Office for Nuclear Regulation

Hunterston B Reactor 4 Periodic Shutdown 2020

ONR Agreement for Extension of Operating Period for Hunterston B Reactor 4

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EXECUTIVE SUMMARY

Title

ONR Agreement for Extension of Operating Period for Hunterston B Reactor 4.

Permission Requested

EDF Energy Nuclear Generation Limited (NGL) has requested Agreement from the Office for Nuclear Regulation (ONR) to extend the operating period of Hunterston B (HNB) Power Station Reactor 4 (R4) until the end of generation to no later than 07 January 2022. This request is made in accordance with Licence Condition (LC) 30 (Periodic Shutdown) of the station's nuclear site licence.

Background

Nuclear site licensees are required to comply with conditions attached to the nuclear site licence. LC 30(1) states that for the purpose of enabling examination, inspection maintenance and testing of any plant or process, the licensee shall, when necessary, ensure that any such plant or process is shutdown in accordance with the requirements of the plant maintenance schedule. LC 30(2) gives ONR the authority to Agree to an extension of a plant's operating period based on an adequate safety justification from the licensee.

The current operating period for R4 will expire on the 31 March 2021. NGL wish to extend this operating period until the 07 January 2022. This extension is supported by an Engineering Change which justifies postponing the outage until June 2022. The proposed outage start date of no later than the end of June 2022 takes into account the declared closure date of R4 and work proposed during the planned graphite inspection outage in 2021.

NGL considered deferral of the statutory outage until after the end of generation to 30 June 2022 will not significantly reduce the reliability or availability of nuclear safety systems and will not lead to any significant increase in the frequency of plant faults as initiating events during the extended period of operation.

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

NGL's safety justification for the extension of the operating period of HNB R4 was examined by the following discipline specialists:

- Civil engineering
- Structural integrity
- Graphite
- Mechanical engineering
- Electrical engineering
- Control and instrumentation.

Overall, the specialist inspectors considered that the deferral would have no, or negligible, impact on nuclear safety and they all supported, or had no objections to Agreeing to the extension to the operating period for R4.

Matters arising from ONR's work

ONR's assessment did not reveal any nuclear safety concerns that would prevent Agreement to the extension of the R4 operating until the end of generation. The assessment conclusions were supported by evidence that:

- NGL had sought input from relevant suitably qualified and experienced personnel (SQEP).

- Agreement was or will be reached with the Pressure Systems Safety Regulations (PSSR) competent person regarding any proposed postponements of inspections.
- The outage deferral is supported by NGL's independent nuclear safety assessment (INA).

Conclusion

ONR's assessment concluded that, NGL has carried out an adequate safety assessment demonstrating the safety of the proposed extension of HNB R4 operating period and supported the issue of ONR Agreement to NGL's request.

Recommendation

I recommend that ONR issue Licence Instrument 569 under LC30(2) for Nuclear Site Licence Sc.13 giving ONR's Agreement to extend the operating period of HNB R4 until 07 January 2022.

LIST OF ABBREVIATIONS

AGR	Advanced gas cooled reactor
ALARP	As low as reasonably practicable
EC	Engineering Change
EC&I	Electrical Control and Instrumentation
EDF	Electricite de France
EIMT	Examination, Inspection, Maintenance and Testing
ERR	Equipment Reliability Reviews
HNB	Hunterston B nuclear power station
INA	Independent Nuclear Assurance
INSA	Independent Nuclear Safety Assessment
LC	Licence Condition
LSD	Living Safety case Documents
MITS	Maintenance Inspection and Testing Schedules
MS	Maintenance Schedule
NGL	Nuclear Generation Limited
ONR	Office for Nuclear Regulation
PCPV	Pre-stressed Concrete Pressure Vessel
PSSR	Pressure Systems Safety Regulations
RTS	Return to Service
R4	Reactor 4
SSR	Station Safety Report
SEPA	Scottish Environment Protection Agency
SQEP	Suitable Qualified and Experienced Personnel

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1 PERMISSION REQUESTED

1. EDF Energy Nuclear Generation Limited (NGL), the operator and Licensee of Hunterston B nuclear power station (HNB), has written to the Office for Nuclear Regulation (ONR) requesting Agreement to an extension of Reactor 4's (R4) operating period up to 07 January 2022 under Licence Condition 30(2) (Ref. 1).

2. This ONR project assessment report has been produced to record regulatory views and judgments in consideration of NGL's request for the extension of the operating period for HNB R4.

2 BACKGROUND

3. The nuclear site licence requires the Licensee to periodically shutdown plant under Licence Condition (LC) 30: Periodic Shutdown to enable examination, inspection, maintenance and testing (EIMT) to take place in accordance with the requirements of its plant maintenance schedule (MS) referred to in LC28(4) EIMT.

4. Requirements of the MS are derived from claims made in the station's safety case (required under LC23: Operating Rules), along with other regulatory requirements, such as Pressure Systems Safety Regulations (PSSR), and requirements from equipment manufacturers.

5. For safety case claims for the operation of equipment, these requirements normally relate to potential damage mechanisms such as metal creep, fatigue or corrosion. Time-based EIMT requirements are identified in the MS derived safety case requirements to ensure appropriate monitoring of equipment takes place and forewarning of failure can be achieved. Such time-based intervals are referred to as operating periods.

6. The operating period for the two reactors at HNB is identified in the MS preface, which is an approved document under LC28(4). This requires that each reactor is shut down after a maximum period of three calendar years following the Consent of ONR to the start-up of the reactor after a routine periodic shutdown. The previous start-up Consent Licence Instrument (LI) 558 (Ref. 2) for R4 is dated 06 November 2017. This required the shutdown of R4 on or before 06 November 2020.

7. LC 30(2) gives ONR the authority to Agree to an extension of a plant's operating period based on an adequate safety justification from the licensee.

8. R4 returned to service on 27 September 2020 from an extended R4 graphite inspection (or 'interim') outage, which started in December 2019. HNB R4 was due to begin its 2020 outage on 6 November 2020, but EDF Energy NGL sought and obtained and Agreement, from ONR, (Ref. 3) to defer this until the 31 March 2021. This allowed R4 the opportunity to complete a 6-month run at-power following its return to service.

9. The current operating period for R4 will expire on the 31 March 2021. NGL wish to extend this operating period until the 07 January 2022. This extension is supported by an Engineering Change (Ref. 4) which justifies postponing the outage until June 2022. The proposed outage start date of no later than the end of June 2022 takes into account the declared closure date of R4 and work proposed during the planned graphite inspection outage in 2021.

10. NGL consider that the deferral of the statutory outage until the end of generation will not significantly reduce the reliability or availability of nuclear safety systems and will not lead to any significant increase in the frequency of plant faults as initiating events during the extended operating period. The safety justification was presented at category 2 which therefore required a formal independent nuclear safety assessment (Ref. 5).

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

11. The NGL safety justification for extending the HNB R4 operating period is based on the following claims:

- Claim 1 - The operational history of Reactor 4 is satisfactory
- Claim 2 - The inspection reports at the last statutory outage of Reactor 4 in 2017 are satisfactory
- Claim 3 - Constraints imposed by the safety case do not affect the deferment of the statutory outage
- Claim 4 - The proposed changes to the inspection interval are consistent with maintaining an overall risk that is ALARP.

12. A technical report has also been produced by NGL which takes the form of a plant area review (Ref. 6), divided into plant areas as per the maintenance inspection and testing schedule (MITS). The report and its appendices include the following areas:

- Identification of MITS activities required to be undertaken during a statutory outage.
- Review of issues identified during past MITS activities and arising in the current operating period. This is accomplished through a review of recent statutory outage Return to Service (RTS) Engineering Changes (EC), Station Safety Reports (SSRs) and Equipment Reliability Reviews (ERRs) and through consultation with the relevant HNB System Engineers.
- Review of other documents that may indicate reasons for why the activities cannot be deferred. This will include reviewing the appropriate Living Safety case Documents (LSDs).
- Assessment of the findings in the above reviews to establish if any present nuclear safety issues could be affected by deferring the R4 statutory outage to 2022.
- Identification of any work that would be required in order to support an outage deferral.

13. Based on the claims, arguments and evidence, the following ONR specialist inspectors have examined NGL's safety justification:

- Civil Engineering
- Structural Integrity
- Graphite
- Mechanical Engineering
- Electrical Engineering
- Control and Instrumentation

14. Sections 3.1 – 3.6 below present a high-level summary of the findings from each of the specialist inspectors.

3.1 Civil Engineering Assessment

15. An assessment from the specialist civil engineer was not required to support this deferral (Ref. 7). This was based on assessment of the previous deferral (Ref. 8) and on the basis that:

- The licensee has agreed to carry out the 2 remaining MITS items during the graphite inspection outage (GIO), scheduled for April 2021.
- To conclude the PCPV assessment, the Appointed Examiner will produce a full report on the results of the PCPV MITS results by 31st May 2021.

- The specialist inspector reviewed EC 368383 and the supporting plant area review and noted no new proposals or information from their previous assessment.

16. To conclude, the specialist civil engineer inspector has no objection to the proposed extension of the R4 operating period to 7 January 2022.

3.2 Structural Integrity Assessment

17. The specialist structural integrity inspector focussed their assessment (Ref.10) on the following areas:

- Steam and feed systems;
- Main cooling water systems;
- PCPV penetrations;
- PSSR compliance.

18. The specialist inspector has reviewed recent HNB structural integrity periodic shutdown assessments and has not identified any structural integrity issues which impact upon R4 and would prevent deferral of the R4 2020 periodic shutdown until June 2022.

19. The specialist inspector agrees with the view that accumulated degradation (creep, fatigue and corrosion) associated with the R4 operating history from November 2017 until June 2022 (with end of generation no later than 7 January 2022), would be less than the normal 36 months at full power operation since 2017.

20. No structural integrity issues relating to the steam and feed systems, cooling water systems, gas bypass plant, decay heat system, core restraints or PCPV penetrations have been identified which impact upon R4 and prevent deferral of the R4 2020 periodic shutdown until June 2022.

21. The specialist inspector is content that an appropriate process has been implemented to agree postponement of PSSR inspections and they have now been agreed by the Competent Person.

22. To conclude, the specialist structural integrity inspector has no objection to the proposed extension of the R4 operating period to 7 January 2022.

3.3 Graphite Assessment

23. The specialist graphite inspector reviewed the deferral EC taking into consideration the recent ONR R4 graphite assessments, focussing on the implications of not performing the graphite trepanning activities and concluded that a full assessment was not required (Ref. 11).

3.4 Mechanical Engineering Assessment

24. The specialist mechanical engineering assessment (Ref. 12) built on work undertaken in the evaluation of NGL's request to extend R4's operating period from 5 November 2020 to 31 March 2021. It focussed on the same systems to determine whether their performance and reliability will be impaired by extending R4's operating period and deferral of periodic shutdown EIMT requirements:

- Gas Circulators;
- Reactor vessel CO_2 gas safety relief valves;
- Control rods.

25. The assessment concluded that no safety matters preventing ONR issuing its agreement to extend R4's periodic shutdown operating period to 7 January 2022 and deferring identified EIMT requirements to 30 June 2022, were identified.

26. To conclude, the specialist mechanical engineering inspector has no objection to the proposed extension of the R4 operating period to 7 January 2022.

3.5 Electrical Engineering Assessment

27. The specialist electrical engineering assessment (Ref. 13) considered the arguments and evidence in the proposal that support the claims made by NGL. This included:

- An examination of ERRs;
- A review of return to service ECs and 28-day reports;
- A review of the plant area review report.

28. The specialist electrical engineering inspector focussed their assessment on gas circulators, essential supplies, oil filled transformers, short break supply systems and no break supplies systems.

29. As a result of their assessment the specialist electrical engineering inspector is satisfied, from the sample assessed for HNB in an electrical engineering context, that:

- The operational history of Reactor 4 is satisfactory;
- The inspection reports at the last statutory outage of Reactor 4 are satisfactory;
- The constraints imposed by the safety case do not affect the deferment of the statutory outage;
- The proposed changes to the inspection interval are consistent with maintaining the overall risk to be ALARP.

30. As a result of their assessment the specialist inspector did not identify anything of significance in relation to electrical engineering aspects that should prevent deferral of the Hunterston B Reactor 4 Periodic Shutdown. To conclude, the specialist electrical engineering inspector has no objection to the proposed extension of the R4 operating period to 7 January 2022.

3.6 Control and Instrumentation Assessment

31. The objectives of the specialist C&I assessment (Ref. 14) of EDF NGL's nuclear safety justification for deferring the HNB R4 statutory outage until the end of June 2022 were:

- To determine whether C&I related statutory outage examination, inspection, maintenance and testing activities covered by the HNB maintenance schedule have been reviewed by suitably qualified and experienced personnel (SQEP).
- To determine if the potential for the performance of C&I systems / equipment important to safety to drift / degrade such that it becomes unable to perform its nuclear safety function during the statutory outage deferral period has been considered by SQEP and been adequately assessed to remain acceptably low.
- To determine if the potential for C&I systems / equipment important to safety to reach a reliability cliff edge during the statutory outage deferral period has been considered by SQEP and been adequately assessed to remain acceptably low.
- To determine if appropriate C&I related statutory outage risk reduction measures have been identified.

32. Based on the information provided, the specialist C&I inspector considers the C&I system / equipment risks associated with deferring the HNB R4 statutory outage until the end of June 2022 to be negligible

33. To conclude, the specialist control and instrumentation inspector has no objection to the proposed extension of the R4 operating period to 7 January 2022.

4 MATTERS ARISING FROM ONR'S WORK

34. Each of the ONR specialist inspectors; civil engineering, structural integrity, graphite, mechanical engineering, electrical engineering and control and instrumentation, examined the NGL safety justification for the outage deferral. The specialist inspectors considered that the deferral would have no, or negligible, impact on nuclear safety and they all supported, or had no objections to Agreeing to the extension to the operating period for HNB R4.

35. Their judgements were supported by the evidence that:

- NGL had sought input from relevant suitably qualified and experienced personnel;
- Agreement was or will be reached with the PSSR competent person regarding any proposed postponements of Written Scheme of Examination (WSE) inspections;
- The outage deferral is supported by NGL's independent nuclear safety assessment (INSA) team.

36. No concerns were raised by any of the specialist inspectors and the request for the extension of the operating period was considered reasonable.

4.1 Engagement with other Government Agencies

37. The HNB Scottish Environment Protection Agency (SEPA) site inspector has been informed that ONR intended to issue an LI giving its agreement to the extension of R4'soperating period. SEPA confirmed that it has no objections to the deferral proposal and ONR issuing an Agreement to extend the R4 operating period (Ref. 15).

5 CONCLUSIONS

38. ONR has undertaken assessment of NGL's safety justification for extending the operating period of HNB R4.

39. The current operating period for R4 will expire on the 31 March 2021. NGL has requested to extend the operating period until the 07 January 2022. This extension is supported by an Engineering Change which justifies postponing the outage until June 2022.

40. ONR's assessments of the proposed extension to the operating period judged that the outage deferral would have no, or negligible, impact on nuclear safety and supported, or had no objections to, Agreeing to the extension to the operating period.

6 RECOMMENDATIONS

1. I recommend ONR issues Licence Instrument 569 under LC30(2) for Nuclear Site Licence Sc.13, giving ONR's Agreement to extend the operating period of HNB R4 to 7 January 2022.

7 REFERENCES

1. NSL HNB50575R. Extension of Hunterston B Reactor 4 Operating Period, CM9 2021/2508
2. Licence Instrument 558, Consent Granted under Condition 30(3) of Schedule 2 attached to Nuclear Site License No Sc.13 Hunterston B, CM9 2017/410629
3. Licence Instrument 568, Agreement Granted under Condition 30(2) of Schedule 2 attached to Nuclear Site License No Sc. 13 Hunterston B, CM9 2020/304222
4. EC No 368383 Proposal Version 02 – Deferral of Hunterston B R4 Statutory Outage MITS Routines until 2022, CM9 2021/865
5. EDF Nuclear Generation Ltd Milestone Full INSA Approval Statement, CM9 2021/2508
6. DAO/REP/JICC/081/HNB/20, Hunterston B Power Station – Deferral of HNB R4 2020 Statutory Outage – Plan Area Review, Revision 000, August 2020, CM9 2020/270783
7. Email from C. Ryan to S. Thompson – Civil Engineering 'Assessment Note' RE: EC 36883 – HNB R4 2nd outage deferral – INSA received – 10/12/2020, CM9 2021/2583
8. ONR-OFD-AR-20-059 Revision 0 Civil Engineering Assessment of Proposed Statutory Outage Deferral for Hunterston B Reactor 4, CM9 2020/301035
9. Email from S. Hinley – RE: Hunterston B R4 deferral, 23/02/2021 CM9 2021/15915
10. ONR-OFD-AR-20-090, EC367341 – Postponement of Periodic Shutdown of Reactor 4 Until 2022 CM9 2020/323531 (Structural Integrity)
11. Email from M. Bamber to S. Thompson RE: EC 368383 – HNB R4 2nd outage deferral – INSA received – 21/12/2020, CM9 2021/2581
12. ONR-OFD-AR-20-102, Mechanical Engineering Assessment of Safety Justification for Extension of Hunterston B Reactor 4 Planned 2021 Periodic Shutdown Operating Period, CM9 2021/11483
13. ONR-OFD-AR-20-097, Deferral of Hunterston B Reactor 4 Statutory Outage MITS Routines Until 2022 - EC 368383 – Revision 0 Version 2, CM9 2021/10577 (Electrical Engineering)
14. Control and Instrumentation (C&I) Assessment of EDF NGL's Nuclear Safety Justification for Deferring the HNB R4 Statutory Outage Until the End of June 2022 (Engineering Change (EC) 368383, Proposal Version 02), CM9 2021/15376
15. Email from P. Dale (SEPA) to S. Thompson – HPE CM: ONR Confirmation 23/03/2021, CM9 2021/24751