



| PROJECT ASSESSMENT REPORT | | | |
|--|---|------------------|------------|
| Unique Document ID and Revision No: | ONR-HYA-PAR-15-030 Revision 0 | TRIM Ref: | 2016/17305 |
| Project: | Heysham 1 – 7 Boiler Pod Operation | | |
| Site: | Heysham 1 | | |
| Title: | Operation of Heysham 1 Reactor 1 on 7 boiler pods | | |
| Licence Instrument No: (if applicable) | LI 599 – Agreement under LC 22(1) LI 605 – Approval under LC 23(5) | | |
| Nuclear Site Licence No: | 60 | | |
| Licence Conditions: | 22(1) and 23(5) | | |

Document Acceptance and Approval for Issue / Publication

| Role | Name | Position | Signature | Date |
|---------------------------------------|------------|--------------------------|-----------|---------------|
| Author | [REDACTED] | Inspector | | 28 April 2016 |
| Reviewer | [REDACTED] | Principal Inspector | | 28 April 2016 |
| Accepted by ¹ | [REDACTED] | Superintending Inspector | | 28 April 2016 |
| Approval for publication ² | [REDACTED] | Superintending Inspector | | 28 April 2016 |

Revision History

| Revision | Date | Author(s) | Reviewed By | Accepted By | Description of Change |
|----------|---------------|------------|-------------|-------------|---|
| A | 28 April 2016 | [REDACTED] | [REDACTED] | n/a | 1 st draft for DL review |
| B | 28 April 2016 | [REDACTED] | [REDACTED] | n/a | 2 nd draft incorporating DL comments |
| 0 | 28 April 2016 | [REDACTED] | [REDACTED] | [REDACTED] | First accepted issue |
| | | | | | |
| | | | | | |

¹ Acceptance of the PAR to allow release of LI

² Approval is for publication on ONR web-site, after redaction where relevant

Circulation (latest issue)

| Organisation | Name | Date |
|-------------------------------|------------|------|
| Office for Nuclear Regulation | [REDACTED] | |
| Environment Agency | | |
| Licensee | | |

Heysham 1 – Reactor 1 – 7 Boiler Pod Operation
Nuclear Site Licence No. 60 – Licence Conditions 22(1) and 23(5)
Operation of Heysham 1 Reactor 1 on 7 boiler pods

Project Assessment Report ONR-HYA-PAR-15-030
Revision 0
28 April 2016

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Published 04/2016

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EXECUTIVE SUMMARY

Title

EDF Energy Nuclear Generation Ltd – Heysham 1 Power Station - Licence Instrument LI 599 - Agreement to Operating on 7 out of 8 Boiler Pods and Licence Instrument LI 605 – Approval to modify operating rule 02/NSR/04.

Permission Requested

EDF Energy Nuclear Generation Limited (NGL), the operator (known as the licensee) of Heysham 1 power station, has requested agreement or acknowledgement under licence condition 22(1) of modifications undertaken to facilitate 7 pod operation at Heysham 1 Reactor 1 and approval to modify operating rules under Licence Condition 23(5) (replace 02/NSR/04 Issue 004 with 02/NSR/04 Issue 005) to support this mode of operation.

Background

During a periodic shutdown in September 2013 a defect was found in a weld within boiler 1D1 at Heysham 1 Reactor 1. After a number of investigations and installation of cooling modifications across the other spines at Heysham 1 and Hartlepool reactors (including 1D2), Heysham 1 Reactor 1 was returned to service at a reduced temperature and operating on three quadrants.

A number of options were considered in order to eliminate the need for the temperature reduction and the selected option results in the licensee intending to undertake work to separate the two pod boilers (1D1 & 1D2) located within Heysham 1 reactor 1 delta quadrant and then operate on 7 pod boilers (including 1D2).

The purpose of this work is to consider whether the safety claims, arguments and evidence presented by the licensee supports safe operation of Heysham 1 Reactor 1 to power on 7 of 8 boilers.

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

ONR technical specialists in Control and Instrumentation, Electrical, Mechanical, Structural Integrity and Fault Studies have assessed the safety case and produced Assessment Reports and Contact Records to support this Project Assessment Report. ONR specialists also inspected operations on the reactor simulator.

Matters arising from ONR's work

No issues preventing the issue of these Licence Instruments arose from the assessment of the licensee's safety justification by ONR.

Conclusions

ONR's assessment of the Licensee's safety justification, together with inspections carried out on site, provides confidence that it is appropriate to agree to the implementation of the modifications and approve the change to of the operating rule.

Recommendation

This Project Assessment Report recommended that ONR issue Licence Instrument 599 giving Agreement to the modifications described in the safety submissions and issue Licence Instrument 605 to Approve the modification of the operating rule.

LIST OF ABBREVIATIONS

| | |
|-------|--|
| ALARP | As Low As Reasonably Practicable |
| C&I | Control and Instrumentation |
| DCH | Direct Control Heater |
| DMG | Delivery Management Group |
| EC | Engineering Change |
| GWT | Guided Wave Testing |
| HOW2 | (Office for Nuclear Regulation) Business Management System |
| HYA | Heysham 1 |
| INSA | Independent Nuclear Safety Assessment |
| LC | Licence Condition |
| LI | Licence Instrument |
| NGL | EDF Energy Nuclear Generation Limited |
| NSR | Nuclear Safety Requirement |
| MWth | Megawatt Thermal |
| ONR | Office for Nuclear Regulation |
| PAR | Project Assessment Report |
| R1 | Reactor 1 |
| R2 | Reactor 2 |
| SS | Staged Submission |
| T1 | Reactor gas inlet temperature - Temperature 1 (Lower) |
| T2 | Reactor gas outlet temperature - Temperature 2 (Higher) |

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1 PERMISSION REQUESTED

1. EdF Energy Nuclear Generation Limited (NGL), the operator and licensee of Heysham 1 (HYA) nuclear power station, has written to the Office for Nuclear Regulation (ONR) requesting an Agreement or Acknowledgement under licence condition 22(1) to modifications undertaken to facilitate operating on 7 of the 8 boiler pods in a modified configuration at HYA Reactor 1 (R1) and approval to modify operating rules under Licence Condition (LC) 23(5) to facilitate this mode of operation (ref 8).
2. This Project Assessment Report (PAR) considers this request and recommends issuing Licence Instrument (LI) 599 under Licence Condition 22(1) and Licence Instrument (LI) 605 under Licence Condition 23(5) giving Agreement to the engineering modifications and approval to modify the operating rule.

2 BACKGROUND

3. During the HYA R1 periodic shutdown in September 2013, an unexpected result was found from the Guided Wave Technology (GTW) measurement on the boiler spine in pod boiler 1D1. This result indicated the possibility of a defect in the region of weld 12.3 which is a key structural weld operating in a high temperature region. An in-vessel inspection campaign was undertaken in 2014 which identified a significant crack just below weld 12.3 and analysis of a sample removed from the defective area indicated that the cracking was caused by weld buttering applied during the manufacturing process.
4. Extensive inspections on all four similar reactors enabled HYA Reactor 2 and both Hartlepool reactors to be returned to service at reduced reactor gas outlet temperature - Temperature 2 (T2) in order to reduce spine temperatures in the location of the critical weld 12.3. Subsequently HYA R1 was returned to service at reduced T2 and on 3 quadrants with D quadrant out of service i.e. with boiler pods 1D1 and 1D2 isolated. A programme of work took place to underwrite the structural integrity of the boiler spines, including installation of cooling modifications to reduce the temperature of the affected region of the boiler spines. The intent of this programme of work was to eliminate the requirement for the T2 reduction, and hence allow the reactors to be returned to normal full power operation. ONR assessed the safety justification and permissioned return to full power in January 2016 (Ref 1). However, for D quadrant, the presence of the defect in the 1D1 boiler spine means that additional work is required to return the quadrant to service. At a high level, the available options for HYA R1 were:
 - i. Continue three quadrant operation until end of life at reduced power (1200MWth).
 - ii. Effect some form of repair / modification to the 1D1 spine such that 1D quadrant can be returned to normal operation and the reactor to full power (1575MWth).
 - iii. Split 1D quadrant to allow 1D2 pod (which does not have a defect in weld 12.3) to be returned to service, leaving 1D1 isolated and permanently out of service. HYA R1 could then be operated on 7 pods, allowing an increase in output to a proposed limit of 1400MWth.
5. A Paper of Principle was submitted (Ref 2) for the third option – 7 pod operation. The philosophy adopted by the licensee was to present a comprehensive justification for this new mode of operation, taking benefit where appropriate from supporting assessments / analyses that have already been performed for three or four quadrant operation. This paper included:

- design principles for 7 pod operation;
 - identification of the key plant modifications required;
 - the safety case claims and arguments required to substantiate 7 pod operation;
 - a series of stage submissions to provide the detailed evidence for the various modifications through to commissioning of the reactor and
 - key project quality and nuclear safety administration arrangements.
6. In order to facilitate the operation on 7 pods a number of modifications are required in order to enable this mode of operation. These changes include:
- isolating the steam and feed pipework to 1D1;
 - physically disconnecting the electrical supplies to the gas circulators;
 - disconnecting automatic control of the inlet guide vanes;
 - modifying the reactor control system to operate with a feed flow at a nominal 50% of the other quadrants;
 - modifying the Indications, alarms and operating procedures;
 - ensuring the reactor protection ensures future operation at two permitted operating points: 7 pod and 3 quadrant and
 - modifying the quadrant protection system for 1D to allow 1D2 operation with 1D1 isolated;
7. A Nuclear Safety Requirement (NSR) needs to be updated to reflect the changes to the limits and conditions for safe operation for 7 pod operation. A table within the NSR details the reactor safety circuits and states the requirements for reactor trip settings for the in service quadrants. This will be updated to clarify that for the 1A, 1B and 1C quadrants the trip settings remain the same, however, whilst 1D quadrant will be in service, the feed flow trip setting will be updated to note that the feed flow will effectively be halved.
8. The modifications are outlined in five staged submissions and this PAR is the consideration of SS1, with SS2 through SS5 being supporting references. The Staged Submissions are as follows:
- SS1 - Category 1 – This is the safety case for the modifications which describes the overall safety case for operation on 7 pods, giving arguments and evidence to show adequacy against the requirements of the Nuclear Safety Principles and that risk levels are As Low As Reasonably Practicable (ALARP) – Ref 3.
 - SS2 - Category 2 – This describes the system isolation to support 7 pod operation and outlines the arrangements for isolation of feed and steam circuits to 1D1, and electrical supplies to 1D1 gas circulator and Inlet Guide Vane fast motor – Ref 4.
 - SS3 – Category 2 – This describes the changes to the protection system including the modifications required to quadrant protection equipment, reactor protection and boiler tube leak protection in order to operate on 7 pods. It includes relevant testing and plant (static) commissioning proposals – Ref 5.
 - SS4 – Category 2 – This describes the changes to the control and instrumentation (C&I) system including the modifications required to reactor control systems, instrumentation and alarms for 7 pod operation. It will include relevant testing and plant (static) commissioning proposals – Ref 6
 - SS5 – Category 2 – This describes the commissioning of HYA R1 for 7 pod operation including the arrangements for system (dynamic) commissioning 7 pod operation, with reference to earlier stage submissions, changes to station documentation, and confirmation of operator training – Ref 7.

9. The five claims made within SS1 are :-
- Claim 1 - The existing (i.e. unmodified) 1D quadrant plant configuration, condition and nuclear safety functions, and the control and protection systems that interact with it, are fully understood. The proposed modifications to it are fully scoped and controls specified to ensure that the design satisfies the requirements of the safety case.
 - Claim 2 - Fault initiation during normal operation will not be significantly increased by 7-pod operation.
 - Claim 3 - There will be no significant detriment to the existing provision of reactor and quadrant trip protection or boiler tube leak protection following modification of 1D quadrant.
 - Claim 4 - Adequate post-trip cooling is provided for all reactor operating states, up to the proposed operating power of 1400 MWth.
 - Claim 5 - The risk associated with implementation of 7-pod operation is ALARP.

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

10. I have considered the licensee's request for ONR's agreement or acknowledgement under Licence Condition 22(1) of modifications undertaken to facilitate 7 pod operation at HYA R1 and approval to modify operating rules under Licence Condition 23(5) (Ref 8). I have:
- Followed ONR procedures for delivering a permissioning project, as detailed in HOW2 (Ref 9).
 - Utilised the services of ONR specialist inspectors (C&I, Electrical, Mechanical, Structural Integrity and Fault Studies), whom the Delivery Management Group (DMG) Leads identified and which they considered covered the disciplines necessary to make an informed and proportionate judgement.
 - Considered the views of the ONR nominated site inspector, who has carried out interventions on site on preparations and delivery of the modifications.
11. Requests for engineering modifications and changes to operating rules are not novel and similar requests have been submitted to ONR for Approval in the past.
12. ONR considered the Paper of Principle and decided that the modification should be assessed and permissioned by ONR, however, the detailed justifications would be provided in the staged submissions. A permissioning strategy (Ref 10) was agreed within the sub-programme that the Paper of Principle should be acknowledged. This acknowledgment was sent by ONR on 12th February 2016 (Ref 11).
13. ONR decided that permissioning will be against Staged Submission 1 as this is a Category 1 EC however, the ONR has used the other EC's (SS2 through SS5) as supporting references to the assessment. This was communicated to the licensee through a letter (Ref 12).
14. Due to timescales when the safety case submissions were available for assessment it was not possible to undertake the assessment before the outage when the modifications take place. As the modifications would not be implemented until start-up, the ONR decided to undertake the assessment in parallel to the modifications taking place. This did not therefore have any safety implications but did present a commercial risk to the licensee should ONR identify any concerns. A letter was sent to the licensee stating ONR's position (Ref 13) at the start of the outage that ONR intended to complete its assessment before HYA R1 returns to service.

15. In order to facilitate this approach a number of Level 4 meetings were held between the technical specialists at ONR and those at the licensee to understand the modifications (Ref 14, 15 & 16). Furthermore, technical questions have been asked by the ONR technical specialists during the assessment process in order to get the licensee to address any concerns and aid in understanding.

3.1 ELECTRICAL ASSESSMENT

16. The ONR electrical systems inspector reviewed the electrical engineering aspects of the modifications presented by licensee. These are presented in a contact record (Ref 17). A contact record was considered appropriate noting that the electrical modifications are relatively straightforward.
17. The main electrical work is associated with isolating 1D and is presented in SS2, this includes disconnecting of the 1D1 gas circulator 11KV motor cable and the earthing of the 11KV switchboard.
18. The conclusion of this assessment was that the review of the documentation sampled and sample inspection of the electrical modifications did not identify any issues of an electrical engineering nature that should delay completion of the activities to deliver the necessary modifications and safety justification for 7 pod operation. Some electrical minor works and commissioning activities remain outstanding at this time. However, the electrical assessor received assurance from the station that the remaining work will be completed in full, or the proposed way forward will be recorded under the station's LC 22 arrangements. Furthermore none of the proposed electrical engineering activities are novel and have been undertaken by suitably qualified and experienced personnel and therefore the electrical assessor is content with the proposals.
19. The electrical inspector therefore recommended that ONR agree to the request made under LC22(1) arrangements to implement the electrical engineering modifications to HYA R1 to enable 7 pod operation as proposed in NP/SC 7736.

3.2 CONTROL AND INSTRUMENTATION ASSESSMENT

20. The ONR Control and Instrumentation (C&I) inspector reviewed the C&I engineering aspects of the modifications presented by the licensee (Ref. 18).
21. In the assessment the C&I inspector sampled aspects of the safety case which were considered to be the most nuclear significant and potentially invasive C&I modifications. These were mainly the changes to the protection system, including modifications to the quadrant protection system and changes to the C&I system including changes to alarms and indications.
22. Based on the evidence provided within the safety case and associated documentation the specialist is satisfied that the licensee has:
 - Carried out detailed assessment and designed the modifications to the reactor safety circuits and the quadrant protection equipment to minimise spurious trip and retain trip protection functionality in 7-pod operation.
 - Carried out detailed assessment and demonstrated that the control system modifications maintain safety-related plant parameters within their specified ranges.
 - Designed the 7-pod modifications to ensure that user interfaces provide effective monitoring and control at HYA as far as reasonably practicable.
 - Put in place arrangements to ensure that R1 will be subject to suitable and sufficient commissioning tests before its operation.
 - Allowed for the potential unavailability of equipment during maintenance activities.

23. The C&I Technical specialist recommended that:
- ONR should Agree to the request made under LC22(1) arrangements to implement the modifications to HYA R1 to enable 7-pod operation as proposed in SS1.
 - ONR should Approve under LC23(5) changes to Nuclear Safety Requirement NSR 4.

3.3 STRUCTURAL INTEGRITY ASSESSMENT

24. The ONR structural integrity inspector has reviewed (Ref 19) the following structural integrity aspects of the proposed modifications that are presented to support the claims made in NP/SC 7736, which are:
- The justification of operation under the proposed operating conditions until end of life (currently expected to be 2024).
 - The adequacy of the licensee's safety submission to demonstrate that the 1D2 boiler is fit for return to service following an extended period of isolation.
 - That the proposed modifications will not result in an increase in risk of a 1D1 boiler tube failure during the extended period of isolation.
 - The proposed pipework and component (flow nozzles and orifice plates) modifications have been designed, manufactured and installed in accordance with appropriate structural integrity guidance.
 - That the operating plant conditions following the proposed modification will be no more onerous than the existing three quadrant or four quadrant operation safety case that is currently claimed for the HYA and Hartlepool sites.
25. From the information that was sampled as part of the assessment, the structural integrity specialist is satisfied that the licensee's existing arrangements for assessing accumulated boiler tube damage during elevated temperature operation are unlikely to be affected by the proposed plant modifications. Also, the licensee has provided sufficient evidence to demonstrate that, following an extended period of isolation, an acceptable margin to feed water restrictor tube damage limits remains to support operation of 1D2 until the end of station life (2024)
26. The specialist reviewed the licensee's justification for continuing the period of isolation for 1D1, and is satisfied that the proposed modification to isolate the D quadrant boilers independently is unlikely to increase the frequency of boiler tube failures on 1D1 above that which has already been discussed as part of the extended three quadrant operating safety case for HYA R1. The specialist supports the licensee's recommendations to install thermocouples into 1D1 boiler at the next periodic shutdown to measure dead space gas temperature. The specialist considers this information to be an important reference to support the best estimate oxide growth rate predictions required to demonstrate 1D1 boiler feed water restrictor tube integrity until end of life.
27. The specialist reviewed the licensee's arrangements for the qualification and implementation of physical modifications to the steam and feed system to enable the proposed operating configuration of seven out of eight boilers. From a structural integrity perspective, the specialist is satisfied that the licensee has provided sufficient evidence to demonstrate that the pipework and component modifications being implemented are appropriately classified and qualified for the proposed safety function. This work has been completed in accordance with the licensee's own internal guidance on the production of structural integrity safety cases, which is considered to be adequate for the proposed application.

28. In the opinion of the specialist, the proposed operating configuration is unlikely to significantly degrade the reactor internal components, or increase the likelihood of boiler tube failure, in comparison to those conditions already accepted for extended three quadrant or four quadrant normal operating conditions.
29. The specialist is satisfied that the licensee has presented an adequate safety case to demonstrate that the proposed modifications to isolate 1D1 will not adversely affect existing safety related plant, such that the integrity claim of infrequent failure tolerability for the steam and feed pipework is not undermined.
30. As part of the assessment, the specialist raised questions regarding the continued monitoring of vibration data associated with the Direct Contact Heater pipework, and what effect the proposed change in operating configuration is likely to have. The specialist is satisfied with the licensee's response confirming that no detrimental changes have been observed during the recent operating period, which has involved an increase of power on Heysham 1, Reactor 1. The specialist is also satisfied that the licensee is continuing with the programme of monitoring and access control proposed by the licensee to ensure that the nuclear and industrial safety risks associated with the proposed modification to isolate the D quadrant boilers and re-instate 1D2 for operation under normal conditions, are ALARP.
31. The Structural Integrity assessment therefore concluded:-
 - From the information that was sampled and the licensee's response to questions that were raised, the specialist is broadly satisfied that the licensee has conducted an adequate review of the structural integrity aspects associated with operating Heysham 1, Reactor 1 on seven out of eight boilers and has no objection to the proposed modifications to return 1D2 boiler to service.
 - It is noted that there are vibration issues associated with the DC heater (DCH) support and pipework that will require ongoing monitoring of plant conditions in accordance with the licensee's proposed strategy to support the continued operation of Heysham 1 Reactor 1. The progress of this ongoing work will continue to be managed through ONR's normal regulatory business resolution of ONR issues 3657 and 3375.

3.4 FAULT STUDIES ASSESSMENT

32. The ONR fault studies inspector reviewed the fault studies aspects of the modifications presented by licensee. These are presented in an assessment report (Ref 20). The summary of this assessment was:-
 - All of the claims made in the safety case are relevant to fault studies and have been considered within the assessment. However, in particular the focus of the fault studies inspector was on Claim 2 which concerns the identification of faults that could occur during 7 pod operation and Claim 4 which considers the adequacy of post trip cooling at 1400 MWth.
 - The assessment has not identified any significant concerns that would prevent implementation of the modifications or 7 pod operation at up to 1400 MWth. It was also noted that the safety justification for operation on 3 quadrants at up to 1200 MWth is not affected by the modifications.
 - It was noted that operation on 7 pods results in a small increase (1.5%) in Dose Band 5 risk relative to 4 quadrant operation. This increase in risk is dominated by the increased risk of spurious trip and is essentially equivalent to that for 3 quadrant operation. Overall the fault studies specialist accept the licensee's claim that the risk associated with 7 pod operation is As Low As Reasonably Practicable (ALARP).

33. The fault studies assessment therefore concluded:-
- Based upon the high level review of the approach to testing and commissioning the fault studies inspector considered the scope of the planned testing and commissioning to be reasonable in terms of supporting the plant modifications and safety functional requirements. The specialist also considered the hold points that have been identified by the licensee to be appropriate.
 - It was noted that 7 pod operation will require a revision to Nuclear Safety Requirements NSR 4. The inspector considered the proposed change, which clarifies that the 1D1 boiler pod will be out of service and that the level of feed flow to the D quadrant will be half of that to the other quadrants, to be appropriate.
 - To conclude, from a fault studies perspective and based upon the sampling of the safety case, the inspector was broadly satisfied with the claims, arguments and evidence laid down within the safety case presented by the licensee and could see no reason to prevent issue of the LI's for the modifications and NSR change.

3.5 MECHANICAL ENGINEERING

34. The ONR mechanical inspector reviewed the mechanical aspects of the modifications presented by the licensee. These are presented in an assessment report (Ref 21) which covered the design, installation, testing and commissioning of:
- Mechanical segregation of 1D2 boiler from 1D1.
 - Modification of the flow control components within the 1D2 boiler circuit to achieve seven boiler operation.
35. The assessment also considered the impact of residual swarf left in 1D2 boiler pod from previous mechanical works. The swarf was produced following cutting activities undertaken to enable inspections of the 12.3 region. It is stated that 13kg of type 316 stainless steel swarf was produced and the chips are up to 3-4mm by 1mm thick. Some swarf was collected but 5kg may have entered 1D2.
36. The mechanical inspector concluded that:
- The modification proposed has adopted established fluid flow technologies that are well understood and supported by theoretical flow modelling and component testing. Additionally, through the prescribed programme of inactive and active testing and commissioning, the licensee will be able to adequately demonstrate that the required flow rates for seven boiler pod operation are achieved.
 - By withdrawing the 1D2 gas circulator (before entering into seven pod operation) to allow the removal of swarf that has collected on the surfaces above the gas circulator, the licensee has reduced the risk of swarf affecting the satisfactory operation of the gas safety relief valves that protect the reactor pressure vessel to be ALARP. From a mechanical engineering perspective, the specialist considered the principal risk associated with seven pod operation came from the redistribution of swarf that will occur when the 1D2 Gas Circulator is switched on. In removing the swarf from the accessible areas of the boiler pod above the 1D2 GC, the specialist is satisfied that NGL has taken an appropriate and conservative decision to reduce the quantity of swarf that might enter the reactor circuit
37. The mechanical inspector therefore supports the decision to issue an agreement for the licensee to operate Heysham 1 Reactor 1 on seven boiler pods.

3.6 NOMINATED SITE INSPECTOR

38. The nominated site inspector has reviewed the quality plan and observed the preparation work prior to the cutting of the superheater feed outlet pipe from 1D1 to the superheater header and considers the work to be well managed and controlled (Ref 22). All the plant operators are undergoing specific training on operation of the reactor on 7 boiler pods and the nominated site inspector will witness one of the training sessions in early May. Currently there have been no issues identified by the nominated site inspector which would prevent ONR granting agreement for this mode of operation.

3.7 USE OF SIMULATOR

39. ONR C&I and fault studies specialists attended a meeting about the HYA simulator on 15/02/2016 (ref 22). The licensee provided a description of the configuration of the control systems for 7-pod operation using a series of drawings and explained that this operation of R1 will be the same as the current operational arrangements. During the meeting, the licensee described how the simulator had been modified with the proposed changes and subsequently a series of test had been undertaken to verify the proposed 7-pod modifications. Using the simulator, the licensee demonstrated at the meeting the modelled impact of the 7-pod operation (on reactor 1 simulator) and compared this to the modelled response on reactor 2 (i.e. 8-pod operation). The following scenarios were simulated and we observed similar responses from both simulators:
- Normal, no fault, operation.
 - Transient fault resulting in a reduction of main feed flow (DC heater trip).
 - Start up where incremental demands on the feed flow were instigated.
40. The licensee explained that they had observed instabilities in the control systems from the modelling of an earlier specification for 7-pod operation. From this modelling it had been determined that the specification of the modification for the IGV position on 'D' quadrant had been ill-conceived. This specification has subsequently been modified and the model changed. This has resulted in the observed instabilities being rectified.
41. During the meeting at the HYA simulator ONR inspectors were provided with evidence that the simulator has provided confidence that the 7-pod modifications have been adequately conceived.
42. The use of the HYA simulator to understand the impact of the 7-pod modifications to the control systems provides an important aspect of the safety case. The licensee has made the commitment to compare the simulator characteristics with the real unit, during start-up and at power, to see what differences exist between the simulator and plant, with the aim to carry out minor adjustments to the simulator to improve fidelity. ONR have raised regulatory issue #4393 for the licensee to send ONR the outcome of the comparison of the HYA simulator in 7-pod operations and the operational unit, during start-up and at power, to see what differences exist between the simulator and plant and identify whether any adjustments to the simulator to improve fidelity is necessary. This issue will be tracked under ONR's issues database and does not impact on ONR's Agreement to the modifications to Reactor 1 to enable 7-pod operation as proposed in SS1.
43. Noting that the HYA reactor simulator is a relatively detailed whole plant model the demonstration provided confidence that the effects of the modifications on reactor control and plant response are well understood.

3.8 COMMITMENTS MADE WITHIN THE EC

44. There are no commitments made within the staged submissions that are due to be complete before the issuing of the site licence instruments, those commitments that are due post this will be tracked through normal business.

3.9 OTHER GOVERNMENT DEPARTMENT LIAISON

45. It was not necessary to liaise with other government departments for the assessment of the modifications undertaken as part of this work.

3.10 REGULATORY CONSIDERATIONS

46. I have considered the licensee's request for an agreement or acknowledgement under LC 22(1) of modifications undertaken to facilitate 7 pod operation at HYA R1 and approval to modify operating rules under LC 23(5) and note that:

- The licensee has requested agreement or acknowledgement to undertake modifications to enable 7 Pod Operation at HYA R1 under the correct licence condition, LC22 (1). ONR has decided that an Agreement is appropriate.
- The licensee has requested approval to modify operating rules at HYA R1 under the correct licence condition, LC23 (5).
- The Licensee's justification to undertake modifications to enable 7 pod operation on R1 at HYA, EC356858 (Ref 2) has completed the company's due process for a Category 1 submission in the production, review and authorisation of the engineering modifications and changes to the operating rules. The safety case received full Independent Nuclear Safety Assessment (INSA) approval with no caveats being raised.
- The Licensee's justification to undertake modifications to enable 7 pod operation on Reactor 1 at Heysham 1 has been assessed by specialist assessors within ONR who have not identified any matters of nuclear safety significance. No inspector has objected to 7 Pod Operation and each is supportive of issuing the Licence Instruments to allow this.
- The Agreement and Approval requested by the licensee requires the issue by ONR of routine Licence Instruments.

4 MATTERS ARISING FROM ONR'S WORK

47. No issues preventing issue of these Licence Instruments arose from the assessment of the Licensee's safety justification.

5 CONCLUSIONS

48. I judge that the licensee has made an adequate justification for the modifications to facilitate 7 Pod operation and changing an operating rule based on:

- The licensee's safety case presented in EC356858 (Ref 2) having satisfactorily completed company due process.
- The licensee's safety case having INSA approval with no caveats being raised.
- Satisfactory assessment of the modifications by ONR technical specialists and the nominated ONR site inspector.

6 RECOMMENDATIONS

I recommend that the Superintending Inspector;

- Signs this Project Assessment Report to confirm acceptance for the technical and regulatory arguments that justify issuing of HYA R1 Licence Instruments 599 and 605.
- Signs Heysham 1 Licence Instrument 599 an Agreement under Licence Condition 22(1) of modifications undertaken to facilitate 7 pod operation at HYA R1.
- Signs this Project Assessment Report approving its release for publication, after redaction where appropriate.

I recommend that the Deputy Chief Inspector;

- Signs Heysham 1 Licence Instrument 605 an Approval to modify operating rules under Licence Condition 23(5) (replace 02/NSR/04 Issue 004 with 02/NSR/04 Issue 005).

7 REFERENCES

1. *Agreement under Arrangements Made Under Licence Condition 22(1) - HEYSHAM 1 – Compliance Arrangements for Boiler Spine Weld Temperatures (EC356499, Revision 003, Proposal Version 1) - January 2016 – TRIM 2016/39264*
2. *Heysham 1 power station, operation of Heysham 1 Reactor 1 on 7 boiler pods, paper of principle – NP/SC 7736 – TRIM 2015/480024*
3. *Heysham 1, Reactor 1, Safety Case for 7 Pod Operation (stage submission 1) – Modification Submission – EC 356858 – Revision 000 - Proposal Version No: 03 – February 2016 – TRIM 2016/156460*
4. *HYA R1 7 Pod Operation – Stage Submission 2 – Mechanical Segregation of 1D Quadrant – EC 356811 – Revision 000 - Proposal Version 02 – TRIM 2016/156464*
5. *Stage Submission 3 for Operation of Heysham 1 Reactor 1 on 7 Boiler Pods – Modifications to Reactor, Quadrant and Boiler/Circulator Protection – EC357280 - Revision 000 – Proposed Version 03 – TRIM 2016/156481*
6. *Stage Submission 4 for Operation of Heysham 1 Reactor 1 on 7 Boiler Pods – Data Processing Systems and Reactor Monitoring – EC 357282 – Revision 000 – Proposed Version 03 – TRIM 2016/156497*
7. *HYA R1 – 7 POD OPERATION – STAGE SUBMISSION 5 – COMMISSIONING – EC35739 000 Proposal Version No 03b – TRIM 2016/174277*
8. *Request for approval under licence condition 23(5) for amendment to a Nuclear Safety Requirement (NSR)/Request for Agreement or Acknowledgement under arrangements made under licence condition LC 22(1) – Letter from [REDACTED] – 23rd March 2016 – TRIM 2016/132772*
9. *ONR HOW2 Guide - Purpose and Scope of Permissioning - NS-PER-GD-014 Revision 4. July 2014. <http://www.onr.org.uk/operational/assessment/index.htm>*
10. *Permissioning Strategy for Heysham 1 Reactor 1 Pod Boiler D2 (1D2) – January 2016 – TRIM 2016/6084*
11. *HYA 71086 N – Letter to Company Secretary - ACKNOWLEDGEMENT OF NP/SC 7736 OPERATION OF HEYSHAM 1 REACTOR 1 ON 7 BOILER PODS - PAPER OF PRINCIPLE (EC354732) – 12 February 2016 – TRIM 2016/64472*
12. *Proposals to recover 1D1 and 1D2 boiler pods - letter to [REDACTED] - 12 February 2016 – TRIM 2016/168227*
13. *Heysham 1 Reactor 1 – 7 Pod Operation – Stage Submission 1 - ONR letter to EDF NGL before start of outage - TRIM 2016/156665*
14. *7 out of 8 Pod Operation at Heysham 1 – Level 4 Meeting – 4th February 2016 – TRIM 2016/64085*
15. *7 out of 8 Pod Operation at Heysham 1 – Level 4 Meeting – 10th March 2016 – TRIM 2016/119741*
16. *7 out of 8 Pod Operation at Heysham 1 – Level 4 Meeting – 24th March 2016 – TRIM 2016/143904*
17. *7 out of 8 Pod Operation of Reactor 1 at Heysham 1 – Level 4 Meeting - Electrical Aspects - Contact Report– [REDACTED] – TRIM 2016/159269*
18. *Control and instrumentation assessment of operation of Heysham 1 Reactor 1 on 7 boiler pods - [REDACTED] – TRIM 2016/159672*
19. *Structural Integrity Assessment of Heysham 1 1D2 Boiler Recovery [REDACTED] – TRIM 2016/132971*

20. *Fault Studies Assessment of NP/SC 7736 SS1- Heysham 1, Reactor 1, Safety Case for 7 Pod Operation* – [REDACTED] – TRIM 2016/134343
21. *Mechanical Engineering Assessment of Operation of Heysham 1 Reactor 1 on 7 Boiler Pods Site* [REDACTED] – TRIM 2016/136792
22. *Intervention Record – HYA R1 – Planned LC17 and LC25 compliance inspection – 12-14 April 2016* – TRIM 2016/174562
23. *ONR-CNRP-Contact Record-15-327 HYA - Level 4 meeting to discuss feed flow x modifications and HYA simulator* [REDACTED] - 15 February 2016 - TRIM 2016/70271.