers and no significant signs of age-related degradation with respect to the items of C&I equipment were identified. The specialist inspector also found the general standard of housekeeping to be adequate. Five regulatory issues were identified, and the specialist inspector will monitor their progress to resolution as part of normal regulatory business. However, they did not consider that any of these issues would pose an immediate or significant risk to nuclear safety or need to be addressed before Reactor 1 can return to service.

84. From the evidence gathered during this inspection of a sample of Heysham 1 Reactor 1 statutory outage C&I activities, the specialist inspector did not identify any C&I issues

that would pose an immediate or significant risk to nuclear safety or prevent ONR issuing a Consent to allow Reactor 1 to restart.

85. Following the site inspection the specialist inspector identified some instances where 'out of tolerance' relay parameters values were recorded, but were not highlighted as such. The specialist inspector also found that the 'as found condition' on the associated Work Order Cards (WOCs) was declared to be 'B' - Normal and that no related task handover / remark comments were provided. There were also instances where the maintainer had positively ticked the 'relay OK for further service' boxes when the relays had exceeded the replacement threshold.

86. The specialist inspector informed NGL that prior to restart of Reactor 1 NGL must undertake an 'extent of condition' survey to determine if:

- The relevant control rod control system (CRCS) relay parameters have been correctly recorded, or as necessary repeat the tests;
- 'Out of tolerance' CRCS relay parameters have been appropriately identified, independently reviewed and considered and advise ONR of what action is being taken to address this with appropriate justification;
- Those relays that have parameters which meet replacement thresholds have been replaced, or a work instruction has been put in place to ensure they are replaced prior to return to service (RTS) or justify why this is not necessary;

87. Taking into account the results of the bullet points above, NGL was also asked to consider repeating the 'extent of condition' review for other relays in other safety systems, e.g. reactor post trip logic system (RPTLS) relays;

88. The project inspector has confirmed with the specialist inspector that NGL have now satisfactorily completed the above actions and that they support the return to service of Heysham 1 Reactor 1 from a C&I perspective (Ref. 26)

4.7 INTERNAL HAZARDS – FIRE

89. A remote inspection was carried out by an ONR internal hazards specialist inspector (Ref. 27). The inspection was a planned fire protection system based inspection which sampled fire related aspects of the outage.

90. The specialist inspector sampled the arrangements in place to manage fire risks during the outage as fire risks increase during outages due to the number of activities (especially hot working) taking place at site during this time. Nuclear Safety Group (NSG) and the Fire Safety Co-ordinator (FSC) explained that the stations normal arrangements are used to manage fire risks during the outage which operators are already familiar with. This included:

- Laydown areas process – to control the storage of materials / fire loads that increase during the outage
- Hot works and permits process – to manage and control the hazards associated with hot works during the outage
- Oil leaks database – to manage the prioritisation of oil leaks
- Fire related Tech Specs to manage the availability of the fire protection system

91. The FSC was able to clearly articulate how the above arrangements are implemented on site to limit the potential for fires to develop during the outage. This included laydown process and the FSC's role in signing onto all laydown areas to ensure the fire loading is acceptable. Fire loading information is included with each laydown area and that regular checks (by laydown co-ordinator and area safety walkdowns) are undertaken to ensure the laydown is being managed appropriately. Control of laydown

areas is also managed through the laydown area database. The ONR site inspector examined a laydown area used by Field Core for their outage related work on Turbine Generator 1 during the plant walkdown. It was found to be well labelled/managed with no obvious fire loading.

92. Based on the evidence sampled, the specialist inspector was satisfied that no issues were identified that would prevent permission to restart Reactor 1.

4.8 RADIOLOGICAL PROTECTION INTERVENTION

93. An ONR specialist radiological protection (RP) inspector carried out an intervention in two parts. The first (Ref. 28) was a remote outage surveillance meeting which took place via teleconference. This meeting enabled the specialist radiological protection inspector to discuss the scope of work being carried out during the outage and general outage arrangements, progress and any issues.

94. The following areas were discussed at the meeting:

- Outage work scope
  - Gas circulator exchange work
  - Aux Gas plant maintenance
- Pile cap
- RP organisational structure
- Dose management
- Contractor resources
- Radioactive source management
- RP events
- Clearance of items from the Radiation Controlled Area (RCA)
- Notification, registration and consent

95. There had been an oil leak from a Gas Circulator (GC) into the liner resulted in loose contamination in the work area. During the clean-up workers spent more time in the GC liner than had been planned for. This resulted in the dose to workers from GC related work to be higher than estimated. However, the head of radiological protection (HoRP) is confident this increase will not result in station missing its 9 man mSv dose target for the outage.

96. A COVID-19 mitigation facemask policy is in use on site; this is in line with Public Health England and NGL guidance on indoor working. Workers in C2 areas were expected to wear face masks; HoRP reported this made communicating between workers difficult, and resulted in personnel, on occasion, adjusting facemask to communicate. The site saw an increase in personal contamination events to the face. To mitigate against this, visors were used instead of facemasks, which Heysham have stated complies both with government guidance and ensures the personal contamination event risk to the face is reduced.

97. Due to COVID-19 restrictions, the second part of the intervention was carried out on-site by the NGL corporate RP function, with oversight from ONR (Ref. 29).

98. The aim of the RP intervention was:

- To meet the requirements of the Heysham 1 Statutory Outage Project as defined in the ONR Outage Inspection Plan.
- To provide regulatory confidence in relation to RP and compliance with Ionising Radiations Regulations 2017 (IRR'17).
- To inform the ONR decision relating to the issue of a Licence Instrument for Consent for return to service of Reactor 1 at Heysham 1.

99. This inspection sampled the following through discussions, document review, and plant visits:

- Summary of outage programmed work and its radiological implications, which was provided in an As Low As Reasonably Practicable (ALARP) document produced for this statutory outage.
- Adequacy of RP personnel arrangements.
- Contractor control and supervision.
- RP input to outage work planning.
- Radiation survey instrument maintenance and provision.
- Radiological event investigation and follow-up.
- Planning for radiologically significant outage tasks.
- Operational dose management, i.e. day-to-day dose management and profiling during the outage.
- Radioactive source management.
- Health Physics clearance arrangements.
- Reviewing the observations given by RP staff from NGL corporate centre during the intervention.

100. The inspection did not reveal any significant nuclear safety concerns relevant to the Heysham 1 Reactor 1 outage that require action by the Licensee or further follow-up by ONR.

101. Discussions with the HoRP for Heysham 1 gave the specialist inspector suitable assurance that there is effective RP practice in place; an adequate level of compliance with the requirements of IRR'17 was noted by the RP staff from the NGL corporate centre.

102. To conclude, the specialist radiological protection inspector has no objection to Consent for the return to service of Heysham 1 Reactor 1.

4.9 CONVENTIONAL SAFETY INTERVENTION

103. An ONR specialist conventional safety inspector carried out an inspection at the Heysham 1 site during the outage (Ref 30).

104. The key regulatory activities undertaken during the inspection were:

- To provide regulatory confidence in the management of work at height risks present during the Heysham 1 Reactor 1 outage and compliance with the Work at Height Regulations 2005. The focus was on three areas – planning and supervision of work at height activities, competence of staff carrying out the work and suitability of the equipment used.
- To provide regulatory confidence in the management of workplace transport risks present during the Heysham 1 Reactor 1 outage and compliance with the relevant parts of the Workplace (Health, Safety and Welfare) Regulations 1992. The focus was the three areas of safe site, safe vehicle and safe driver.
- To discuss the recent adverse inspection reports received by ONR in relation to lifting equipment.

105. The specialist inspector sampled work at height activities taking place as part of outage work, observing good practice taking place in relation to the three focus areas – planning and supervision, competence of staff and suitability of equipment.

106. The specialist inspector sampled workplace transport activity observing examples of good practice in relation to the three focus areas of safe site, safe vehicle and safe driver. There were concerns around the effectiveness of station arrangements for the

thorough examination and maintenance of fork-lift trucks as a relatively new machine had missed its statutory thorough examination as required under the Lifting Operations and Lifting Equipment (LOLER) Regulations 1998. This machine was taken out of service until such time as the matter could be resolved. There were also several locations on the sites external roadway which had significant potholes which could present a stability risk to some fork-lift trucks. The station agreed to identify these locations via the use of barriers/cones until such time as repairs could be conducted.

107. During the inspection, the specialist inspector had a meeting with the station LOLER lead person around recent adverse inspection reports received by ONR from the independent third-party inspection authority in relation to station lifting equipment. It was conformed that NGL are in the process of investigating these events and a copy of their report would be provided to ONR.

108. During the inspection the specialist inspector made general observations in relation to COVID-19 control measures and found compliance with social distancing requirements, use of face coverings and hand washing.

109. Good standards were seen during the inspection in the key focus area of Work at Height and this was rated Green with no formal action required from ONR.

110. In relation to the issues identified with examination and maintenance of forklift trucks, to determine the appropriate enforcement decision, the specialist inspector used the ONR Enforcement Management Model (Ref. 31) which for these circumstances resulted in an enforcement letter (Ref. 32).

111. To conclude, the specialist conventional safety inspector has no objection to Consent for the return to service of Heysham 1 Reactor 1.

4.10 ONR PROJECT INSPECTOR OVERVIEW OF OUTAGE ACTIVITIES

112. The ONR project inspector supported the NGL internal nuclear assurance (INA) team on their early outage review (EOR) inspection (Ref. 33) The early outage review looked at work area standards and working practices. The purposes of the EOR are to:

- Assist station management in reducing or eliminating undesirable behaviours and conditions which could have an adverse impact on outage success.
- Identification of performance shortfalls in the early stages of an outage.
- Identify any Fleet issues for resolution in the longer term.

113. The most significant issue observed during the review was an individual observed on the outside of a scaffolding gate lowering some bags down. The individual was immediately challenged and asked to move to the inside of the gate.

114. COVID-19 controls around site were in line with expectations. Masks were worn in all areas apart from offices where separation was greater than 2 metres and masks were worn whilst moving around the office or talking to others.

115. The project inspector spoke to several individuals whilst on site who were all aware of the 5 A Day safety initiative which reinforces standards in the areas of:

- Work area standards
- Peer to peer communications
- Time out for personal safety
- Pre-job brief
- Procedural use and adherence

116. The individuals were asked about the outage training and the general feedback was that it was good in particular the use of the videos and the “modular” approach with questions after each section.

117. Positive and negative observations were fed back daily to the Heysham 1 lead team. The significant issues were followed up immediately including the issue where the contractor was found on the outside of the scaffolding gate.

4.11 RETURN TO SERVICE MEETING

118. A return to service meeting was held on the 11 November 2020 (Ref. 12). The purpose of the meeting was for NGL to present the findings to date of the Heysham 1 Reactor 1 periodic shutdown to ONR.

119. The licensee provided updates for each of the safety management areas including:

- Nuclear Safety
- Industrial Safety
- Fire Safety
- Radiological Protection, Environmental Safety and Radwaste
- Quality

120. There have been some dropped objects during the outage, and the project inspector explained to the licensee that the dropped objects themselves were a concern but also of concern was that some of the objects fell outside of the designated drop zone. The licensee was asked whether the procedure for how drop zones are designated needs to be reviewed. NGL is looking into this area to see if there is some learning and whether improvements can be made.

121. Slides were also presented for each of the focus areas:

- Reactors – Gas Circulators
- Reactors – Aux Gas
- Condensate and Feed
- Turbine and Auxiliary Systems
- ISI and Refuelling
- Protection and Electrical
- Cooling Water
- Boiler Tops
- Boilers

122. Following the presentations, we fed back to the licensee that from our perspective, the outage had gone well and that we were content with how Heysham had managed the outage in respect of the COVID-19 pandemic. We discussed an issue that had arisen before the meeting regarding the implementation of Written Schemes of Examinations required under the PSSR Regulations. NGL was asked to provide assurance detailing why they are content to re-start reactor 1. This is discussed in more detail in section 4.12

4.12 PSSR SHORTFALLS REVEALED BY AGEING MANAGEMENT INSPECTION

123. During an ONR ageing management inspection unrelated to the outage, it was revealed that PSSR examinations of a number of safety relief valves within the nitrogen storage and vaporisation plant had not been completed. This resulted in an LC15(4) Direction being issued to the station relating to PSSR compliance (Ref 34).

124. NGL were asked to provide an adequate response to the PSSR shortfalls prior to return to service (RTS) of Reactor 1. An assessment of NGL’s response to this request

has been carried out by an ONR specialist structural integrity inspector (Ref. 35). The specialist inspector focussed their assessment on NGL's response to phase 1 of the event recovery strategy (Ref. 36) set up in response to ONR's Direction. Phase 1 is partly concerned with providing confirmation that all examinations contained within the written schemes of examination (WSE) are aligned with the Heysham 1 maintenance system (AMS), used to enable completion of examination, maintenance, inspection and testing required by LC28 and additional statutory regulations. Phase 1 also aimed to confirm that, for those examinations contained in the WSE and AMS, an in-date PSSR Competent Person (CP) examination report exists. Phases 2 and 3 of NGL's event recovery strategy will address the wider aspects of the Direction and are not required to be completed prior to RTS of Reactor 1

125. As a result of the review of system evidence packs, findings table and close out letter (Ref. 37) produced by NGL as part of the phase 1 PSSR event recovery at Heysham 1, the specialist inspector did not find any issues that would prevent the safe RTS of the systems covered. NGL has responded appropriately to RTS specific technical queries (TQ) and committed to addressing non-RTS queries in a timely manner following R1 RTS.

4.13 ENGAGEMENT WITH OTHER GOVERNMENTAL AGENCIES

126. ONR has engaged with the Environment Agency who has confirmed that they have no objections to the restart of Heysham 1 Reactor 1 following the 2020 statutory outage (Ref. 38).

5 CONCLUSIONS

127. NGL's request to ONR for Consent to start-up Heysham 1 Reactor 1 following periodic shutdown in compliance with LC 30(3) has been supported by their letter (Ref. 1) stating that all plant maintenance schedule requirements and modifications identified in the Reactor 1 outage intentions document (Ref. 4) have been met. This excludes testing of equipment which can only take place when the reactor becomes pressurised and steam-raising commences. Based upon ONR's intervention evidence the project inspector is content that the station has complied with their plant maintenance schedule requirements.

128. NGL has submitted the Heysham 1 Reactor 1 APEX report (Ref. 15) following completion of civil inspection and maintenance of the PCPV. This confirms that there are no safety issues in returning the vessel back to service. This report was reviewed by the ONR civil engineering inspector who is content. The ONR inspector supports NGL's conclusion that the PCPV is safe to return to service and will remain in this condition until its next periodic shutdown. The ONR civil engineering inspector supports ONR issuing Consent for Reactor 1 start-up.

129. NGL's return to service safety justification for Reactor 1 is set out in EC364964 covering steel components (Ref. 39) and EC368421 covering graphite core inspections (Ref. 40). It confirms that no safety issues have been identified from EIMT activity to challenge safety case claims that would prevent Reactor 1 start-up or its safe operation until its next periodic shutdown planned in 2023. NGL support this claim with statements from their independent third party PSSR Competent Person, Bureau Veritas (Ref. 41), who confirmed that there were no compliance issues from inspections carried out in accordance with PSSR written schemes of examination. NGL's findings from thorough examination of PCPV penetrations were found to be satisfactory. These documents have been reviewed by ONR Inspectors supporting the Reactor 1 outage, who agreed that claims and arguments presented are in line with their views from intervention findings and assessment. ONR structural integrity and

graphite specialist inspectors therefore support ONR issuing a Consent for Reactor 1 start-up.

130. Heysham 1 Independent Nuclear Assurance (INA) has provided their INA concurrence (Ref. 42) that based on their Reactor 1 shutdown concurrence activities, no issues have been identified that would challenge their support for start-up of Reactor 1.

131. Based on evidence gathered from ONR's intervention and assessment activities for the Heysham 1 Reactor 1 shutdown together with claims, arguments and evidence presented by NGL in its request for start-up of Reactor 1, it the project inspector's judgement that Heysham 1 power station has complied with its LC30(1) requirements for Reactor 1 in carrying out the required EIMT work in accordance with the station's plant maintenance schedule. The work was carried out in accordance with the station's procedures by competent SQEP personnel working to identified quality arrangements and with appropriate supervision. Where EIMT findings were anomalous with safety case requirements, NGL has provided adequate safety justification that relevant safety case limits and conditions are not challenged.

132. During an ageing management inspection unrelated to the outage, it was revealed that inspections for examinations of a number of safety relief valves within the nitrogen storage and vaporisation plant had not been completed. This resulted in a Direction being issued to the station relating to PSSR compliance. To support return to service NGL has carried out a review of Reactor 1 and its shared pressure systems focussed on the implementation of relevant written schemes of examination. A structural integrity specialist inspector has reviewed the evidence provided by NGL and did not find any issues that would prevent the safe return to service of the systems covered. Consequently, ONR is satisfied that there are no implications for the return to service of Reactor 1.

133. In conclusion, ONR has identified no matters of concern that would prevent ONR granting Consent for Heysham 1 Reactor 1 to start-up following its periodic shutdown.

6 RECOMMENDATIONS

134. The project inspector recommends that, in response to the request by NGL, ONR issue Licence Instrument 631 granting Consent under LC30(3) of Nuclear Site Licence 60 to start-up Heysham 1 Reactor 1 following the 2020 Periodic Shutdown.

7 REFERENCES

1. HYA/50875R, Application for Consent to Start up Reactor 1 Under Licence Condition 30(3) CM9 2020/322457

2. Heysham 1 Licence Instrument number 10 for Nuclear Site Licence 60 issued 25 March 1996, Unique Document No HYA 70566N, CM9 Ref 2015/292878

3. ONR-OFD-CR-19-594, Heysham (R1) 2019 Outage Intentions Meeting, CM9 2019/332599

4. HYA/M/METHODS/186, R1 2020 Statutory Outage 025 Outage Intentions Document, CM9 2020/218077

5. BEG/ICP/OPS/009, Outage Management Process.

6. HYA/M/METHODS/180, Outage Organisation and Responsibilities

7. BEG/SPEC/OPS/007, Outage Safety Arrangements.

8. BEG/SPEC/SHE/COP/008, Code of Practice – construction Design and Management

9. BEG/SPEC/OPS/008, Model Quality Assurance Arrangements.

10. ONR-OFD-PAR-19-016, ONR Agreement for Extension of Operating Period for Heysham 1 Reactor 1, CM9 2020/78918

11. ONR-OFD-PAR-20-003, ONR Agreement for Extension of Operating Period for Heysham 1 Reactor 1, CM9 2020/140268

12. ONR-OFD-CR-745, Heysham 1 Reactor 1 Re-Start Meeting, CM9 2020/311236

13. ONR-OFD-AR-20-066, Assessment of the Pre-Stressed Concrete Pressure Vessel in Support of the Re-start of Reactor 1, CM9 2020/311490

14. ONR-OFD-IR-20-076 Heysham 1 Power Station, Reactor 1. LC28 Civil Engineering Outage Intervention (Remote) prior to return to service, CM9 2020/313958

15. E/REP/BNCB/0649/HYA/20, Heysham 1, Statutory Examination of the Prestressed Concrete Pressure Vessel of Reactor 1 - 2020, CM9 2020/311892

16. Email – FW: Update on PCPV Inspections – 01/12/2020, CM9 2020/315285

17. ONR-OFD-IR-20-088, Heysham 1 Power Station – Reactor 1 Periodic Shutdown 2020 – LC28 Compliance Inspection in Support of Structural Integrity, CM9 2020/310873

18. ONR-OFD-AR-20-072, EDF NGL Heysham 1 Nuclear Power Station: Assessment of Structural Integrity in Support of the Restart of Reactor 1 Following the 2020 Periodic Shutdown, CM9 2020/311158

19. Email – Re: Heysham 1 Reactor 1 RTS – 08/12/2020, CM9 2020/318711

20. ONR-OFD-IR-20-063, Inspection of the Heysham 1 Reactor 1 Graphite Core Inspection Arrangements during the 2020 Statutory Outage, CM9 2020/306289

21. ONR-OFD-AR-20-064, Heysham 1 Reactor 1 2020 Periodic Shutdown: Structural Integrity Assessment of the Graphite Core Inspection Findings, 2020/303188

22. Email – FW: Heysham 1 R1 graphite inspections EC 368421 – 24/11/2020, CM9 2020/313138

23. ONR-OFD-IR-20-087, Heysham 1 Reactor 1 Outage 025 – Mechanical Engineering Inspection, CM9 2020/309633

24. ONR-OFD-IR-20-061, EDF Energy NGL Heysham 1 statutory outage and combined systems based inspection covering: No Break Supplies System (SBI 07); Emergency Generation and Short Break Supplies Systems (SBI 08); Transformers, Grid Systems, and Main Electrical System (SBI 09), CM9 2020/309302

25. ONR-OFD-IR-20-068, EDF Energy Nuclear Generation Limited (EDF NGL) Heysham 1 (HY1) Power Station Reactor 1 (R1) 2020 Statutory Outage (025) Control and Instrumentation (C&I) Inspection, CM9 2020/310365

26. Email – FW:RI8441 – HYA Response to Actions 1 & 2, 13/12/2020, CM9 2020/320342

27. ONR-OFD-IR-20-062, Heysham 1 planned Intervention, Remote System Based Inspection SBI11, Fire Detection, Suppression, Barriers, Doors and Dampers, CM9 2020/305609

28. ONR-OFD-CR-20-648, Opening meeting for Heysham 1 remote outage surveillance, CM9 2020/302841

29. ONR-OFD-IR-20-073, EDF Energy Nuclear Generation Limited, Heysham 1 Reactor 1 Statutory Outage 2020 Radiological Protection Inspection, CM9 2020/305697

30. ONR-OFD-IR-20-060, EDF NGL, Heysham 1 (HYA) Power Station, Heysham, Morecambe, Lancashire, LA3 2XH Inspection of Work at Height and Workplace Transport arrangements during statutory outage, CM9 2020/307494

31. ONR-ENF-GD-006, ONR Guide, Enforcement, CM9 2020/92759

32. HYA 71141R, Conventional Health and Safety Inspection 14th October 2020, CM9 2020/305808

33. ONR-OFD-CR-20-572, Heysham 1 Reactor 1 Early Outage Review, CM9 2020/301621

34. EDF-NGL Heysham 1 – Licence Instrument 632 – Direction Under LC15(4) – PSSR Shortfalls CM9 2020/312168

35. ONR-OFD-AR-20-087, Assessment of Pressure Systems Safety Regulations (PSSR) evidence provided to support HYA Reactor 1 return to service position following statutory outage, CM9 2020/323909

36. HY1/PSSR/001 Rev 006, HY1 PSSR Compliance, Event Recovery Terms of Reference, 14/12/2020, CM9 2020/323001

37. EDF HYA Regulatory Correspondence, HYA/50876R PSSR, WSE review findings table and letter confirming completion of phase 1 of their event recovery, December 2020. CM9 2020/323804

38. Email – RE: Heysham 1 Reactor 1 Re-start following 2020 statutory outage – 12/11/2020, CM9 2020/308981

39. EC364964, Return to Service of Heysham 1 Reactor 1 with Respect to Inspections undertaken during the 2020 Statutory Outage, CM9 2020/317685

40. EC 368421, Justification for the Return to Service of Heysham 1 Reactor 1 Following the Graphite Core Inspections at the 2020 Statutory Outage, CM9 2020/313091

41. Letter – Heysham Reactor 1 – 2020 Statutory Outage Pressure System Safety Regulations CM9 2020/314765

42. SRD/REP/CON/HYA/019B, Heysham 1 Reactor 1 Statutory Outage 2020, Independent Nuclear Assurance Concurrence Part B, CM9 2020/323820