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| ONR Project Assessment Report  Consent to start up Torness Reactor 1 following 2024 periodic shutdown |



ONR Project Assessment Report

**Project Name**:

Torness Reactor 1 Periodic Shutdown 2024

**Report Title**:

Consent to start up Torness Reactor 1 following 2024 periodic shutdown

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

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# Executive summary

**Permission requested**

EDF Energy Nuclear Generation Limited (EDF), the operator and licensee of Torness nuclear power station (TOR), has written to the Office for Nuclear Regulation (ONR) requesting consent to start up Reactor 1 following its 2024 periodic shutdown. The request is in accordance with the licensee’s arrangements made under licence condition (LC) 30(3).

**Background**

The nuclear site licence requires the licensee, under LC 30, to periodically shut down any plant or process to enable examination, inspection, maintenance and testing (EIMT) to take place. ONR has specified under LC 30(3) that the licensee is required to seek ONR’s consent before the start-up of a reactor after its periodic shutdown in compliance with LC 30(1).

At TOR, reactor periodic shutdowns are every three years, as specified in the maintenance schedule preface, which is an approved document under LC 28(4). ONR’s consent to start up TOR Reactor 1 after its last periodic shutdown was given on 15 April 2021. This would have required Reactor 1 to shut down on or before 15 April 2024 unless ONR had agreed to an extension of the operating period.

The TOR Reactor 1 2024 periodic shutdown commenced on 05 April 2024.

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

The main requirements ONR seeks to confirm during a periodic shutdown are:

* The EIMT requirements specified in the station’s maintenance schedule in support of LC 30 have been complied with;
* EIMT has been carried out by suitably qualified and experienced persons (SQEP), with an appropriate level of supervision and quality assurance in place commensurate with the safety function of a system, structure or component (SSC); and
* All safety issues identified during the outage have been adequately addressed. Where necessary, a suitable and sufficient safety justification has been provided which allows a regulatory judgement to be made in support of restarting the reactor.

ONR’s inspection and assessment activities during this periodic shutdown have been carried out by specialist inspectors from the following specialisms:

* Metallic Structural Integrity;
* Graphite Structural Integrity;
* Electrical Engineering;
* Chemistry;
* Control and Instrumentation;
* Mechanical Engineering;
* Civil Engineering;
* Nuclear Site Health and Safety; and
* Operational Inspection.

**Matters arising from ONR's work**

There are no outstanding issues preventing the issue of a consent to start up Torness Reactor 1.

**Conclusions**

ONR’s inspection and assessment findings of the Torness Reactor 1 2024 periodic shutdown confirm that the licensee has carried out EIMT in accordance with the requirements of its maintenance schedule or provided an appropriate justification for any deferral. The work has been conducted to the required quality standards by competent personnel. No outstanding issues have been identified that prevent the start-up of Torness Reactor 1 following its 2024 periodic shutdown.

**Recommendation**

ONR should issue licence instrument 567, giving consent to start up Torness Reactor 1 following its 2024 periodic shutdown.

Table 2: List of abbreviations

| Term/Acronym | Description |
| --- | --- |
| ALARP | As low as reasonably practicable |
| AFI | Area for improvement |
| BIM | Boiler inspection manipulator |
| CW | Cooling water |
| EC | Engineering change |
| EDF | EDF Energy Nuclear Generation Limited |
| EIMT | Examination, inspection, maintenance and testing |
| EOSR | Early outage safety review |
| FME | Foreign material exclusion |
| INA | Independent nuclear assurance |
| INSA | Independent nuclear safety assessment |
| LC | Licence condition |
| MITS | maintenance, inspection and test schedule |
| ODR | Off-load depressurised refuelling |
| OFI | Opportunity for improvement |
| ONR | Office for Nuclear Regulation |
| PCPV | Pre-stressed concrete pressure vessel |
| PSSR | Pressure Systems Safety Regulations |
| R1/R2 | Reactor 1/Reactor 2 |
| RI | Regulatory issue |
| RIDDOR | Reporting of Injuries, Diseases and Dangerous Occurrences Regulations |
| SQEP | Suitably qualified and experienced person(s) |
| SRGW | Seal ring groove wall |
| TOR | Torness nuclear power station |

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# Permission requested

1. EDF Energy Nuclear Generation Limited (EDF), the operator and licensee of Torness nuclear power station (TOR), has written to the Office for Nuclear Regulation (ONR) (ref. [1]) requesting consent to start up Reactor 1 (R1) after its 2024 periodic shutdown. The request is in accordance with the licensee’s arrangements made under licence condition (LC) 30(3).
2. This report presents how ONR has regulated the periodic shutdown, the matters considered, decisions made and the basis for granting consent to start up TOR R1.

# Background

1. The Torness nuclear site licence requires the licensee to periodically shut down any plant or process under LC 30 to enable examination, inspection, maintenance and testing (EIMT) to take place. The Torness maintenance schedule preface, an approved document under LC 28(4), specifies that reactor periodic shutdowns take place every three years. ONR has specified under LC 30(3) (ref. [2]) that the licensee requires consent from ONR to start up a reactor after its shutdown in compliance with LC 30(1).
2. ONR consent to start up TOR R1 after its last periodic shutdown was given on the 15 April 2021 (Licence Instrument 562, ref. [3]). This would have required R1 shutdown on or before 15 April 2024 unless ONR had agreed to an extension of the operating period.
3. The TOR R1 periodic shutdown started on 05 April 2024. The scope of work was set out in the licensee’s outage intentions document (ref. [4]). With all required EIMT now complete (except for those on the exception list as noted in subsection ‎3.8.5.3), the licensee has applied to ONR for consent to start up R1, as required by LC 30(3).

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

1. The purposes of ONR inspection and assessment activities during a periodic shutdown are to establish that:

* The EIMT requirements specified in the station’s maintenance schedule in support of LC 30 have been complied with;
* EIMT has been carried out by suitably qualified and experienced persons (SQEP), with an appropriate level of supervision and quality assurance in place commensurate with the safety function of a system, structure or component (SSC); and
* All safety issues identified during the outage have been adequately addressed. Where necessary, a suitable and sufficient safety justification has been provided which allows a regulatory judgement to be made in support of re-start of the reactor.

1. Based on the scope of work identified in the outage intentions document and in accordance with the regulatory permissioning strategy (PR-01500), ONR has carried out the following inspections and assessments:

* Metallic Structural Integrity – assessment (ref. [5]) and LC 28 site inspection (ref. [6]);
* Graphite Structural Integrity – assessment (ref. [7]) and LC 28 site inspection (ref. [8]);
* Electrical Engineering – LC 28 site inspection (ref. [9]);
* Chemistry – LC 28 site inspection (ref. [10]);
* Control and Instrumentation – LC 28 site inspection (ref. [11]);
* Mechanical Engineering – LC 28 site inspection (ref. [12]);
* Civil Engineering – assessment (ref. [13]);
* Nuclear Site Health and Safety – interventions including the Construction (Design and Management) Regulations (ref. [14]) and the Early Outage Safety Review (ref. [15]); and
* Site and Project Inspection – LC 26 site inspection (ref. [16]).

1. ONR’s project inspector has maintained oversight of the outage activities prior and throughout the outage through site visits and regular meetings with the TOR senior outage managers.
2. Furthermore, the project inspector, supported by the TOR nominated site inspector and the Head of Assessment Delivery Lead, attended the TOR site for:

* The outage intentions meeting (ref. [17]) prior to the outage, for the purpose of reviewing the station preparations for the outage; and
* The start-up meeting (ref. [18]) towards the end of the outage, for the purpose of reviewing the completed work and readiness for return to service.

1. The following sub-sections provide summaries of the ONR inspection and assessment findings for each of the technical discipline areas evaluated during the TOR R1 periodic shutdown. These summaries provide the information and evidence to underpin ONR’s judgement to grant consent to start up TOR R1.

## Metallic Structural Integrity

1. Refs. [5] and [6] report the findings of the metallic structural integrity assessment and LC 28 inspection activities, respectively, during the TOR R1 2024 periodic shutdown.
2. The structural integrity specialist inspector focused their LC 28 inspection on the following sample:

* Pressure systems (supporting Pressure Systems Safety Regulations (PSSR));
* Reactor/boiler interiors;
* Flow assisted corrosion;
* Hangers and snubbers;
* Gas circulators;
* Materials and weld;
* Feedwater valves;
* Gas bypass system; and
* Decay heat removal system.

1. Based on the activities sampled during the site inspection, the specialist inspector is content that TOR is in compliance with their LC 28 arrangements.
2. The specialist inspector has assessed the scope and a sample of the results of the EIMT of steel SSCs carried out during the 2024 TOR R1 periodic shutdown in ref. [5].
3. Overall, the specialist inspector is content with the inspection programme. They are also content that the inspections have been undertaken in line with the TOR R1 2024 outage intentions document and the reactor internals proposals document, and that EDF has followed corporate procedures in the selection, assessment and sentencing of component inspections and subsequent results.
4. The specialist inspector considers that TOR has satisfactorily completed the inspection activities during the periodic shutdown with no findings that challenge the safety case.
5. The specialist inspector notes the following observations:

* The reactor boiler inspection manipulator had broken down which resulted in inspections being removed from the scope of the outage. EDF provided justification for the missed inspections in the return to service engineering change (EC) and will investigate the cause of the failure. The specialist inspector is satisfied with the actions taken by the station and has no cause for concern for the start-up of TOR R1. This is further discussed in subsection ‎3.8.4.6;
* EDF has informed the specialist inspector of the intention to reduce the inspection regime for the gas circulator impellers via an EC. To monitor this work, the specialist inspector has raised regulatory issue RI-12078. This issue does not affect the start-up of TOR R1; and
* Due to a history of repeated failure of one type of pipe hangers, discrepancies in categorising defects of hangers and postponement of some remediation work to the next outage, the specialist inspector has raised RI-12076 to ensure appropriate actions are being taken in a timely manner. Nonetheless, the specialist inspector is satisfied that this is not a start-up issue.

1. To conclude, the structural integrity specialist inspector has no objection to consent being granted for start-up of TOR R1, subject to ONR receiving a number of additional documents and assurances:

* The independent nuclear safety assessment (INSA) certificate for the return to service EC 375298;
* A return-to-service statement from the third-party competent person to confirm completion of the PSSR inspections with no concerns being raised; and
* A statement from the second-party PSSR competent person supporting the fitness for return to service for the gas side penetrations of the reactor pressure boundary.

1. EDF has submitted the documentation required within the start-up request (see sub-sections ‎3.8.5.4, ‎3.8.5.7 and ‎3.8.5.8) and the structural integrity specialist inspector has further confirmed they are content for ONR to grant consent to start up TOR R1 (ref. [19]).

## Graphite Structural Integrity

1. Refs. [7] and [8] report the findings of the graphite assessment and LC 28 inspection activities, respectively, during the TOR R1 2024 periodic shutdown.
2. The scope of the graphite inspections for the periodic shutdown included:

* Graphite sample trepanning of a minimum of 24 samples from fuel channels of the graphite core;
* Bore measurements and visual inspections of 16 fuel channels;
* Visual inspection and bore measurements of one control rod channel; and
* Visual inspection of three faces of the peripheral shield wall.

1. ONR’s graphite LC 28 inspection focused on the EIMT arrangements and activities related to the graphite core examination and inspection.
2. The graphite specialist inspector judges the station arrangements with regards to collection of graphite core inspection data during this outage to be suitable and adequate. They also consider that the visual records and the data sampled were of adequate quality for EDF to form an accurate judgement and enable sentencing of the cracks.
3. However, the specialist inspector has observed some minor shortfalls that will be tracked and resolved through regulatory issues RI-12056 and RI-12054. The former is related to improving the station guidance for fuel assembly recharge, following observation of graphite fragments as a result of cracking of the seal ring groove wall (SRGW) in the graphite fuel channels. The latter is related to confirming the adequacy of the training and qualification status for the first-line assessor of the graphite visual inspections. Regulatory issues RI-12056 and RI-12054 will be tracked through normal regulatory business to ensure they are completed adequately in a timely manner.
4. The specialist inspector has assessed the graphite core inspection findings in ref. [7] against the limits of the extant graphite safety cases.
5. The specialist inspector states that the number of full-height axially cracked fuel channel bricks is aligned with the upper percentile (rather than the best estimate) forecasts issued by EDF prior to the inspection campaign. However, fewer fully formed seal ring groove wall fragments were observed than expected (i.e., zero observation vs pre-outage prediction of six SRGW fragments).
6. Furthermore, the specialist inspector notes a new fragment generation mechanism was observed. The new mechanism is the result of combining two known cracking mechanisms, i.e., secondary axial cracking and seal ring groove wall cracking, to generate a graphite fragment termed by EDF as ‘hybrid’ fragment. This mechanism has not been considered in the existing forecasting processes for generating graphite debris.
7. The specialist inspector considers the observations within the fuel channels described in paragraphs ‎26 and ‎27 to represent a shortfall in the pre-inspection core state forecasts. The specialist inspector notes that EDF has outlined areas for improvement within their core state predictive capability following the inspection findings at TOR R1. Therefore, the specialist inspector has raised regulatory issues RI-12081 and RI-12082 to track EDF’s revision to the core state forecasting capabilities for (a) axial cracking and (b) seal ring groove wall fragments and debris, respectively.
8. The specialist inspector states that EDF has provided confidence that, despite the inspection observations being at the upper end of expectations with regards to axial cracking, the current limits of the graphite safety case for tolerance to axial cracking bound the observations and will remain bounding until at least the next graphite inspection campaign.
9. The specialist inspector is content that there is sufficient margin available within the existing graphite safety cases for axial cracking and seal ring groove wall debris that bounds the current observations and that the shortfalls noted above should not prevent the start-up of TOR R1 following its periodic shutdown.
10. No reportable defects were observed in the control rod channel inspected and no significant observations were recorded from the peripheral brick inspections.
11. To conclude, the graphite specialist inspector has no objection to consent being granted for start-up of TOR R1, subject to ONR receiving the INSA certificates for EC 374991 and EC 375298. These have subsequently been received (see sub-sections ‎3.8.5.4 and ‎3.8.5.5) and the specialist inspector has confirmed this satisfies their recommendation (ref. [20]).

## Electrical Engineering

1. Ref. [9] reports the findings of the electrical engineering LC 28 inspection during the TOR R1 2024 periodic shutdown. The electrical engineering specialist inspector sampled EIMT for electrical SSCs important to nuclear safety, including:

* Nuclear significant transformers;
* Switch boards;
* Switch gear;
* Electrical protection devices;
* Gas circulators;
* Essential supplies systems; and
* Variable frequency converters and variable speed drives.

1. The specialist inspector considers the activities sampled were being satisfactorily carried out or completed.
2. Therefore, the electrical engineering specialist inspector supports consent being granted for start-up of TOR R1.

## Chemistry

1. Ref. [10] reports the findings of the chemistry LC 28 inspection during the TOR R1 periodic shutdown. The inspection focused on significant outage activities for systems required to control chemistry, specifically those associated with:

* The bypass gas plant; and
* The decay heat removal system.

1. The specialist inspector is content that appropriate EIMT was being conducted on the SSCs important to maintaining chemistry compliance.
2. Therefore, the chemistry specialist inspector supports consent being granted for start-up of TOR R1.

## Control and Instrumentation

1. Ref. [11] reports the findings of the control and instrumentation LC 28 inspection during the TOR R1 2024 periodic shutdown. The control and instrumentation specialist inspector sampled EIMT related activities on control and instrumentation equipment and systems important to nuclear safety, including:

* Reactor safety circuits, inclusive of the:
  + Guardline systems; and
  + Neutron flux detectors;
* Control rod control system;
* Reactor post trip logic system, referred to as post trip sequencing equipment;
* Gas circulators;
* Torness on-line computing system;
* Secondary shutdown system;
* Boiler feed and water treatment systems; and
* In-core thermocouples.

1. The specialist inspector considers the activities sampled to have been satisfactorily completed.
2. Therefore, the control and instrumentation specialist inspector supports consent being granted for start-up of TOR R1.

## Mechanical Engineering

1. Ref. [12] reports the findings of the mechanical engineering LC 28 inspection during the TOR R1 2024 periodic shutdown. The mechanical engineering specialist inspector sampled the mechanical engineering aspects of the SSCs important to nuclear safety being maintained during the TOR R1 periodic shutdown. These included:

* Boron bead injection system;
* Gas circulators focusing on the inlet guide vane drives; and
* Circulator auxiliary cooling system;

1. The specialist inspector considers the activities sampled to have been satisfactorily completed.
2. Therefore, the mechanical engineering specialist inspector supports consent being granted for start-up of TOR R1.

## Civil Engineering

1. Ref. [13] reports the findings of the civil engineering assessment of the statutory examination of the pre-stressed concrete pressure vessel (PCPV) of TOR R1.
2. It covers the findings of the surveillances, inspections and tests of certain key safety-related components of the PCPV, including:

* Concrete surface condition (including PCPV support walls);
* Tendon anchorages;
* Tendon residual load;
* Assessment of the pre-stressing strand;
* Settlement and tilt survey;
* Review of embedded strain gauge readings;
* Review of vessel concrete temperatures;
* Review of reactor coolant leakage;
* Review of pressure vessel cooling water leaks; and
* Top cap deflection survey.

1. The specialist inspector considers the activities sampled to have been satisfactorily completed.
2. The specialist inspector notes that the timing of the three-yearly tendon inspections has become misaligned with the site outage timescales. These inspections are due later in 2024. As TOR reactors are designed to facilitate the removal and replacement of a tendon whilst on-load, and given the positive output from the previous 2021 inspections, the specialist inspector judges that it is acceptable to support the start-up of R1 with the tendon inspections occurring later in 2024.
3. The tendon inspections will be tracked by the specialist inspector through regulatory issue RI-12062, which requires EDF to provide ONR with the results of these inspections in a timely manner.
4. The inspector concludes that they are satisfied the licensee has demonstrated that the condition of the PCPV is satisfactory and will remain so for the next period of operation.
5. Therefore, the civil engineering specialist inspector supports consent being granted for start-up of TOR R1.

## Project inspection and start-up request

### Outage intentions meeting

1. EDF formally engaged with ONR in October 2023 through the outage intentions meeting (ref. [17]). At this meeting, EDF set out its intended scope of work through its Reactor 1 Outage Intentions Document (ref. [4]). This document sets out the maintenance requirements as well as identifying other work to be carried out in support of safety. The document also identifies Torness’s approach for managing safety and quality during the outage.

### Early outage safety review

1. The project inspector and a nuclear site health and safety inspector joined the EDF’s internal nuclear assurance (INA) team on their early outage safety review (EOSR) (ref. [15]).
2. The TOR R1 EOSR was a week-long event led by INA, which took place on 22 to 26 April 2024 at the station. The purpose of the EOSR was to:

* Identify safety performance shortfalls in the early stages of an outage;
* Assist station management in reducing or eliminating undesirable behaviours and conditions which could have an adverse impact on outage success. This includes station response and reinforcement following significant findings;
* Assist fleet to identify potential issues at various levels of outage oversight and implement long-term, sustainable solutions with the relevant process owners.

1. The EOSR focused on nuclear safety (e.g. protected plant, defence-in-depth) and site health and safety (e.g. lifting operations, working at height). Feedback was given to the station lead team at the end of each day with more significant observations followed up immediately.
2. At the end of the EOSR, feedback was given on positive observations and areas for improvement. The INA team identified three areas for improvement (AFI) and one opportunity for improvement (OFI):

* AFI 1 – Foreign material exclusion (FME) is not consistently applied;
* AFI 2 – Working at height standards are not consistently applied which could lead to potential increase in dropped object events;
* AFI 3 – Multiple non-compliances with laydown area process, which could have an effect on safety; and
* OFI 1 – Visibility and communication of operational risk status for the shutdown unit.

1. INA has produced a report to document the EOSR findings (ref. [21]). This was presented to the station lead team at the end of the EOSR week.
2. The issues identified were accepted by the station lead team and commitment was given to act on them. There was positive engagement between the INA team and the station lead team.

### LC 26 compliance inspection

1. The nominated site inspector and the project inspector carried out an LC 26 (control and supervision of operations) compliance inspection of a sample of the working activities during the TOR R1 2024 periodic shutdown. The findings of this inspection are reported in ref. [16].
2. The purpose of this LC 26 inspection was to ensure all safety-related operations are carried out under the control and supervision of SQEP.
3. The inspection focused on the adequacy of commissioning instructions and associated documentation (risk assessments, method statements, task instructions and quality plans), task handovers, pre-job briefing, and the level of supervision required to carry out activities safely.
4. The inspection sample included discussions with management, supervisors and workers carrying out two tasks. One task was associated with the removal, overhaul and replacement of six half unit valves in C quadrant and the other task was the reinstallation of a closing plate on the reheater inlet penetration 1B3.
5. Overall, the inspection was positive with no significant issues identified that would prevent consent for the start-up of TOR R1 following its periodic shutdown.

### Emergent issues and events

#### Double reactor outage

1. At the beginning of the R1 periodic shutdown, Reactor 2 (R2) was in the final stages of an off-load depressurised refuelling (ODR) outage. This led to a double reactor outage over a few days. R2 was successfully returned to service and there was no significant effect on the R1 periodic shutdown.

#### Feedwater valve spindles

1. Shortly before the periodic shutdown, a safety event at Heysham 1 station occurred where a valve on the steam system failed catastrophically. Similar valves are used at Torness but only on the feedwater system, where EDF claims that the risk of degradation is considerably lower.
2. The station has 28 valves of the same type but of different sizes. The outage scope was extended to include the replacement and examination of 11 valves, with destructive testing carried out on four of them. The outcome of the examinations will be utilised at fleet-wide level to provide confidence in the population of feedwater valves. EDF’s strategy behind the sampling is reported in ref. [22].
3. The results of the destructive testing on three valves have already been reported in ref. [23] with the results from the fourth valve due shortly after return to service. Based on the visual examinations and destructive testing, EDF reported that no significant degradation was observed and the spindles are in a suitable condition.
4. The metallic structural integrity specialist inspector has considered the selection of the valves and the results of the examinations in their assessment of the outage in ref. [5].
5. The specialist inspector has concluded that they are content with the range of testing undergone and that the licensee has made suitable conclusions. They consider that the licensee has adequately demonstrated that the risk of valve failure at Torness due to corrosion of the spindles in feedwater valves has been reduced as low as reasonably practicable (ALARP).

#### Decay heat valves R1(2)X-WC-0688A(B)

1. Inspection of valve R1X-WC-0688A was added to the outage scope due to operational experience gained from Heysham 2 Reactor 8 outage in 2020, where threaded interface between the valve body and the valve seat was damaged.
2. During the last TOR R2 statutory outage both flash vessel level control valves (R2X-WC-0688A & B) were overhauled, which included removing the valve seat to inspect the threads. These inspections revealed no damage.
3. EDF completed the same work on the R1X-WC-0688B of R1 during this statutory outage and found that valve was in good condition with no damage to the threads. The valve was overhauled as planned.
4. However, damage was found on R1X-WC-0688A of R1 and EDF decided to replace the valve body and rebuild the valve using new internal components.
5. The structural integrity specialist inspector has confirmed they are content that the risk and consequences of failure are acceptable (ref. [24]) and that the risk has been reduced by replacing the damaged valve.

#### Graphite trepanning equipment

1. The licensee aimed to collect 30 graphite samples from the graphite fuel channels, which is six more than the maintenance schedule requirement of a minimum of 24 samples. The licensee has successfully recovered 25 trepanned samples from the TOR R1 graphite core. However, during the trepanning activities the licensee encountered problems with the trepanning tool.
2. The licensee considered the benefits and disbenefits of completing the repairs on the trepanning tool and obtaining the extra samples. The licensee concluded the risk was not reduced ALARP as a result of continuing the trepanning programme, as the safety case requirement has been exceeded and the necessary repairs would expose workers to additional dose and lead to delays.
3. The graphite specialist inspector has considered this in their assessment (ref. [7]) of the graphite core inspections and they agree with the licensee’s position that risk was not reduced ALARP as a result of continuing the trepanning programme.

#### Cooling water (CW) pump 1A

1. Examinations of the CW pump 1A shaft and sleeve revealed some corrosion and erosion damage to both parts (ref. [25]). EDF decided to machine out the damage on the shaft, which would reduce the diameter, though it would remain significantly larger than the minimum design diameter. For the sleeve, EDF decided to use coating repairs.
2. EDF plans to remove the CW pump next outage to swap the shaft and sleeve for new parts (ref. [26]).
3. ONR’s mechanical engineering specialist inspector has considered this issue along with the low safety consequences due to a CW pump failure. The specialist inspector is content with EDF’s decisions for both parts (ref. [27]). However, they requested that the station collate operational experience of CW pump shaft repairs from other stations, but noting this is not a return to service issue.

#### Boiler inspection manipulator (BIM) failure

1. During pre-outage testing, the BIM suffered a failure to the mast and after assessing the damage, the station decided it was not repairable within the time scales of the outage programme. The BIM was scheduled to carry out inspections of the boiler and casing during this outage. EDF utilised other manipulators to inspect the boiler where practicable, but some inspections were not possible to complete. These have been detailed in the exception list (ref. [28]) and justified in the return to service EC 375298 (ref. [29]).
2. ONR’s structural integrity specialist inspector has confirmed that they are content that the missed inspections do not challenge the start-up of TOR R1 (refs. [5] and [30]).

#### Hangers and snubbers

1. A total of 33 snubbers were exchanged during this outage. This is part of a planned programme of work designed to ensure that the snubbers are replaced prior to exceeding the manufacturer’s recommended service life.
2. However, two snubbers of type 3063 were tested and re-fitted due to a shortfall in the spares available. The return to service EC 375298 (ref. [31]) makes a commitment to replace these two snubbers within 12 months after return to service during one of the two refuelling outages planned over this period.
3. ONR’s structural integrity specialist inspector has confirmed they are content that this does not affect the start-up of R1 (ref. [30]).

#### Safety events

1. During the outage, there were three safety events that were reported under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR). For all three events, EDF has carried out detailed investigations (ref. [32]). ONR’s nominated site inspector will follow up as appropriate.

### Start-up request

1. This section summarises the start-up request which:

* Confirms that TOR R1 is in a satisfactory state for start-up following its 2024 periodic shutdown; and
* Provides confirmation of completion of statutory examinations and justifies any exceptions.

#### Start-up meeting

1. ONR’s inspectors attended the start-up meeting (ref. [18]) which was held on 22 May 2024 at the station. A briefing pack was submitted in advance of the meeting with verbal updates provided during the meeting on outage progress and findings. Prior to the meeting, a plant walkdown of completed and ongoing significant periodic shutdown work packages was carried out. The actions from the meeting have been closed out and no issues that would prevent the start-up of R1 were identified.

#### Start-up letter

1. The Station Director has asked ONR for consent to start-up TOR R1 under LC 30(3) (ref. [1]). The Station Director has confirmed that the reactor and associated plant is in a satisfactory state for a further period of operation subject to completion of a small number of activities that are required before, or as part of, return to service.

#### Maintenance schedule exceptions list and safety justification

1. The licensee’s request for ONR’s consent to start-up TOR R1 following the 2024 periodic shutdown states that the EIMT specified in the outage intentions document is now complete, with the exceptions detailed in ref. [28] and that these will be completed before, or as part of, return to service.
2. The licensee notes that a number of maintenance schedule activities will be deferred, and this is discussed in Section ‎3.8.4. Based on the evidence from ONR’s inspections and assessments, I am content that the licensee has complied with their plant maintenance schedule requirements or provided an appropriate justification if this is not the case.

#### Return to service EC 375298

1. The licensee’s justification to return TOR R1 to service following the in-service inspections and associated assessments during the 2024 periodic shutdown is set out in EC 375298 (ref. [31]).
2. It confirms that the inspection programme has been successfully completed and the reactor is fit for return to service for the next operating period.
3. This is supported by an INSA approval statement (ref. [29]).

#### Graphite core inspections EC 374991

1. EDF’s justification to return TOR R1 to service following the graphite core inspections is set out in EC 374991 (ref. [33]) which is supported by an INSA approval statement (ref. [34]). It confirms that the inspection of the graphite core has been completed in accordance with the maintenance schedule requirements and the graphite assessment panel has confirmed that the results are within the accepted limits of the relevant graphite safety cases.

#### Appointed examiner statement for PCPV

1. The licensee has submitted the Appointed Examiner’s statement (ref. [35]) summarising the outcome of the PCPV examinations as specified in the station’s maintenance, inspection and test schedule (MITS) and the written scheme of examination.
2. The statement confirms that all the inspection activities required to monitor the PCPV during the periodic shutdown are complete, except those which have to be completed as part of or after return to service.
3. Based on the results of the inspection activities undertaken, the Appointed Examiner concludes that the TOR R1 PCPV is in a satisfactory condition for continued operation, subject to normal in-service surveillance, until the next scheduled statutory outage due in 2027 and is certified for operation at pressure for a period of 40 months to 3 September 2027, noting that there are no cliff-edge effects associated with this date.

#### Competent Person statement for PSSR-related systems

1. The licensee has submitted a statement with respect to the inspections performed in accordance with PSSR during the periodic shutdown from their independent third party PSSR Competent Person (ref. [36]). The statement confirms that the out-of-service examinations detailed in the written schemes of examination are complete and have been found to be satisfactory. In-service examinations of the TOR R1 pressure systems will be completed following return to service.

#### Competent Person statement for PCPV penetrations

1. The licensee has submitted the inspection results of the thorough examination for the TOR R1 PCPV penetrations (ref. [37]).
2. All the penetrations inspected were confirmed as being in a satisfactory condition, with no significant challenges to integrity identified. The competent person has confirmed the suitability of the system of PCPV penetrations on R1 for continued service for the maximum interval permitted by the written scheme of examination (up to 30 November 2027 unless a postponement has been agreed with the competent person).

#### Station INA concurrence

1. INA has provided an interim concurrence statement (ref. [38]) which concludes that no issues that present a threat to start-up or continued operation of TOR R1 have been identified.

### ONR civil nuclear security and safeguards

1. The ONR civil nuclear security and safeguards inspectors have confirmed (ref. [39]) that they have no objections to ONR providing consent to start up TOR R1.

### Engagement with other governmental agencies

1. Before giving consent, other relevant competent regulatory authorities are notified of ONR’s intentions to ensure there are no specific objections that may compromise other regulatory requirements. ONR has engaged with the Scottish Environment Protection Agency, who have confirmed (ref. [40]) that they have no objections to the start-up of TOR R1 following the 2024 periodic shutdown.

# Matters arising from ONR’s work

1. There are no outstanding matters arising from the inspection and assessment work carried out by ONR that would prevent granting consent to start up TOR R1 after its 2024 periodic shutdown.
2. Residual issues that do not prevent ONR granting consent to start up TOR R1 will be followed up through normal regulatory business.

# Conclusions

1. Based on the evidence gathered from ONR’s inspection and assessment activities for the TOR R1 2024 periodic shutdown, together with the claims, arguments and evidence presented by the licensee in its request for consent to start up TOR R1, I am satisfied that:

* The EIMT requirements specified in the station’s maintenance schedule in support of LC 30 have been complied with. Where maintenance schedule activities have been deferred, appropriate safety justifications have been provided;
* EIMT has been carried out by SQEP, with an appropriate level of supervision and quality assurance in place commensurate with the safety function of an SSC; and
* Safety issues identified by the licensee during the shutdown have been adequately addressed with suitable and sufficient safety justification that relevant safety case limits and conditions are not challenged.

1. There remain some outstanding activities to complete as part of reactor start-up and completion of these activities will be reported to ONR in the 28-day report, or in specific documents that are not required prior to giving consent to start up.
2. In conclusion, no matters of concern have been identified that would prevent ONR giving consent for TOR R1 to start up following its 2024 periodic shutdown.

# Recommendations

1. ONR should issue licence instrument 567, giving consent to start up Torness Reactor 1 following its 2024 periodic shutdown.

# References

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