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| ONR Project assessment report  Hartlepool Reactor 1 2024 Periodic Shutdown Deferral  Agreement to Deferral of Hartlepool Reactor 1 2024 Statutory Outage to 10 May 2025 |



ONR Project assessment report

**Project name**:

Hartlepool Reactor 1 2024 Periodic Shutdown Deferral

**Report title**:

Agreement to Deferral of Hartlepool Reactor 1 2024 Statutory Outage to 10 May 2025

**Dutyholder/Applicant**: EDF Energy Nuclear Generation Limited

**Authored by**:

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# Executive summary

**Title**

Agreement to Deferral of Hartlepool Reactor 1 2024 Statutory Outage to 10 May 2025.

**Permission requested**

EDF Energy Nuclear Generation Limited (EDF), in accordance with Nuclear Site Licence 59 for Hartlepool (HRA), Licence Condition (LC) 30(2), applied for agreement from the Office for Nuclear Regulation (ONR) to an extension of the operating period of Reactor 1 (R1) by a period of 131 days, to no later than 10 May 2025.

**Background**

The Nuclear Site Licence 59 for HRA requires the licensee to periodically shut down any plant or process under LC 30 to enable examination, inspection, maintenance and testing to take place. The reactor periodic shutdowns (also known as statutory outages) take place every three years, as specified in the maintenance schedule preface, an approved document under LC 28(4).

ONR gave consent to start up HRA R1 after its last periodic shutdown on 30 December 2021 (Licence Instrument 574) and therefore it is required to shut down on or before 30 December 2024. In order to avoid a conflict with the Heysham 2 Reactor 7 periodic shutdown, EDF has produced a safety case, Engineering Change (EC) 375069, to extend the operating period of HRA R1 until no later than 10 May 2025.

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

ONR’s assessment of the proposed deferral has focused on whether EDF has provided an adequate safety case justifying that the risks from the proposed deferral remain tolerable and have been reduced to as low as reasonably practicable (ALARP). Review and assessment work has been carried out by ONR’s specialist inspectors from the following specialisms:

* Graphite structural integrity;
* Steel structural integrity;
* Electrical engineering;
* Control and instrumentation (C&I);
* Mechanical engineering;
* Civil engineering; and
* Probabilistic safety analysis (PSA).

In support of their assessments, ONR’s specialist inspectors have engaged with EDF in technical discussions to ensure that key nuclear safety issues have been adequately addressed.

**Matters arising from ONR’s work**

There are no outstanding matters arising from the review and assessment work carried out by ONR. All specialist inspectors consider that the issue of ONR’s agreement to the extension of the operating period of HRA R1 up to 10 May 2025 is acceptable.

**Conclusions**

It is concluded that EDF has provided an adequate justification underpinning the deferral of the 2024 periodic shutdown of HRA R1 to no later than 10 May 2025 and that a licence instrument should be issued to EDF.

**Recommendation**

ONR should issue Licence Instrument 578, under LC 30(2) for Nuclear Site Licence 59, granting agreement to extend the operating period of HRA R1 to no later than 10 May 2025.

Table 1: List of abbreviations.

|  |  |
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| Term/Acronym | Description |
| ALARP | As low as reasonably practicable |
| C&I | Control and Instrumentation |
| CLA | Component Life Assessment |
| EC | Engineering Change |
| EDF | EDF Energy Nuclear Generation Limited |
| HRA | Hartlepool |
| HYB | Heysham 2 |
| INSA | Independent Nuclear Safety Assessment |
| LC | Licence Condition |
| ONR | Office for Nuclear Regulation |
| PAR | Project Assessment Report |
| PCPV | Prestressed Concrete Pressure Vessel |
| PSA | Probabilistic Safety Analysis |
| PSSR | Pressure Systems Safety Regulations |
| R1 | Reactor 1 |
| SQEP | Suitably Qualified and Experienced Personnel |

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# Permission requested

1. EDF Energy Nuclear Generation Limited (EDF), the licensee, in accordance with Nuclear Site Licence 59 for Hartlepool (HRA), Licence Condition (LC) 30(2), applied for agreement from the Office for Nuclear Regulation (ONR) to an extension of the operating period of Reactor 1 (R1) by a period of 131 days, to no later than 10 May 2025 (ref. [1]).
2. The extension has been justified in a Category 2 Engineering Change (EC) 375069 Revision 000, ‘Proposal for the deferral of the Hartlepool Reactor 1 2024 Statutory Outage (R1/114) to the 10th May 2025’ (ref. [1]).
3. In line with ONR’s procedures, this project assessment report (PAR) documents ONR’s view on the adequacy of the safety justification, EC 375069, supporting the proposed periodic shutdown deferral of HRA R1 by up to 131 days. ONR will also produce a Licence Instrument to communicate its decision on the proposed deferral to the station.

# Background

1. The Nuclear Site Licence 59 for HRA requires the licensee to periodically shut down any plant or process under LC 30 for the purpose of examination, inspection, maintenance and testing. The maintenance schedule preface (an approved document under LC 28 (4)) specifies that reactor periodic shutdowns (referred to as statutory outages) take place after a maximum period of three calendar years following consent from ONR to start up after the previous periodic shutdown.
2. Consent to start up HRA R1 after its last periodic shutdown was issued on 30 December 2021 (Licence Instrument 574). Therefore, the next periodic shutdown (R1/114) is due on or before 30 December 2024.
3. Owing to the volume and nature of work carried out during a periodic shutdown, the licensee requires a significant amount of support from its contract partners. Constraints in the supply chain mean that concurrent periodic shutdowns cannot be supported appropriately. This is managed by EDF through the fleet outage plans, which manage resource availability and plan to avoid overlaps between the periodic shutdowns of the operating reactors.
4. To avoid a conflict with the Heysham 2 (HYB) Reactor 7 statutory outage which is scheduled between January 2025 and March 2025 (and had already been deferred to avoid an overlap with the Sizewell B (SZB) periodic shutdown (RO19)), EDF has proposed to defer the HRA R1 periodic shutdown by 131 days, to no later than 10 May 2025.
5. EDF has therefore produced a safety case, EC 375069 (ref. [1]), which provides the nuclear safety justification for the proposed deferral of the HRA R1 periodic shutdown to no later than 10 May 2025.
6. It is worth noting that EDF is planning to start the HRA R1 periodic shutdown on 19 April 2025 with a backstop date of 10 May 2025.
7. EDF claims that EC 375069 (ref. [1]) has considered all the potentially affected plant and safety cases to ensure the proposed extension to the operating period will not result in a significant increase in nuclear safety risk.
8. To reach a decision on the proposed deferral, ONR has carried out a risk-informed targeted assessment of EC 375069 (ref. [1]). The findings of ONR’s assessment are summarised in the following section of this PAR.

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

1. In accordance with the regulatory permissioning plan produced for assessing the deferral submission recorded in PR-01907, ONR has carried out reviews and assessments by specialist inspectors from the following disciplines:

* Graphite structural integrity (ref. [2]);
* Steel structural integrity (ref. [3]);
* Electrical engineering (ref. [4]);
* Control and instrumentation (C&I) (ref. [5]);
* Mechanical engineering (ref. [6]);
* Civil engineering (ref. [7]); and
* Probabilistic safety analysis (PSA) (ref. [8]).

1. The following sections provide summaries of the findings of the review and assessment work for each discipline.

## Graphite structural integrity (ref. [2])

1. Ref. [2] reports the findings of the graphite structural integrity review of the licensee’s justification to extend the operating period of HRA R1 to May 2025.
2. The specialist inspector states that the accumulated operating period since the last statutory outage at the proposed deferred periodic shutdown date of May 2025, in terms of core burn up, is less than it would have been after three calendar years at full power. This is due to the refuelling and core inspection outages that took place over this period.
3. The specialist inspector also notes that the graphite core of HRA R1 will be inspected in November/December 2024 ahead of the proposed deferred date for the periodic shutdown. This will provide information on the core condition in terms of cracking of fuel bricks. It is worth noting that no keyway root cracks have been observed in the graphite cores of the HRA reactors.
4. Overall, the specialist inspector is content that the licensee has adequately justified the proposed deferral of HRA R1 periodic shutdown to May 2025. Therefore, the specialist inspector has recommended, from a graphite structural integrity perspective, that ONR agree to EDF’s proposal for deferring the HRA R1 periodic shutdown to May 2025.

## Steel structural integrity (ref. [3])

1. Ref. [3] reports the findings of the steel structural integrity assessment of the licensee’s justification to extend the operating period of HRA R1 to May 2025.
2. The specialist inspector has focused their assessment of the proposed deferral on the evidence supporting compliance with LC 28 and the Pressure Systems Safety Regulations (PSSR).
3. LC 28 requires that the dutyholder shall make and implement adequate arrangements for the regular and systematic examination, inspection, maintenance and testing of all plant which may affect safety. The specialist inspector states that appropriate inspection intervals are established through component life assessments (CLA) and safe life reviews.
4. The specialist inspector has examined the evidence underpinning CLA and safe life reviews and they are satisfied there is adequate justification for the proposed deferral and adequate margins against component failure within the proposed extension of 131 days.
5. For PSSR compliance, the specialist inspector notes that the Competent Person, undertaken by Bureau Veritas, has agreed in principle to the deferral which necessitates the postponement of several examinations specific in the written scheme.
6. The specialist inspector is content this is permitted under the PSSR and within normal business.
7. Overall, the specialist inspector is content that the licensee has adequately justified the proposed deferral of HRA R1 periodic shutdown to May 2025. Therefore, the specialist inspector has recommended, from a steel structural integrity perspective, that ONR agree to EDF’s proposal for deferring the HRA R1 periodic shutdown to May 2025.

## Electrical engineering (ref. [4])

1. Ref. [4] reports the findings of the electrical engineering assessment of the licensee’s justification to extend the operating period of HRA R1 to May 2025.
2. The specialist inspector has considered the impact of the proposed periodic shutdown deferral on nuclear safety significant electrical systems by determining:

* Whether electrical related statutory outage examination, inspection, maintenance and testing activities covered by the HRA maintenance schedule have been adequately reviewed by the licensee’s suitably qualified and experienced personnel (SQEP);
* Whether the risks of any relevant electrical systems, including relevant nuclear significant transformers, being unable to perform their nuclear safety function during the statutory outage deferral period have been adequately assessed by the licensee’s SQEP and whether the risks have been considered to remain acceptably low;
* Whether there is a risk of any relevant electrical systems reaching a performance reliability cliff edge during the statutory outage deferral period; and
* Whether the proposed deferral of the HRA R1 statutory outage by up to 131 days is consistent with maintaining an overall risk that is tolerable and as low as reasonably practicable (ALARP).

1. Based on their assessment, the specialist inspector is satisfied that:

* Nuclear safety systems will not incur any significant decrease in their reliability or functionality, and there will be no significant increase in the risk of an initiating event during the extended period of operation;
* There are no safety case commitments, or related issues which would prevent the safe deferral of the outage; and
* Any increased risks associated with deferring the outage by up to 131 days are acceptably low and the overall proposal is consistent with the ALARP principle.

1. Overall, the specialist inspector is content that the licensee has adequately justified the proposed deferral of HRA R1 periodic shutdown to May 2025. Therefore, the specialist inspector has recommended, from an electrical engineering perspective, that ONR agree to EDF’s proposal for deferring the HRA R1 periodic shutdown to May 2025.

## C&I (ref. [5])

1. Ref. [5] reports the findings of the C&I assessment of the licensee’s justification to extend the operating period of HRA R1 to May 2025.
2. The specialist inspector has focused their assessment of the proposed deferral of the HRA R1 2024 periodic shutdown on:

* Whether C&I related statutory outage examination, inspection, maintenance and testing activities covered by the HRA maintenance schedule have been adequately reviewed by SQEP;
* The potential for the performance of C&I systems or equipment important to safety to drift or degrade such that they become unable to perform their nuclear safety function during the deferral period;
* The potential for C&I systems or equipment important to safety to reach a reliability cliff edge during the deferral period; and
* Whether further potential C&I-related risk reduction measures have been identified and assessed to demonstrate that the risk has been reduced to ALARP.

1. The specialist inspector is content that the C&I-related HRA R1 statutory outage activities in the maintenance schedule have been reviewed by appropriate SQEP.
2. The inspector considers that the likelihood of the C&I equipment parameters drifting or degrading past the point that they will be unable to fulfil their nuclear safety function(s), or reaching a reliability cliff edge, will remain acceptably low during the deferral period.
3. The inspector is also content that C&I-related risk reduction measures have been identified and considered and the risk has been reduced to ALARP.
4. Overall, the specialist inspector is content that the licensee has adequately justified the proposed deferral of HRA R1 periodic shutdown to May 2025. Therefore, the specialist inspector has recommended, from a C&I perspective, that ONR agree to EDF’s proposal for deferring the HRA R1 periodic shutdown to May 2025.

## Mechanical engineering (ref. [6])

1. Ref. [6] reports the findings of the mechanical engineering assessment of the licensee’s justification to extend the operating period of HRA R1 to May 2025.
2. The specialist inspector has focused their assessment on the potential effect of the maintenance or testing deferral of specific plant items by 131 days which included gas circulators, control rods drop tests, boiler safety relief valves and steam admission valves.
3. The specialist inspector states that EDF has identified suitable mitigation activities to monitor the relevant plant items affected by the deferral and is maintaining an overall risk that is reduced to ALARP.
4. Overall, the specialist inspector is content that the licensee has adequately justified the proposed deferral of HRA R1 periodic shutdown to May 2025. Therefore, the specialist inspector has recommended, from a mechanical engineering perspective, that ONR agree to EDF’s proposal for deferring the HRA R1 periodic shutdown to May 2025.

## Civil engineering (ref. [7])

1. Ref. [5] reports the findings of the civil engineering review of the licensee’s justification to extend the operating period of HRA R1 to May 2025.
2. The specialist inspector has considered the potential effect of the periodic shutdown deferral on the civil structures, focusing on the prestressed concrete pressure vessel (PCPV) and its associated maintenance schedule routine.
3. Based on their consideration of recent surveillances, inspections, tests and checks of the PCPV and other civil structures provided by EDF, the specialist inspector is satisfied that the proposed periodic shutdown deferral does not have any adverse impact on the PCPV and other civil structures.
4. Overall, the specialist inspector is content that the licensee has adequately justified the proposed deferral of HRA R1 periodic shutdown to May 2025. Therefore, the specialist inspector has recommended, from a civil engineering perspective, that ONR agree to EDF’s proposal for deferring the HRA R1 periodic shutdown to May 2025.

## PSA (ref. [8])

1. Ref. [8] reports the findings of the PSA review of the licensee’s justification to extend the operating period of HRA R1 to May 2025.
2. The specialist inspector has considered how EDF utilised the PSA model to demonstrate that the station risk is not impacted significantly by the proposed periodic shutdown deferral and is reduced to ALARP.
3. The specialist inspector is content that the risk impact due to the proposed deferral is minor and the PSA results do not point to any specific component that has a significant change in importance due to the deferral.
4. Overall, the specialist inspector is content that the licensee has adequately justified the proposed deferral of HRA R1 periodic shutdown to May 2025. Therefore, the specialist inspector has recommended, from a PSA perspective, that ONR agree to EDF’s proposal for deferring the HRA R1 periodic shutdown to May 2025.

# Matters arising from ONR’s work

1. There are no outstanding matters arising from the review and assessment work carried out by ONR that would prevent granting agreement to the extension of the operating period of HRA R1 up to 10 May 2025.
2. On that basis, I have prepared Licence Instrument 578 for agreement to the proposed extension of the operating period of HRA R1 by a period of 131 days, to no later than 10 May 2025.

# Other matters

1. I have confirmed that EDF has followed its own due process. An Independent Nuclear Safety Assessment (INSA) statement for EC 375069 has been submitted in support of the case (ref. [1]).
2. Before issuing a Licence Instrument, it is established practice to notify other competent regulatory authorities of ONR’s intention, to ensure there are no specific objections that may compromise other regulatory requirements. I have liaised with the Environment Agency and they have confirmed that they have no objection to ONR’s agreement to the proposed periodic shutdown deferral for HRA R1 to 10 May 2025 (ref. [9]).
3. I have also liaised with ONR’s nuclear security and safeguards inspectors and they have confirmed that they have no objection to ONR’s agreement to the proposed periodic shutdown deferral of HRA R1 to 10 May 2025 (refs. [10] and [11]).

# Conclusions

1. Based on the work carried out by ONR, I am satisfied that ONR should grant agreement to the extension of the operating period of HRA R1 to no later than 10 May 2025.

# Recommendations

1. ONR should issue Licence Instrument 578, under LC 30(2) for Nuclear Site Licence 59, granting agreement to extend the operating period of HRA R1 to no later than 10 May 2025.

# References

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| [2] | ONR, Graphite Structural Integrity Review of HRA R1 2024 Outage Deferral, ONRW-2019369590-15446. |
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