



**Torness Reactor 1 Periodic Shutdown 2020**

**ONR Agreement for Extension of Operating Period for Torness Reactor 1**

Project Assessment Report ONR-OFD-PAR-20-006  
Revision 0  
21 July 2020



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Published 10/20

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## EXECUTIVE SUMMARY

### Title

ONR Agreement for Extension of Operating Period for Torness Reactor 1.

### Permission Requested

EDF Energy Nuclear Generation Limited (NGL), the operator (known as the Licensee) of Torness (TOR) power station, has requested permission from the Office for Nuclear Regulation (ONR) to extend the operating period of Torness Reactor 1 (R1) from 26 July 2020 until 7 March 2021. This request is in line with the Licensee's arrangements, as set out in Licence Condition (LC) 30 (Periodic Shutdown) of its 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. The licensee's arrangements require that periodic shutdowns, as required by LC 30(1), are carried out every three years on each reactor at TOR. The previous start-up consent for R1 was granted on 6 June 2017.

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.

A previous extension was granted by ONR, via Licence Instrument (LI) 560, which Agreed to the extension of the operating period, of TOR R1, from 6 June 2020 to no later than 26 July 2020. This initial extension aimed to minimise the overlap between statutory outages taking place at Heysham A (HYA) and TOR power stations. EDF have now requested via another Engineering Change (EC) to move the outage to no later than 7 March 2021. This second deferral is based on NGL's view that conducting the outage in July 2020 would not be ALARP due to the increased risk presented by the Covid-19 pandemic. NGL recognise that the supply chain and contractor availability could be significantly impacted during the current planned outage period and it would be difficult to ensure staff safety onsite in line with expected social distancing requirements.

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

NGL's safety justification for the extension of the operating period was examined by the following ONR discipline specialists: structural integrity, graphite, civil engineering, electrical engineering, mechanical engineering, control & instrumentation, probabilistic safety analysis, and chemistry. There were no issues identified that would prevent Agreement by ONR to the requested extension of the R1 operating period. The Scottish Environment Protection Agency (SEPA) was consulted and raised no objections to ONR issuing an Agreement to the extension.

### Matters arising from ONR's work

During the assessment of the submitted case there were several areas that ONR considered required either further evidence, or clarity on the evidence presented in order to support the deferral request. ONR engaged with the licensee to secure adequate responses to all of the identified queries. The responses provided to ONR's queries ensured that the case clearly demonstrated robust evidence for the suitability of the deferral.

ONR's inspectors did not identify any concerns that the extension of the R1 operating period would increase safety risks. The judgements were supported by evidence that:

- NGL had sought input from relevant suitably qualified and experienced personnel,
- Agreement has been reached with the Pressure Safety System Regulations (PSSR) competent person regarding any proposed postponements of inspections.

## **Conclusions**

ONR's assessment confirms that NGL has carried out an adequate safety assessment demonstrating the safety of the proposed extension of the R1 operating period and supports issuing the Agreement.

## **Recommendation**

It is recommended that ONR issue Licence Instrument 561 under LC30(2) for Nuclear Site Licence Sc.14 giving ONR's Agreement to extend the operating period of Torness Reactor 1 until no later than 7 March 2021.

## LIST OF ABBREVIATIONS

ALARP	As low as reasonably practicable
APEX	Appointed Examiner
AR	Assessment Report
CTO	Central Technical Organisation
EC	Engineering Change
EIMT	Examination, Inspection, Maintenance and Testing
GC	Gas Circulator
GCRP	Gas Circulator Review Panel
HNB	Hunterston B nuclear power station
HYA	Heysham A nuclear power station
HYB	Heysham B nuclear power station
IJCO	Interim Justification for Continued Operation
INA	Independent Nuclear Assurance
INSA	Independent Nuclear Safety Assessment
LC	Licence Condition
LP	Low Pressure
MITs	Maintenance Inspection Test Schedule
MS	Maintenance Schedule
NSC	Nuclear Safety Committee
NGL	EdF Energy Nuclear Generation Limited
ONR	Office for Nuclear Regulation
PAR	Project Assessment Report
PICA	PSR Identified Corrective Actions
PSSR	Pressure Safety System Regulations
PTSE	Post-trip Sequencing Equipment
R1	Reactor 1 (at Torness)
SEPA	Scottish Environment Protection Agency
SSC	System Structure and Components
TWd	Terra-Watt Day
TOR	Torness nuclear power station
WSE	Written Scheme of Examination

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## **1 PERMISSION REQUESTED**

1. EDF Energy Nuclear Generation Limited (NGL), the operator and Licensee of Torness (TOR) nuclear power station, has written (Ref. 1) to the Office for Nuclear Regulation (ONR) requesting Agreement to an extension of Reactor 1's (R1) operating period to no later than 7 March 2021.
2. This ONR project assessment report (PAR) has been produced to record regulatory views and judgments in consideration of NGL's request for the extension of the operating period for TOR R1.

## **2 BACKGROUND**

3. The nuclear site licence requires the Licensee to periodically shutdown plant under Licence Condition (LC) 30: 'Periodic Shutdown'. This is to enable examination, inspection, maintenance and testing (EIM&T) to take place in accordance with the requirements of the plant maintenance schedule (MS) under LC28: 'Examination, inspection, maintenance and testing'. At TOR reactor periodic shutdowns are undertaken every three years, as specified in the MS Preface, which is an Approved document under LC28 (4).
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 System Safety Regulations (PSSR), and requirements from equipment manufacturers.
5. LC30(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.
6. Without ONR Agreement to the extension of an operating period TOR R1 is required to be shutdown on, or before, the third anniversary of the previous ONR Consent to restart. The previous Consent to restart TOR R1 (Licence Instrument (LI) 553(Ref. 2)) was issued 6 June 2017, and therefore the operating period would expire on 6 June 2020.
7. Prior to the expiry of this date, NGL requested an extension to the operating period (Ref. 3) to no later than 26 July 2020. ONR Agreed to this extension (Ref. 4), under LI 560, and as such, TOR R1 is permitted to operate until no later than this date without a further Agreement from ONR. This first deferral was initially requested to ensure there was no significant overlap with the planned statutory outage due to take place at Heysham A (HYA) power station.
8. Due to the Covid-19 pandemic NGL now believe that to conduct the TOR R1 outage in July 2020 would present an increased risk to both nuclear and personnel safety and have submitted to ONR Engineering Change (EC) 367867 (Ref. 5) as safety justification for extending R1's operating period, for a second time, to no later than 7 March 2021. This is a total extension of up to 274 days.
9. NGL have entered phase D of their company pandemic plan (Ref. 6). NGL state within their guidance that Phase D is enacted when "the pandemic has or has the potential to have a significant impact upon business continuity including security of supply (i.e. widespread cases of the virus in the UK and / or inside the Company)". NGL claim that both the supply chain and contractor availability will be significantly affected over the current planned outage and as such it will not be possible to efficiently execute the planned outage and the scope of such an outage would necessarily be significantly reduced. NGL also claim that starting the outage in July 2020 would present significant challenges to ensuring the safety of staff and contract partners due to the expected social distancing requirements.



10. The deferral length requested by NGL is relatively longer than typical outage deferrals and as such it has been assessed proportionally by a number of ONR specialist inspectors.
11. NGL considers that it is ALARP to defer the outage until no later than 7 March 2021 based on the claims, arguments and evidence presented in its case.
12. The safety justification was presented as a category 2 EC which therefore required a formal independent nuclear safety assessment (INSA). The case underwent an independent nuclear safety assessment (Ref. 7) by NGL's internal nuclear regulator who supported the proposal.

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

13. In this PAR ONR has considered the request to the extension of the operating period of TOR R1 by 274 days. Whilst it is not uncommon for EDF to request an outage deferral from ONR this particular extension to the operating period is relatively longer in duration. As such, it was considered appropriate that the submitted case was assessed by the majority of specialisms that are normally utilised during the assessment of operating reactors statutory outages.
14. ONR has utilised the following specialist inspector resource in order to proportionally assess the case:
  - Graphite
  - Structural Integrity
  - Civil engineering
  - Mechanical engineering
  - Electrical engineering
  - Control and Instrumentation
  - Probabilistic Safety Analysis
  - Chemistry
  - Security
15. Additionally the findings of NGL's internal regulator, Independent Nuclear Assurance (INA), have been taken into consideration (Ref. 7). The INSA certificate highlights that the justification for extending the period of operation has been considered separately for each technical area, which concludes that no issues have been identified that could prevent operation to the proposed shutdown.
16. The INSA certificate does however highlight that there are a number of entries on the MS which have multiples of 3 years (6Y, 9Y, 12Y etc), some of which will come out of compliance as a result of this operating period extension. This issue was also identified independently by ONR and an appropriate regulatory issue has been raised (see para 68) that will be tracked to closure via routine regulatory engagement. This extension of R1 is not predicated on this issue being closed but may impact future outage requests.
17. The NGL safety justification for extending the operating period considered the requirements of the following prescriptive documents:
  - Maintenance, inspection and testing schedule (MS) requirements,
  - Component life assessment,
  - Specific commitments made in previous return to service ECs,
  - Periodic Safety Review (PSR) Identified Corrective Actions (PICAs),
  - Planned modifications in support of safety cases,

- Safety case commitments and caveats including Engineering Changes (ECs), Justifications for Continued Operation (JCOs) and Interim Justifications for Continued Operations (IJCOs),
  - Written Schemes of Examination (WSE) for Pressure Systems Safety Regulations (PSSR),
  - Environmental Maintenance, Inspection and Testing Schedules (EMITS).
18. The submitted case is based on the following two claims:
1. Nuclear safety systems will not incur any significant decrease in their reliability and functionality claims, and there will not be any significant increase in the risk of an initiating event during the extended period of operation.
  2. The nuclear safety issues identified within this submission are not significantly impacted by the proposed delay in statutory outage activities by up to 274 days, as such, the change in risk is sufficiently small that this would not preclude the proposed deferral.
19. The proposal presented the arguments and evidence to support these claims which was the basis for assessment of each of the ONR specialist inspectors.
20. Section 3.1-3.9 below presents a high level summary of the findings from each of the specialist inspectors' reports.
21. During the assessment of the proposal ONR maintained a tracker (Ref. 8) of all technical queries (TQs) relating to the case that were presented to NGL. Each of these TQs was subsequently closed by the relevant ONR specialist inspector upon receipt of satisfactory evidence.

### 3.1 GRAPHITE ASSESSMENT

22. Reference 9 provides the findings of the ONR graphite core integrity assessment of the TOR R1 outage deferral request, which is summarised below.
23. The scope of the graphite assessment was based on the claims, arguments and evidence presented within the submitted case (Ref. 5) and examining these in relation to the current graphite core safety case NP/SC 7663 (Ref. 10) for TOR R1.
24. Within the assessment the specialist inspector considered the following areas:
- Graphite weight loss limits,
  - Peripheral brick cracking,
  - Seal ring groove wall (SRGW) cracking,
  - Graphite brick cracking limits.
25. **Graphite Weight Loss:** The current justified core burn-up for TOR reactors is 15.4 Tera-Watt Days (TWd) which is not expected to be reached until October 2021 at the earliest. The graphite specialist inspector states within their assessment that the expected core burn-up in March 2021 is expected to be 15.1 TWd (below the current weight loss safety case limit). The specialist inspector was therefore satisfied that the graphite weight loss limit is unlikely to be exceeded during the extended period until March 2021.
26. **Peripheral brick cracking:** Peripheral brick cracking was not considered in the submission and as such was raised as a TQ by the specialist inspector to gain confidence that the rate of cracking in the peripheral bricks would not challenge the deferral of the outage.

27. In the response to the TQ NGL explained that the peripheral brick safety case demonstrates that the findings from all four HYB/TOR reactors were consistent and could therefore be used to inform the rate of cracking at TOR R1. NGL also explained that the previous inspections at TOR Reactor 2 (R2) and Heysham B (HYB) Reactor 8 (R8) had shown that the cracks being re-inspected had not progressed between the three-yearly inspections.
28. The specialist inspector was of the opinion that the findings from latest peripheral brick re-inspections at HYB and TOR are consistent with NGL's explanation and that the rate of cracking in the peripheral bricks is unlikely to be significant during the extended period until March 2021.
29. The graphite specialist inspector was satisfied that the inspection requirement of the peripheral brick cracks at TOR R1 should not be a concern for the deferral of the outage.
30. **Seal ring groove wall (SRGW) cracking:** During the last graphite inspections at TOR R1 in 2017, circumferential defects which present some similarities with SRGW cracking were observed in several channels. The specialist inspector raised a TQ to establish whether these observations could challenge the proposal of the outage deferral. In their response NGL described the defects as being rarely seen in the reactor and were likely to be the results of manufacturing defects and of bore stresses early in the life of the core. The specialist inspector was content that this explanation is reasonable as one of these defects was already observed in 2010 and more extensive bore cracking has been observed in other AGR cores.
31. The graphite specialist inspector was therefore satisfied that observations from previous graphite inspections do not challenge the deferral of the outage.
32. **Graphite brick cracking limits:** The graphite safety case for HYB/TOR is limited by the extent of cracking in the core being no more than 10% of singly axially cracked bricks. Whilst the number of cracked bricks due to bore cracking in the graphite core at HYB/TOR is relatively low, the number of cracks in the core is expected to increase following the onset of KWRC.
33. Noting that the R1 core burn-up (14.7 TWd) in July 2020 would be below the expected onset of KWRC (14.75 TWd) the graphite specialist inspector judged that it would be unlikely that KWRC would be observed if inspections took place during July 2020.
34. The graphite specialist inspector's view is that it is unlikely that the 10% limit on cracking in the HYB/TOR reactors would be exceeded by March 2021. Furthermore, in the unlikely event that cracking was to develop to the extent of NGL's 99.9 percentile prediction, the current graphite safety case at HYB/TOR demonstrates no cliff-edge beyond 10% cracking and up to 30% cracking. The specialist inspector was therefore satisfied that the risk from deferring the TOR R1 outage would not be significant.
35. The graphite specialist inspector raised one recommendation in their report:
  - To further demonstrate the lack of cliff-edge beyond 10% cracking, NGL should present the verified and technically reviewed results from the whole core damage tolerance assessments for HYB/TOR to ONR Graphite Inspectors at the earliest opportunity, currently expected to be before the end of October 2020.
36. This recommendation has been raised in the ONR Regulatory Issue database (Regulatory Issue 8174) which will ensure the relevant evidence is presented to ONR in a timely manner.

37. Overall the graphite specialist inspector was content that the claims, arguments and evidence presented within the case were acceptable and supported the deferral of the statutory outage to 7 March 2021.

### 3.2 STRUCTURAL INTEGRITY

38. Reference 11 provides the findings of the ONR structural integrity assessment of the TOR R1 outage deferral request, which is summarised below.
39. The scope of the structural integrity assessment focused on the justification by considering the arrangements for EIMT against the requirements of the MS and the PSSR WSE.
40. During their assessment the structural integrity specialist inspector considered the following areas:
- PSSR examinations,
  - Inspection of reactor sea water and auxiliary cooling water systems,
  - Survey of pipe restraints, supports, hangers and snubbers,
  - Inspections for corrosion, including Flow Assisted Corrosion (FAC),
  - Inspection of steel components in the reactor vessel and its penetrations,
  - Materials and weld inspections.
41. For all of the areas identified above the specialist inspector was content with the evidence presented and was satisfied that the submitted case makes adequate provision for EIMT to satisfy LC28 in light of the deferral.
42. The specialist inspector raised a number of TQs to clarify the evidence presented in the EC; these were all adequately responded to by NGL and closed out by the inspector.
43. **PSSR:** Due to the initial deferral of the TOR R1 outage to July 2020, it is recognised that some components that would require deferral under PSSR had already been deferred once. Under PSSR it is not permitted to defer an examination twice and as such for the second deferral to March 2021 NGL will be unable to complete a number of examinations by their required date. This issue has affected a number of UK licenced sites and driven by the exceptional issues presented by the Covid-19 pandemic. ONR issued a position statement (Ref. 12) on this matter to provide clarity on how licencees could adequately proceed. Ultimately, ONR have stated that where PSSR WSE examinations cannot be completed in good time as a result of the pandemic, the position given is that ONR will not automatically pursue enforcement action providing certain conditions are met.
44. Those conditions require that the delay is justified with agreement from the Competent Person (CP), that extensions to the inspection intervals are necessary, that there is judged to be no detriment to safety and that there is a written commitment to examine the equipment as soon as is practicable.
45. The structural integrity specialist inspector was content that the requirements set out in the ONR position statement were applicable to TOR R1 and the PSSR CP has provided a judgement that there is no detriment to safety in each case where Reference 12 applies.
46. Overall, the structural integrity specialist inspector was content that the claims, arguments and evidence presented within the case were acceptable and supported the deferral of the statutory outage to 7 March 2021.

### 3.3 CIVIL ENGINEERING

47. Reference 13 provides the findings of the ONR civil engineering assessment of the TOR R1 outage deferral request, which is summarised below.
48. The scope of the civil engineering assessment covers the aspects of the Pre-Stressed Concrete Pressure Vessel (PCPV), specifically the ten areas covered by the Appointed Examiner (APEX) under the written scheme of examination (WSE):
- Concrete Surface,
  - Anchorages,
  - Tendons,
  - Vertical pre-stressing strands,
  - Embedded strain gauges,
  - Pressure vessel cooling water leaks,
  - Settlement and tilt,
  - Vessel temperatures,
  - Reactor coolant leakage,
  - Top cap deflection.
49. **Concrete Surface:** The most recent visual examinations on the external surfaces of the TOR R1 PCPV were undertaken in June 2019 which concluded that the concrete surface of the accessible areas of the PCPV and support structure appeared to be in good condition. No evidence of unsatisfactory crack development or deterioration to the concrete integrity was noted since the previous examinations in 2017. Further examinations of the PCPV concrete surface will be undertaken prior to the start of the next Statutory Outage but the next MITS routine is not due until June 2022. This MITS activity is therefore not affected by the proposed deferral.
50. **Anchorages:** The last report concludes anchorage component systems are in good condition and should continue to provide satisfactory structural security to the pre-stressing tendons. This MITS activity is therefore not affected by the proposed deferral.
51. **Tendons:** A total of seventy six tendons (38 top and bottom) are load checked on the TOR R1 PCPV every three years whilst the reactor is pressurised. The last tendon load checks on TOR R1 were undertaken in 2018. For the upper and lower effective anchorage loads, the projected trend analysis demonstrates that adequate pre-stress, in excess of the minimum design load (MDL), should be available until at least 2023 and 2030 respectively. The next load checks are not due until Q4 in 2021. This MITS activity is therefore not affected by the proposed deferral.
52. **Vertical Pre-Stressing Strands:** Strand removal for visual examination, laboratory and mechanical testing is undertaken every three years whilst the reactor is pressurised. The last strand removals on R1 PCPV were undertaken in 2018 and the next strand removals are not due until Q4 in 2021. The last strand removals confirmed that the strands are generally in good condition with little or no visible corrosion. This MITS activity is therefore not affected by the proposed deferral.
53. **Embedded Strain Gauges:** The strain data and the temperature readings obtained from the vibrating wire strain gauges (VWSGs) over the period December 2013 to April 2017 confirms that the PCPV continues to behave in a stable, compressive state, with slowly increasing compressive strain due to concrete creep. This MITS activity is accepted by the APEX on the basis that the historical strain behaviour of the R1 PCPV has been stable and is expected to continue along the same trend.
54. **Pressure Vessel Cooling water leaks:** At three monthly intervals, the lower stressing gallery and secondary shutdown room are examined by the station system engineer



for any signs of water leakage. There are currently no Pressure Vessel Cooling System (PVCS) leaks on TOR R1. PVCS flow checks and resetting generally take place at two yearly intervals, with the exception of the pile cap area, where flows are checked at three yearly intervals during each statutory outage. Supplementary flow checks on penetrations not tolerant to PVCS blockages take place at three month intervals. The MITS activities for undertaking the three monthly and three yearly examinations of the PCPV external concrete surface for evidence of PVCS leakage and the two yearly PVCS flow checks are not affected by the proposed deferral. The MITS activities for undertaking the three yearly PVCS flow checks on the pile-cap area and undertaking the full three yearly APEX assessments are affected by the deferral, but is accepted by the APEX on the basis that there has historically been a low incidence of low flows in the pile-cap area, which shows that the system is functioning effectively.

55. **Settlement and Tilt:** Settlement and differential settlement (tilt) of the PCPV foundation is monitored every three years. A level survey of the TOR R1 PCPV was carried out in June 2018, with results showing no significant changes from previous data. A further settlement survey is scheduled for around June 2021. Settlement and tilt MITS activities can be undertaken whilst the reactor is both on or off-load and thus is not affected by the proposed deferral.
56. **Vessel Temperature:** A three yearly summary report reviewed the TOR R1 PCPV temperatures over the period from September 2015 to September 2018 and concluded that the vessel temperatures were satisfactory, with regard to operational limits, and no significant adverse trends were detected. A representative selection of PCPV temperature records for the period from September 2018 to April 2020 has also been reviewed by the APEX to check for any fluctuations or trends in temperatures, it was concluded that the concrete and liner temperatures have remained within permissible limits.
57. **Reactor Coolant Leakage:** The level of primary coolant leakage from the pressure boundary is assessed, with consideration then given as to the effect on the PCPV. Since June 2017 the results of routine checks have not indicated any significant leakage of CO<sub>2</sub>. The average CO<sub>2</sub> mass flow rate measured from June 2017 to February 2020 was 0.0022g/sec. A limit of 0.01g/sec is specified.
58. **Top Cap Deflection:** The on-load deflection of the top cap is currently measured annually at TOR under normal operating conditions. The most recent on-load survey took place in June 2019 and the results were consistent with previous surveys. The off-load deflection of the top-cap is measured each outage when the reactor is depressurised. The most recent off-load Survey took place May 2017. The MITS activity for the off-load survey is affected by the proposed deferral but is accepted by the APEX on the basis that this examination requires the stable off-load conditions of a statutory outage and the previous results have indicated satisfactory behaviour.
59. Overall, the civil engineering specialist inspector was content that the evidence presented within the case was acceptable and supported the deferral of the statutory outage to 7 March 2021.

### 3.4 MECHANICAL ENGINEERING

60. Reference 14 provides the findings of the ONR mechanical engineering assessment of the TOR R1 outage deferral request, which is summarised below.
61. The scope of the mechanical engineering assessment covers the mechanical structures, systems, and components (SSCs) that would have the greatest impact on

- safety should they fail. The specialist inspector also considered the gas circulators (GCs) that were due to be exchanged during the proposed outage.
62. The mechanical engineering specialist inspector extended the scope to include the low pressure (LP) turbines as the submitted case identified that dispensations would be required against NGL Company Technical Standards. Turbine disintegration has the potential to generate projectiles affecting other nuclear safety significant SSCs and is addressed within the safety case.
63. **Gas Circulators:** The GCs have a significant safety role in providing adequate cooling of the reactor, they also form part of the containment boundary. Two of the eight GCs are exchanged each outage with a further two being removed for impellor inspection and refitted. The two A1 quadrant GCs due for exchange will have been in service for 13.6 years by March 2021, the longest running GCs of the HYB/TOR design, but within the operating experience from Hunterston B (HNB) GCs which are of a similar design.
64. The specialist inspector sampled the Gas Circulator Review Panel (GCRP) minutes and the evidence presented to the panel and was satisfied the panel was formed of suitably qualified and experienced persons (SQEP) and the scope of the GCRP review was adequate to support its decision. The panel concluded that the TOR R1 GCs are expected to complete their nuclear safety function until the deferred outage start date. The specialist inspector was satisfied that the evidence presented to the GCRP was reasonable and adequate in order to make a judgement on the deferral period.
65. **Turbines:** Within the submitted case it is identified that that low pressure (LP) rotor PF161608 will have accumulated nearly 7 years / 59,234 hours operation by the deferred outage date. It was fitted into TG1 'A' berth in April 2014 following a full overhaul at 159,062 total hour's operation. This being the last operational EDF fleet rotor fitted with 12%Cr 'LD66' blades, known to be susceptible to blade / rotor attachment SCC and aerofoil fatigue failures.
66. This is nearly 20% more than the NGL Company Technical Standard 50,000 hour inspection limit for 12%Cr 'LD66' blades. The case identifies that a dispensation is required for deferral of the outage. The specialist inspector reviewed the submitted dispensation and was satisfied that it is based on reasonable mitigating factors and engineering judgement and the response shows that the mitigating actions will be implemented to support continued operation. Turbine disintegration is a low risk event and the ONR PSA review (section 3.7) judged the risk impact due to a potential increase in turbine failure frequency is likely to be low.
67. **MS Preface:** During their assessment the specialist inspector queried the validity of the stated tolerances associated with 6, 9 and 12 year outage related MS items. The submitted case claims that these tolerances are 48, 79, and 106 weeks respectively, despite the Approved version of the MS Preface for TOR not actually stating tolerances for outage related MS items. The specialist inspector was satisfied that the submitted case provides sufficient evidence for the requested deferral to 7 March 2021 but that it does not sufficiently consider the effect of the cumulative deferral on 6, 9 and 12 year outage related MS items due at subsequent outages. As such the specialist inspector made the following recommendation:
- In the planning of future TOR R1 outages, the Licensee should demonstrate that it has considered the implications of the deferral period of approximately 39 weeks to ensure that MS tolerances are not exceeded.
68. A level 4 regulatory issue has been raised (8184) in order to ensure that appropriate evidence is provided to ONR regarding the implications for subsequent outages.

69. Overall, the mechanical engineering specialist inspector was content that the evidence presented within the case was acceptable and supported the deferral of the statutory outage to 7 March 2021.

### **3.5 ELECTRICAL ENGINEERING**

70. Reference 15 provides the findings of the ONR electrical engineering assessment of the TOR R1 outage deferral request, which is summarised below.
71. The scope of the electrical assessment covers the arguments and evidence that supports the claims within the submitted case from an electrical engineering perspective. As part of their assessment the specialist inspector was satisfied, from the sample assessed in an electrical engineering context that nuclear safety systems will not incur any significant decrease in their reliability and functionality claims, and that the nuclear safety issues identified within the proposal are not significantly impacted by the delay in statutory outage activities, with the change in risk being sufficiently small.
72. The specialist inspector sought clarification on several points that were adequately responded to by NGL.
73. The specialist inspector utilised the opportunity during a recent systems based inspection (SBI) (Ref. 16) to consider the implications on the deferral on a sample of three electrical systems that play a significant role in providing electrical power to nuclear safety significant structures systems and components, including post trip cooling, and which undergo periodic maintenance activities during statutory outages:
- No break supplies system;
  - Emergency generation and short break supplies system; and
  - Transformers, grid systems and main electrical system
74. From the sample inspected during the safety case led SBI the trends in system availability and reliability were satisfactory over a three year period prior to the date of the inspection.
75. Overall, the electrical engineering specialist inspector was content that the evidence presented within the case was acceptable and supported the deferral of the statutory outage to 7 March 2021.

### **3.6 CONTROL AND INSTRUMENTATION**

76. Reference 17 provides the findings of the ONR control and instrumentation (C&I) assessment of the TOR R1 outage deferral request, which is summarised below.
77. The scope of the C&I assessment covers the arguments and evidence that supports the claims within the submitted case from a C&I perspective. The C&I specialist inspector focused their review on the following key plant items within their assessment:
- Internal parts of pressure vessel: vessel thermocouples,
  - Reactor Safety circuits including flux measuring detectors,
  - Equipment necessary for safe shutdown: Post Trip Sequencing Equipment (PTSE) X and Y trains,
  - Gas Circulator instrumentation.
78. The C&I specialist inspector in the assessment of the case had to request additional information and evidence to allow them to adequately make a judgement on the suitability of the case to support the deferral. The inspector's opinion was that several parts of the submitted case were difficult to interpret or lacked sufficient detail. On this



basis the inspector rated the NGL submission 'Amber – seek improvement' in accordance with ONR's process (Ref. 18). ONR's process for rating submissions considers the case as submitted but this does not preclude an inspector from considering the final case acceptable based on additional information provided.

79. The specialist inspector raised a number of queries (Ref 8.) which were suitably responded to by NGL and were subsequently considered appropriate by the specialist inspector as evidence to support the claims and arguments made within the case.
80. The specialist inspector was satisfied that from the assessed sample of evidence that nuclear safety systems should not incur any significant decrease in their reliability and functionality claims, and there should not be any significant increase in the risk of an initiating event during the extended period of operation, given that:
- During the 3 years since the last statutory outage, there have not been an abnormal number of shutdowns that would cause concern or inconsistencies with the safety case assumptions,
  - Non-outage related MS activities, such as function tests, calibrations and freedom of movement checks, will still be performed during the period of extension as appropriate,
  - The EIMT periodicities for C&I plant and equipment important to nuclear safety, sampled, are unlikely to be impacted. TOR proposes to defer the commencement of the outage and continue the period of operation for a period no longer than 274 days,
  - Statements made by NGL SQEPs are considered adequate,
  - The judgement of the ONR PSA specialist inspector (section 3.8) that the risk impact of deferring the start date of the outage is small.
81. Overall, the C&I specialist inspector was content that the evidence presented within the case was acceptable and supported the deferral of the statutory outage to 7 March 2021.

### **3.7 PROBABILISTIC SAFETY ANALYSIS**

82. Reference 19 provides the findings of the ONR probabilistic safety analysis (PSA) assessment of the TOR R1 outage deferral request.
83. Due to the length of the requested deferral being considerably longer than typical outage deferrals, it was considered proportionate to conduct a probabilistic analysis on the potential risk increase of such an extension.
84. The scope of the assessment was limited to the PSA elements of the submitted case and the impact of the deferral on the station risk profile as reported by the PSA. The primary purpose of ONR conducting a PSA analysis was to give initial confidence to the other ONR specialist inspectors reviewing the case that the overall risk increase for deferring the outage was demonstrably small and also to assist in identifying appropriate areas to sample within their respective assessments.
85. Overall, the PSA specialist inspector accepted that the increase from deferring the outage was small and supported the decision to agree to the extension to the operating period.

### **3.8 CHEMISTRY**

86. Reference 20 provides the findings of the ONR chemistry assessment of the TOR R1 outage deferral request, which is summarised below.

87. ONR does not routinely request chemistry specialist assessment of outage deferrals and this assessment was a limited scope review at the request of the ONR project inspector to consider a particular aspect within the submitted case.
88. The scope of the review was limited to the proposed changes to operation of the gas bypass plant dryer towers and the suspension of the boiler oxygen injection system. This proposed change is due to the age and subsequent lifetime degradation of the R1 drying tower desiccant, which is due to be replaced during the outage. To ensure the moisture removal function within the extension period a suspension of boiler oxygen injection is suggested by NGL in the submitted case.
89. The specialist inspector stated that the impact of suspending boiler oxygen injection will result in increasing heat transfer impairment (HTI) and therefore potentially increase T2 gas temperature. The specialist inspector states that HTI on boilers historically becomes challenging over a period of years; he also notes that carbon deposition is low at TOR. Operation without this for the period of the deferral should not therefore be an issue. Most importantly, T2 gas temperature limits exist such that if HTI reaches unacceptable levels a de-rating would be required. The specialist inspector was therefore content that this issue is principally a commercial rather than a safety risk.
90. Overall, the chemistry specialist inspector was content that the evidence presented within the case was acceptable and supported the deferral of the statutory outage to 7 March 2021 based on the limited scope review conducted.

### **3.9 SECURITY**

91. Although ONR security did not assess the submitted safety case their view on the outage deferral was considered due to potential implications to site security. The TOR nominated site security inspector confirmed (Ref. 21) that there were no implications from a security perspective to deferring the outage to 7 March 2021.

### **3.10 ENGAGEMENT WITH OTHER GOVERNMENT AGENCIES**

92. The TOR Scottish Environment Protection Agency (SEPA) site inspector was informed that ONR intended to issue an LI giving its Agreement to the extension request. SEPA confirmed that they had no objections to the deferral proposal and ONR issuing an agreement to extend the R1 operating period (Ref. 22).

## **4 MATTERS ARISING FROM ONR'S WORK**

93. No issues preventing issue of this Licence Instrument arose from the assessment of the Licensee's safety justification by ONR specialist inspectors.

## **5 CONCLUSIONS**

94. ONR has undertaken assessment of NGL's safety justification for extending the operating period of Torness Reactor 1 from 26 July 2020 to 7 March 2021.
95. The reason for this extension is primarily relating to effective management of station resources and optimum availability of outage personnel and resources during the current phase of the Covid-19 pandemic.
96. NGL considered that the extension would have no significant impact on nuclear safety and that it is ALARP to continue operating for the additional period.

97. 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 agreeing to the extension to the operating period.

## **6 RECOMMENDATIONS**

98. I recommend ONR issues Licence Instrument 561 under LC30(2) for Nuclear Site Licence Sc.14, giving ONR's Agreement to extending the operating period of Torness Reactor 1 to no later than 7 March 2021.

## 7 REFERENCES

1. TOR R1 2020 Outage Deferral - Request Letter – TOR50670R, 19 June 2020. CM 2020/192106.
2. TOR – Licence Instrument (Consent) No 553 under LC30 (3). Consent to the start-up of Torness Reactor 1, 6 June 2017. CM 2017/221421.
3. TOR R1 2020 Outage Deferral - Request Letter – TOR50667R, 5 May 2020. CM 2020/136894.
4. TOR – Licence Instrument (Agreement) No 560 under LC30 (2). Agreement for Extension of Operating Period for Torness Reactor 1, 28 May 2020. CM 2020/157884.
5. EC No 367867 Proposal Version 02 – Proposal for the Deferral of the Reactor 1 2020 Statutory Outage S12R1 to 7 March 2021. CM 2020/192106.
6. NGL - BEG/SPEC/OPSV/EPG/085, Rev 006 – Pandemic Contingency Plan, March 2020.
7. TOR R1 2020 Outage Deferral – EC 367867 INSA Approval Statement. CM 2020/192106.
8. ONR – Torness R1 2020 Outage Deferral EC 367867: ONR Technical Queries. CM 2020/185792.
9. ONR-OFD-AR-20-026 Revision 0 – Structural Integrity Assessment of the Graphite Aspects of EC 367867: Torness Reactor 1. Proposal for the Deferral of the 2020 Statutory Outage S12R1 to 7 March 2021. CM 2020/199256.
10. Heysham B / Torness Graphite Core Safety Case NP/SC 7663 Version 03. Post-Stress Reversal. CM 2017/457269.
11. ONR-OFD-AR-20-027 Revision 0 – Structural Integrity Assessment of EC 367867: Torness Reactor 1. Proposal for the Deferral of the 2020 Statutory Outage S12R1 to 7 March 2021. CM 2020/199764.
12. ONR Position Statement. Proposed easement. PSSR postponement response during Covid-19 situation. CM 2020/133615.
13. ONR-OFD-AR-20-022 Revision 0 – Civil Engineering Assessment of EC 367867: Torness Reactor 1. Proposal for the Deferral of the 2020 Statutory Outage S12R1 to 7 March 2021. CM 2020/207203.
14. ONR-OFD-AR-20-028 Revision 0 – Mechanical Engineering Assessment of EC 367867: Torness Reactor 1. Proposal for the Deferral of the 2020 Statutory Outage S12R1 to 7 March 2021. CM 2020/201512.
15. ONR-OFD-AR-20-029 Revision 0 – Electrical Engineering Assessment of EC 367867: Torness Reactor 1. Proposal for the Deferral of the 2020 Statutory Outage S12R1 to 7 March 2021. CM 2020/203283.
16. ONR-OFD-IR-20-007 - EDF Energy NGL Torness Combined Systems Based Inspection SBI7-9 June 2020 - CM 2020/178430.
17. ONR-OFD-AR-20-030 Revision 0 – C&I Assessment of EC 367867: Torness Reactor 1. Proposal for the Deferral of the 2020 Statutory Outage S12R1 to 7 March 2021. CM 2020/211784.
18. Guidance on Mechanics of Assessment. NS-TAST-GD-096. Revision 0. April 2020 [http://www.onr.org.uk/operational/tech\\_asst\\_guides/index.htm](http://www.onr.org.uk/operational/tech_asst_guides/index.htm)

19. ONR-OFD-AN-20-024 Revision 0 – PSA Assessment of EC 367867: Torness Reactor 1. Proposal for the Deferral of the 2020 Statutory Outage S12R1 to 7 March 2021. CM 2020/198000.
20. ONR-OFD-AN-20-031 Revision 0 – Chemistry Assessment of EC 367867: Torness Reactor 1. Proposal for the Deferral of the 2020 Statutory Outage S12R1 to 7 March 2021. CM 2020/205287.
21. ONR – Email– Torness R1 Outage Deferral 2020. CM 2020/209658.
22. ONR – Email – Torness Outage Deferral 2020. CM 2020/210286.