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EDF NGL Advanced Gas Cooled Reactor (AGR) Generic Failed Fuel Safety Case.

Agreement to the modification described in safety case EC 345864 NP/SC 7653: In-Reactor
Detection and Management of AGR Fuel Failures Occurring during Normal Operation for
Torness (TOR) Power Station

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EXECUTIVE SUMMARY

This report presents the findings of ONR's assessment of the Category 1 safety case NP/SC 7653 Proposal Version No. 03 attached to EC 345864 Revision 000 (Category 1), "In-Reactor Detection and Management of AGR Fuel Failures Occurring during Normal Operation" and the site specific implementation at Torness power station delivered at Category 2 through EC 319833.

Permission Requested

The licensee requested the Office for Nuclear Regulation's (ONR) 'Agreement' or 'Acknowledgement' under Licence Condition LC22(1) for the modification described in NP/SC 7653 Proposal Version No. 03 attached to EC 345864 Revision 000 (Category 1), "In-Reactor Detection and Management of AGR Fuel Failures Occurring during Normal Operation" for Torness (TOR) Power Station.

Licence Condition 22 (1) requires the licensee to make and implement adequate arrangements to control any modification (or experiment) carried out on any part of the existing plant or processes which may affect safety. This permission is being performed under a derived powers Agreement.

Background

This Project Assessment Report brings together the ONR assessment of the NP/SC 7653 for all seven AGRs with the assessment of the Torness implementation safety case. Furthermore, since the 2015 assessment of the NP/SC 7653 the licensees LC23 arrangements have been revised and the Nuclear Safety Requirements (NSRs) have been removed, thus NP/SC 7653 has been revised to include this change in arrangements. This PAR therefore also considers this update from the already assessed submission. It is not the intent of this PAR to address the global changes to the licensees LC23 arrangements, which have already been considered by ONR.

Failure of fuel pin cladding in an AGR core presents a potential for increases in reactor primary coolant activity, due to the release of gaseous fission products (principally iodine and caesium) from the fuel clad failure site. The impact through normal coolant leakage is insignificant in terms of radiological safety or radioactive discharges. The main nuclear safety concern is a potential for enhanced fission product release if there is a coincident reactor fault involving a loss of containment. The impact of pre-failed fuel (i.e. fuel that has failed prior to the fault commencing) is of particular significance where there are few, if any, consequential fuel failures such that the pre-failed fuel represents the main (or a significant) source of radioactive release.

The licensee's submission considers the risk due to fuel that has failed in-reactor and justifies coolant activity limits to control this risk. However, the licensee has also acknowledged that there may be some circumstances (e.g. due to indications of a deterioration of the fuel failure, or of a systematic mechanism that might result in a population of degraded but intact fuel that could dominate the risk in a subsequent fault) where extra precautions will be needed beyond those set out in in the submission.

The submission adopts the principle that reactors should not be operated indefinitely with failed fuel present, but allows for continued operation provided the coolant activity values lie below specified levels. A framework for safe operation when a fuel failure is detected is set out to appropriately manage, locate and discharge the fuel stringer.

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

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ONR has carried out a programme of work to produce assessments reports under the topics of Fuel Safety and Fault Studies. This work has taken place over the period since 2015 to the issue of this report recognising the need to address the matters arising, which led to assessment of site specific implementation.

Matters arising from ONR's work

The main areas of focus and discussion during this assessment were as follows:

- The safety justification presented by the licensee including sampling of the key technical references underpinning the licensee's safety case.
- Inspections on four of the seven AGR stations of the equipment used to monitor the activity in the reactor primary circuit and hence detect fuel failures in normal operations.
- Implementation of the ongoing programme of improvement to the coolant activity monitoring equipment.
- The adequacy of arrangements proposed for operations subsequent to the detection of failed fuel in the reactor during normal operations.
- The adequacy of arrangements for appropriately conservative decision making in response to detection of fuel failures in normal operations.
- The licensee's policy and guidance on managing failed fuel in normal operations, which provides a clear intent that failed fuel will be removed from the reactor as soon as is reasonably practicable.
- Removal of the NSRs and adequacy process controls noting the duration since the initial submission and changes to LC23 arrangements which took place in parallel.

Conclusions

I am satisfied with the claims, arguments and evidence laid down within the licensee's submission. The assessments supporting this Project Assessment Report have confirmed that the approach adopted by the licensee to implement limits and conditions of operation (LCOs) for management of fuel failures occurring during normal operations are appropriate and suitable and sufficient control arrangements will be implemented.

Notwithstanding my conclusion, there remains the need to continue to monitor the operation of Torness and all AGRs with respect to the arrangements in response to the detection of fuel failures in normal operations. While this forms part of the ongoing and routine interactions between the licensee and ONR it is appropriate to review these arrangements in future once they have been embedded and used. This requirement is included in the recommendations of this PAR.

Recommendation

Based on the findings presented in this PAR, I recommend that ONR gives Agreement to the licensee to implement the safety case, described in "NP/SC 7653 EC345864 Rev 000 Version 03, In-Reactor Detection and Management of AGR Fuel Failures Occurring During Normal Operations" supported by the Category 2 implementation EC 319833 at Torness power station.

Further to the permissioning of this submission for Torness it is recommended that ONR Acknowledges NP/SC 7653 for each other AGR as they are requested by the licensee. Each Acknowledgement is subject to adequate resolution to regulatory issue 6832 in relation to the site for which the LI is requested.

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It is recommended that after allowing sufficient time for the new arrangements to be implemented, ONR should sample compliance with the arrangements as part of a suitable licence condition 23 regulatory intervention. I anticipate that this will occur in around 2020 or at a time when the arrangements have been used in practice and judged to be embedded in response to operational fuel failures. This should be reviewed in 2020.

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LIST OF ABBREVIATIONS

ALARP	As low as reasonably practicable
AGR	Advanced Gas cooled Reactor
AR	Assessment Report
BCD	Burst Can Detection system
EA	Environment Agency
EC	Engineering Change (a modification under EDF NGL LC22 arrangements)
EDF NGL	EDF Energy Nuclear Generation Limited
GAM	Gaseous Activity Monitoring system
GFFSC	Generic Failed Fuel Safety Case (NP/SC 7653)
HYA	Heysham A nuclear power plant
JCO	Justification for Continued Operation
LC	Licence Condition
LCO	Limits and Conditions for Operation
NSR	Nuclear Safety Requirements
NTB	Nuclear Technology Branch
ONR	Office for Nuclear Regulation
PAR	Project Assessment Report
R2	Reactor 2
SEPA	Scottish Environment Protection Agency
SQEP	Suitably Qualified and Experienced Person(s)
TOR	Torness nuclear power plant

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1 PERMISSION REQUESTED

1. The licensee requested (Ref. 1) the Office for Nuclear Regulation's (ONR) 'Agreement' or 'Acknowledgement' under Licence Condition LC22(1) for the modification described in NP/SC 7653 Proposal Version No. 03 attached to EC 345864 Revision 000 (Category 1), "In-Reactor Detection and Management of AGR Fuel Failures Occurring during Normal Operation" for Torness (TOR) Power Station.

2 BACKGROUND

2. The limits and requirements for managing the nuclear safety risk associated with in-reactor failed fuel on a consistent basis for all Advanced Gas Cooled Reactors (AGRs) are justified in the Category 1 safety case NP/SC 7653 (herein known as the 'Generic Failed Fuel Safety Case' and abbreviated to GFFSC), Ref. 1. The GFFSC justifies operational action levels and outlined the requirements for implementing the safety case at stations.
3. The requirement for this safety case has been tracked under regulatory issue 2024, which required that the Licensee produces a robust safety case and associated management procedure(s) to ensure consistent management of fuel pin failures across the whole AGR Fleet.
4. Version 02 of the GFFSC was submitted to ONR for assessment in 2015 (Ref 3). Further to the assessment at that time it was determined by ONR that it was necessary to maintain regulatory oversight of the on-site implementation of the arrangements for decision making in response to detection of operational fuel failures. This requirement is set down in the Fuel Safety Assessment (Ref 6), which assesses NP/SC 7653 for all AGRs.
5. This Project Assessment Report brings together the ONR assessment of the GFFSC (Ref 1) for all AGRs with the assessment of the Torness implementation safety case (Ref 2). Furthermore, since the 2015 assessment of the GFFSC the EDF NGL LC23 arrangements have changed and the Nuclear Safety Requirements (NSRs) have been removed, thus Ref 1 has been revised to version 03. This PAR therefore also addresses this change from the already assessed submission (i.e the changes introduced in Ref 1 in modification to Ref 3). It is not the intent of this PAR to address the global changes to the EDF NGL LC23 arrangements, which have already been reviewed and are reported in Ref 7.
6. Failure of fuel pin cladding in an AGR core presents a potential for increases in reactor primary coolant activity, due to the release of gaseous fission products (principally iodine and caesium) from the fuel clad failure site. Molecular iodine and caesium tend to remain largely within a failed fuel pin and when in the coolant gas stream, they will deposit readily on reactor circuit surfaces. The impact through normal coolant leakage is insignificant in terms of radiological safety or radioactive discharges. The main nuclear safety concern is a potential for enhanced fission product release if there is a coincident reactor fault involving a loss of containment. The impact of pre-failed fuel (i.e. fuel that has failed prior to the fault commencing) is of particular significance where there are few, if any, consequential fuel failures such that the pre-failed fuel represents the main (or a significant) source of radioactive release.
7. The purpose of the EDF NGL GFFSC is to provide a generic (i.e. across its seven operating AGRs) in-reactor safety case for the detection, location and management of fuel failures occurring during normal operation of the reactors. The previous existing safety cases, whilst valid, are not consistent. The intention is to provide a common set of principles, with a consistent set of operating guidelines and procedures for managing fuel failures and to define the safety limits for implementing the safety case.

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These arrangements are implemented through limits and conditions for operation (LCOs) in Reference 2, which presents the implementation for Torness power station.

8. The GFFSC considers the risk due to fuel that has failed in-reactor and justifies coolant activity limits to control this risk. However, EDF NGL has also acknowledged that there may be some circumstances (e.g. due to indications of a deterioration of the fuel failure, or of a systematic mechanism that might result in a population of degraded but intact fuel that could dominate the risk in a subsequent fault) where extra precautions will be needed beyond those set out in in the GFFSC. The increase in fuel failures seen at Heysham 1 (HYA) Reactor 2 in 2016 is an example of such a scenario and has been subject to a separate assessment by ONR (Ref 7).
9. The GFFSC adopts the principle that reactors should not be operated indefinitely with failed fuel present, but allows for continued operation with a located fuel failure provided the iodine-131 at risk level and the coolant activity values lie below specified levels. Should a fuel failure prove difficult to locate in the short term, then continued operation at power for up to one year is permitted by the safety case, but subject to defined limits on the coolant activity. Finally, the GFFSC also permits for some continued operation at higher coolant activity limits, but solely to assist in detection of the fuel failure location and this continued operation period is strictly time limited.
10. EDF NGL has categorised the modification at Category 1, which is its highest nuclear safety category. The proposal has completed EDF NGL's due process at version 02, including consideration by its Nuclear Safety Committee (Ref. 4) and Independent Nuclear Assurance function (Ref. 5). While the current version is 03 the modifications to the document have been completed in line with EDF NGLs LC22 arrangements at a lower category and therefore do not require revisiting by the NSC. An updated INSA statement covering the update to version 03 has been included with the transmittal (Ref 1).

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

11. ONR has carried out a programme of work to produce assessments under the topics of Fuel Safety (Ref 3) and Fault Studies (Ref 8), which has included the implementation arrangements delivered through Ref 2.
12. The GFFSC (Ref 1) has been assessed under the topic of Fuel Safety on a fleet wide basis covering all AGRs. The Torness implementation EC (Ref 2) has been assessed with respect to Fault Studies and ALARP in generic terms, since the judgements could apply to any AGR, depending on the sites specific arrangements. However, the assessment has only examined the submission for Torness and is therefore this permission is only applicable to Torness. The assessment will only be applicable to other AGRs should the implementation submissions for those sites be commensurate in each case. This will be reviewed as and when submissions are provided for the other AGRs.
13. EDF NGL and ONR engaged via level 4 meetings throughout the safety case assessment process.
14. For this assessment effort has been concentrated on:
 - Confirmation that due process appropriate for a category 1 submission has been adequately implemented.
 - Sampling of Claims and supporting Arguments to confirm they are adequately underpinned by appropriate evidence.

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- Demonstration that limits set on the GAM (Gaseous Activity Monitoring) and BCD (Burst Can Detect) systems and subsequent actions are robustly underpinned.
- Confirmation that responses to ONR questions on the safety cases at both the category 1 GFFSC and category 2 implementation have been adequately addressed.
- Ensuring that the GAM and BCD equipment installed at the AGR stations to detect activity released from failed fuel is in an appropriate condition and that a programme for managing ageing and obsolescence issues is in place for the projected lifetime of the stations. This has been executed through site based inspections.
- Consideration of the implementation of the LCOs through a category 2 site specific safety case. This has been to confirm that the decision making and governance processes used to determine the course of action in the event that failed fuel is detected in normal operations are robust, include the correct SQEP staff and maintain an ALARP position at all times.

4 MATTERS ARISING FROM ONR'S WORK

15. Assessment of Ref 1 was initiated in 2015. This resulted in the requirement to include assessment of Ref 2 concerning the site specific implementation at Category 2. Given the time period and changes to EDF NGLs arrangements there are a number of matters arising that are addressed in the subsections below.

4.1 REMOVAL OF EDF NGL NUCLEAR SAFETY REQUIREMENTS (NSR) FROM LC23 ARRANGEMENTS

16. Since submission of the GFFSC at version 02 in 2015 (Ref 3) and during the period after the completion of the ONR Fuel Safety Assessment Report the EDF NGL LC23 arrangements have been revised. This resulted in removal of the Nuclear Safety Requirements (NSRs), which have previously been subject to Approval by ONR under primary powers.
17. The reforms to ONRs regulatory footprint on EDF NGLs LC23(4) arrangements concerning Operating Rules are reported in Ref 9 and are not addressed here.
18. The 2015 version 02 of the GFFSC (Ref 3) made the safety case for implementation of LCOs for coolant activity through modification of the NSRs and was assessed by ONR in Ref 3. GFFSC Version 03 (Ref 1) has been amended to accommodate the changes to arrangements and removal of NSRs. This change does not alter the basis of the safety case or implementation in practice on site. i.e. the technical specifications for coolant activity. These remain as originally proposed and therefore both the safety case and ONR Fuel Assessment remain valid.
19. As a result of the change in LC23(4) arrangements permissions for changes in LCOs are now granted via Agreement or Acknowledgement under derived powers rather than Approval under primary powers.
20. I have reviewed version 03 of the submission to confirm that the revision correctly reflects the changes in the arrangements regarding the removal of the NSRs. EDF NGL have decided to achieve this through addition of a preface specifically to highlight the NSR removal. I judge this approach to be fit for purpose and pragmatic in terms of efficiency.
21. The ONR Fuel Assessment (Ref 3) states:

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“In conclusion, from the totality of the work I have conducted, I am content that the licensee has produced a well argued, technically underpinned safety case which establishes a consistent framework for management of fuel failures in core across its AGR fleet. I also judge that from the safety case, the licensee has set appropriate, conservative and well justified operating limits. Accordingly, I support that each AGR station should be issued with an individual ‘Approval’ Licence Instrument, permitting it to implement the licensee’s requested changes to NSR 8.1.2 (8.1.5 at Torness) and 8.1.3 (8.1.6 at Torness).”

22. Since the arrangements have now changed this conclusion is therefore invalid in terms of the NSRs and derived powers enacted by ONR. However, the conclusion remains valid in terms of the adequacy of the safety case and LCOs defined therein. I am therefore satisfied that the removal of the NSRs does not change the conclusion that the safety case is satisfactory for implementation and thus prevent issuing of a Licence Instrument to “Agree” the modification subject to appropriate site specific arrangements being demonstrated at Category 2, as required by Ref 3 and discussed in section 4.3 below.

4.2 ASSESSMENT OF GENERIC SAFETY CASE NP/SC 7653 FOR ALL AGRS

23. The scope of the Fuel Safety assessment (Ref 6) included:

- The safety justification presented by the licensee.
- Sampling of the key technical references underpinning the licensee’s safety case.
- Engagement with key licensee personnel in the licensee’s Nuclear Technology Branch (NTB) at Barnwood.
- Inspections (on four of the licensee’s seven AGR stations) of the key equipment used to measure the activity in the reactor primary coolant (and hence detect potential fuel failures).

24. As a result the Fuel Safety Inspector concluded, as stated in paragraph 21 above, that the licensee’s safety case is adequate to enable ONR’s agreement. This statement confirming the acceptability of the safety case proposed in Ref 3 (and hence revised in Ref 1) was caveated with a requirement for ONR to assess the site specific implementation of the GFFSC via the EDF NGL modifications process through lower category (Cat 2) engineering changes. In this case, Ref 2 applying to Torness power station only. ONR’s assessment of the category 2 implementation modification for Torness is reported in section 4.3 below.

25. The Fuel Safety assessment identified the need for replacement and upgrade of the Gaseous Activity Monitoring system (GAM). This programme is now being delivered and remains an area of regulatory attention. At the time of writing the programme has fallen behind the original plan and is planned for implementation at Torness in 2019. Whilst the replacement system is not yet installed the current GAM remains adequately reliable to meet the safety case requirements. New systems have been delivered at several AGR stations, where reliability of the old system had been poorer and therefore was higher priority or replacement.

4.3 ASSESSMENT OF SITE SPECIFIC IMPLEMENTATION MODIFICATION (EC 319833) AT CATEGORY 2 FOR TORNESS

26. Ref 8 presents the findings of the assessment of EC 319833 (Ref 2) as presented in support EDF NGL’s submission (Ref. 1).
27. The assessment is restricted to examining the adequacy of arrangements proposed for operations subsequent to the detection of failed fuel in reactor and considers the

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- method of compliance with the proposed limits on primary coolant activity. The fault analysis methodology used to derive the limiting values is outside of scope of the assessment.
28. The control limits on iodine at risk of release (from existing failures) are necessary to monitor and control the risk associated with fuel damage and the submission details the wider arrangements for making conservative operational decisions. The adequacy of these additional measures has also been assessed.
 29. The ONR assessment concludes that the claims, arguments and evidence laid down within the Licensee's safety case are adequate to enable agreement to the proposal.
 30. EDF NGL has provided a policy document with a clear intent to comply with the key legal requirement to ensure that adequate measures are in place to prevent the leakage of any radioactive substance.
 31. Moreover, EDF NGL's guidance ensures that failed fuel will be removed from the reactor as soon as is reasonably practicable.
 32. Since the original submission of the GFFSC increased fuel failures at Heysham 1 Reactor 2 has led to increased governance of fuel performance across the AGR fleet, which has improved the arrangements for managing fuel failures. This governance was assessed by ONR in Ref 7.
 33. I have confirmed that the version of EC 319833 provided in Ref 2 has not been revised since the ONR assessment was completed and that there has been appropriate assessment undertaken by the licensee's internal regulator (Ref 12).
 34. Notwithstanding the above, there is a need to continue to monitor the occurrence of failed fuel as an indicator of the risk associated with weakened fuel cladding and in this context, ONR needs to maintain appropriate engagement with EDF NGL specialists. ONR generally monitors fuel failures through routine planned regulatory interactions with EDF NGL. In situations where trends of systematic failure mechanisms occur these have been managed under regulatory issues, for example in 2016 when failures increased at Heysham 1 Reactor 2.
 35. In order to ensure that the arrangements in the GFFSC are correctly implemented in practice it has been recommended by the Fault Studies Inspector that an intervention is conducted once the arrangements have been embedded and used in practice. This is necessary because the process for decision making with respect to failed fuel will only be conducted in response to a failure being detected. The following recommendation is raised:

After allowing sufficient time for the new arrangements to be implemented, ONR should sample compliance with the arrangements as part of a suitable license-condition 23 regulatory intervention. I anticipate that this will occur in around 2020 or at a time when the arrangements have been used in practice and judged to be embedded in response to operational fuel failures. This should be reviewed in 2020.
 36. In order to track this recommendation, which requires action by ONR rather than being a regulatory issue concerning the submission and thus requiring further action by EDF NGL, I have recorded it in the ONR Operating Facilities Action Tracker (Ref 11 – ORREC-004).

4.4 CONSULTATION WITH OTHER RELEVANT REGULATORS

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37. I have consulted with the other relevant regulator, the Scottish Environmental Protection Agency (SEPA), to establish if they had any specific objections that would prevent ONR from issuing LI 557. The SEPA have discussed this proposal with EDF NGL and have confirmed they do not object to ONR agreeing to implementation of the modification (Ref. 10).
38. In preparation for similar requests from EDF for this safety case to be implemented on other AGRs the Environment Agency (EA) have been included in correspondence on this matter.

5 CONCLUSIONS

39. This report presents the findings of ONR's assessment of NP/SC 7653: In-Reactor Detection and Management of AGR Fuel Failures Occurring during Normal Operation for Torness (TOR) Power Station (Ref 1). This submission is generic to all seven AGR sites but the permission requested is specific to Torness.
40. To conclude, I am satisfied with the claims, arguments and evidence laid down within the EDF NGL submission (Ref. 1). The assessments conducted in the reports supporting this Project Assessment Report have confirmed that the approach adopted by EDF NGL to implement limits and conditions of operation (LCOs) for management of fuel failures occurring during normal operations are appropriate and suitable and sufficient control arrangements will be implemented.
41. At ONR's request EDF NGL submitted the AGR fleet-wide category 1 submission (Ref 1) supported by a Torness site specific implementation EC (Ref 2), which presents the site specific documents and decision making arrangements in the event of a fuel failure being detected in normal operations. My assessment concludes that the implementation of the proposal will ensure adequate arrangements are in place for the management of failed fuel at Torness.
42. Notwithstanding my conclusion, there remains the need to continue to monitor the operation of Torness and all AGRs with respect to the arrangements in response to the detection of fuel failures in normal operations. While this forms part of the ongoing and routine interactions between EDF NGL and ONR it is appropriate to review these arrangements in future once they have been embedded and used. Therefore the recommendation (ORREC-004) in Section 6 below has been raised to capture the need for an ONR intervention, which may take place at any of the applicable AGR sites (of which Torness is the first to be subject to permissioning).
43. Since the assessment of NP/SC 7653 has covered all AGR stations I judge that it is appropriate to recommend that the submissions of the same modification for the other six AGR sites (requests from EDF NGL will be made on a site by site basis) are permissioned via an Acknowledgement Licence Instrument. However, noting the need for site specific implementation to be reviewed by ONR and that these ECs have not yet been delivered. I recommend that EDF NGL shall provide the implementation Cat 2 ECs for each site prior to the issuing of the LIs. This will be controlled via a level 3 regulatory issue (6832).
44. Furthermore, given that issue 6832 will now track the delivery of site specific implementation and that the Cat 1 proposal (Ref 1) has now completed assessment by ONR it is my judgement that it appropriate to close regulatory issue 2024. The original wording of issue 2024 set the requirement for closure to be the implementation of appropriate LCOs at all seven AGR sites. In my judgement, given the assessment position, it is now appropriate to track this by an updated issue which identifies the remaining work more accurately against a new agreed schedule.

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6 RECOMMENDATIONS

45. Based on the assessment reports and conclusions discussed above I have made the following recommendation, which is recorded in Ref 11:

Recommendation 1: ORREC-004 *After allowing sufficient time for the new arrangements to be implemented, ONR should sample compliance with the arrangements as part of a suitable licence condition 23 regulatory intervention. I anticipate that this will occur in around 2020 or at a time when the arrangements have been used in practice and judged to be embedded in response to operational fuel failures. This should be reviewed in 2020.*

46. Based on the findings presented in this PAR, I recommend that ONR gives Agreement to EDF NGL to implement the safety case, described in “NP/SC 7653 EC345864 Rev 000 Version 03, In-Reactor Detection and Management of AGR Fuel Failures Occurring During Normal Operations” supported by the Category 2 implementation EC 319833 at Torness power station.
47. Further to the permissioning of this submission for Torness it is recommended that ONR Acknowledges NP/SC 7653 for each other AGR as they are requested by EDF NGL. Each Acknowledgement is subject to adequate resolution to regulatory issue 6832 in relation to the site for which the LI is requested. Regulatory issue 2024 will be closed and superseded by issue 6832.

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7 REFERENCES

1. EDF Letter NSL/TOR/50633R Request for Agreement or Acknowledgement under Arrangements made under Licence Condition LC22(1): EC 345864 In-Reactor Detection and Management of AGR Fuel Failures Occurring During Normal Operations, Version 03, 6th November 2018. 2018/366234.
2. EDF Letter NSL/TOR/50633R Request for Agreement or Acknowledgement under Arrangements made under Licence Condition LC22(1) Attachment Torness EC 319833: Implementation of NP/SC 7653 In-Reactor Detection and Management of AGR Fuel Failures Occurring During Normal Operation. 2018/366234
3. NP/SC 7653 In-Reactor Detection and Management of AGR Fuel Failures Occurring During Normal Operation EC 345864 (Torness), Version 02, January 2015. 2015/260157.
4. EDF Energy Nuclear Generation Ltd Nuclear Safety Committees Minutes of the Meeting Held at Torness on 29th January 2015, 2015/0260218.
5. INSA Approval Statement – EC 345864 000 - “In Reactor Detection and Management of AGR Fuel Failure Occurring During Normal Operation,” April 2015. 2015/0260218.
6. ONR-CNRP-AR-15-035 Revision 1 - Advanced Gas Cooled Reactor (AGR) Generic Failed Fuel Safety Case - Assessment of the Licensee’s Category 1 Safety Case for In-Reactor Detection and Management of AGR Fuel Failures Occurring During Normal Operation, April 2016. 2015/260003.
7. ONR-OFD-PAR-18-006 Revision 0 - Agreement to the modification described in JCO – Continued Operation for Heysham 1 R2 following Detection of Multiple Fuel Failures in 2016 NP/SC 7757 EC358854. April 2018. 2018/122338.
8. ONR-OFD-AR-18-008 Revision 0 - Assessment of EC 319833 Implementation of NP/SC 7653: In-Reactor Detection and Management of AGR Fuel Failures Occurring During Normal Operation. May 2018. 2018/95969.
9. ONR Operating Facilities Programme - Proposal to reform the use of primary powers under LC23, April 2016. <http://www.onr.org.uk/documents/2016/reform-primary-powers-lc23.pdf>
10. Email from SEPA confirming that there are no objections to ONR issuing a Licence Instrument for NP/SC 7653 for Torness. 13th September 2018. 2018/347479.
11. ONR Operating Reactors Sub-Division Combined Action Tracker 2016/435030.
12. EDF INSA Certificate for assessment of EC 319833: Implementation of NP/SC 7653 In-Reactor Detection and Management of AGR Fuel Failures Occurring During Normal Operation. 2018/370400.