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| ONR Project Assessment Report  PR-01479 Mk A2 AGR Transport Flask (Design No. 2834) – Assessment of Modification N0251, Phase 2 |



ONR Project Assessment Report

**Project Name**: PR-01479 Mk A2 AGR Transport Flask (Design No. 2834)

**Report Title**: Assessment of Modification N0251, Phase 2

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

**Authored by**:

**Report Issue No**.: 1

**Publication Date**: Feb-25

**Document ID**: ONRW-2019369590-8531

Table 1: Circulation (latest issue)

|  |  |  |
| --- | --- | --- |
| Organisation | Recipient | Date Report Sent |
| ONR |  | 20/9/2024 |
| EDF Energy Nuclear Generation Limited |  | 20/9/2024 |

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# Executive Summary

EDF Energy Nuclear Generation Limited (the applicant) has applied to the Office for Nuclear Regulation for approval of Modification N0251 to the Mk A2 AGR Transport Flask (Design No. 2834) package design.

The full scope of Modification N0251 requests approval for:

* extension of the flask major maintenance period from four to five years for all five package variants ‘A’ to ‘E’;
* addition of sea transport for the ‘D’ and ‘E’ package variants; and
* the ‘C’ package variant, which was withheld at the last renewal of the package design approval for the applicant to complete additional shielding assessment work.

We have already assessed and approved extension of the flask major maintenance period under WIReD permissioning record PR-01211.

The basis of our regulatory decision on the remaining scope of the modification is documented in this Project Assessment Report. We have undertaken a proportionate and targeted assessment, assessing the claims, arguments and evidence made in the applicant’s Package Design Safety Report and supporting documentation. We have completed a review of the last renewal of the package design approval to confirm that there are no outstanding issues.

It is concluded that the modification provides an adequate justification for combined package design and shipment approval of the ‘C’ package variant for transport by road and rail and for package design approval of the ‘D’ and ‘E’ package variants for transport by road, rail and sea.

It is recommended that the competent authority grants approval of Modification N0251 and resolves the matter arising from our assessment on inconsistencies between documents within the applicant’s package safety case. This will necessitate the issue of the following revised certificates of package design approval and shipment approval for the ‘A’, ‘B’, ‘C’, ‘D’ and ‘E’ variants of the Mk A2 AGR flask package design under the GB/2834 identification mark:

* GB/2834A/B(M)F (Rev.14);
* GB/2834B/B(M)F (Rev.14);
* GB/2834C/B(M)F (Rev.13);
* GB/2834D/B(M) (Rev.14);
* GB/2834D/B(M)T (Rev.17);
* GB/2834E/B(M) (Rev.6); and
* GB/2834E/B(M)T (Rev.5).

Table 2: List of abbreviations

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| Term/Acronym | Description |
| ADR | Agreement Concerning the International Carriage of Dangerous Goods by Road |
| AGR | Advanced Gas-cooled Reactor |
| CA | Competent Authority |
| CDG | The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 |
| GB | Great Britain |
| GWL | Graphite Weight Loss |
| IMDG | International Maritime Dangerous Goods Code |
| ONR | Office for Nuclear Regulation |
| PAR | Project Assessment Report |
| PDSR | Package Design Safety Report |
| PIE | Post-Irradiation Examination |
| POMM | Package Operations and Maintenance Manual |
| RI | Regulatory Issue |
| RID | Regulations Concerning the International Carriage of Dangerous Goods by Rail |
| TCA | Transport Competent Authority |
| UK | United Kingdom |
| WIReD | (ONR) Well Informed Regulatory Decisions |

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# Permission Requested

1. EDF Energy Nuclear Generation Limited (the applicant) has applied (refs. [1, 2]) to the Office for Nuclear Regulation (ONR) as the Great Britain (GB) competent authority (CA) for approval of Modification N0251 to the Mk A2 AGR transport flask, Design No. 2834.
2. This Project Assessment Report (PAR) presents the basis of our regulatory decision regarding Modification N0251.

# Background

## Overview of Package Design

1. The GB/2834 package design is commonly known as the Mk A2 AGR fuel flask and has been in operation since the 1990s. It has principally been used for the shipment of Advanced Gas-cooled Reactor (AGR) fuel from the applicant’s AGR power stations to Sellafield for storage and reprocessing, as well as transport of fuel assembly tie-bars and other non-fissile components.
2. The package design comprises a forged carbon steel flask body with attached external cooling fins, a flask lid assembly and an internal stainless steel skip (of two different designs) carrying the radioactive contents.
3. The package design has five variants:

* ‘A’ - unbottled AGR fuel elements in a 15-compartment skip;
* ‘B’ - bottled AGR fuel elements in an 8-compartment skip;
* ‘C’ - loose AGR fuel pins in slotted cans or whole/part pins, pellets and powders in debris capsules within slotted cans in an 8-compartment skip (proposed under this modification, no current approval);
* ‘D’ - discharged flask; and
* 'E' - non-fissile components, e.g. irradiated tie-bars.

## Regulatory History

1. The last renewal of the GB/2834 package design approval was completed in 2022. Based on our assessment, we granted package design and shipment approval for the ‘A’, ‘B’, ‘D’ and ‘E’ package variants for transport by road and rail in the United Kingdom (UK). We withheld approval of the ‘C’ variant at that time due to our conclusion that the applicant needed to provide further evidence to demonstrate that the design satisfied the statutory dose rate limits external to the package surface.
2. Our regulatory decision was effected by the issue of certificates of package design approval and shipment approval (refs. [3, 4, 5, 6, 7, 8, 9, 10]).

## Purpose and Scope of Modification

1. The applicant has a requirement to increase the number of Mk A2 AGR flasks within its operational fleet to support the defueling of AGR power stations when their generating lifetime is complete.
2. Modification N0251 is part of a wider modifications programme to deliver this requirement. Specifically, this Category A modification (refs. [1, 2]) requests approval for:

* extension of the flask major maintenance period from four to five years;
* addition of sea transport for the ‘D’ and ‘E’ package variants; and
* the ‘C’ package variant.

1. The regulatory permissioning strategy for Modification N0251 (ref. [11]) was agreed with the Transport Competent Authority (TCA) delivery lead based on assessing the full modification scope submitted by the applicant.
2. We supported continued flask availability by addressing the application in two phases.
3. We granted approval of the extended flask major maintenance period in November 2023 through the issue of combined certificates of package design and shipment approval for the ‘A’, ‘B’, ‘D’ and ‘E’ package variants for transport by road and rail in the UK (refs. [12, 13, 14, 15]).
4. This PAR is therefore limited to the remaining scope of Modification N0251, as agreed in the WIReD permissioning record (ref. [16]).

# Assessment and Inspection Work Carried out by ONR in Consideration of this Request

1. In accordance with the regulatory permissioning strategy, we have carried out targeted and proportionate assessments of the applicant’s proposed modification. Our assessment of the modification has included assessment by criticality, shielding and engineering specialist inspectors.
2. We previously assessed the safety case requirements aspects of the package design as part of the approval for the renewal of the existing transport and shipment certificates for the GB/2834 package in 2022 (ref. [17]). This modification does not impact the scope or conclusions of that assessment and so the safety case requirements have not been revisited.
3. We undertook our most recent inspection of the applicant in 2023 (ref. [18]) and concluded that the applicant was compliant with its duties under ADR (ref. [19]), RID (ref. [20]) (by inference) and CDG (ref. [21]). The applicant has a positive history of compliance. Given the nature of this modification and the recent history of transport compliance inspections, we did not consider it proportionate to undertake further inspection activities as part of this assessment.
4. All our assessments were undertaken in accordance with the requirements of ONR’s HOW2 Business Management System and its associated guidance, principally ONR’s transport permissioning assessment guidance (ref. [22]).

## Criticality Assessment

1. We assessed the ‘C’ package variant at the previous renewal and it was recommended for approval from a criticality safety perspective (ref. [23]). The criticality assessor confirmed that there were no changes to the ‘C’ variant design under this modification and concluded it was bounded by the previous assessment and no further assessment was required (ref. [24]).
2. The modification for the addition of sea transport relates only to the ‘D’ and ‘E’ package variants, which are Type B(M) package designs and hence do not require criticality assessment.

## Shielding Assessment

1. Our radiation shielding assessment for the full scope of Modification N0251 was reported in a technical assessment note (ref. [25]).
2. The shielding assessor confirmed that there are no additional shielding requirements for sea transport of the ‘D’ and ‘E’ package variants under SSR-6 (ref. [26]).
3. Our assessor reviewed the applicant’s new shielding analysis for the ‘C’ package variant and confirmed that the principal source assumptions for AGR core graphite weight loss (GWL) are reasonable, and consistent with those that we accepted at the last renewal in 2022. The assessor confirmed that the maximum dose rates with peak radiation source terms external to the package satisfied the statutory dose rate limits under all conditions of transport specified in SSR-6 .
4. The assessor noted that the additional shielding analysis modelled two post-irradiation examination (PIE) debris slotted cans in the opposite corners of the skip and did not include non-fissile items such as tie-bars in the other compartments, as was permitted by previous package design approvals for the ‘C’ package variant. The assessor confirmed with the applicant that there was no identified requirement for the transport of non-fissile items under the ‘C’ configuration (ref. [27]) and recommended that non-fissile items should be excluded from the new issue of the approval.
5. We raised a regulatory issue (ref. [28]) to monitor the applicant’s progress in addressing the shielding assessment shortfalls from the last renewal of package design approval. That regulatory issue has been closed based on the evidence provided by the applicant to support this modification.
6. Our assessor recommended that Modification N0251 to permission the ‘C’ package variant and the addition of sea transport for the ‘D’ and ‘E’ package variants should be approved from a radiation shielding perspective.

## Engineering Assessment

1. Our mechanical engineering assessment for the full scope of Modification N0251 was reported in an assessment report (ref. [29]).
2. The engineering assessor confirmed that there are no additional engineering requirements for sea transport of the ‘D’ and ‘E’ package variants under SSR-6.
3. We assessed the ‘C’ package variant at the previous renewal and it was recommended for approval from a mechanical engineering perspective (ref. [30]). There were no changes from the ‘C’ variant design under this modification and there have been no changes in legislation, regulatory guidance or any regulatory intelligence that required further assessment.
4. Our assessor recommended that Modification N0251 to permission the ‘C’ package variant and the addition of sea transport for the ‘D’ and ‘E’ package variants should be approved from an engineering perspective.

## Review of Previous Renewal

1. At the last renewal of the package design approval, our human factors assessment (ref. [31]) identified some shortfalls in the identification of the administrative controls and operating limits for the Mk A2 AGR flask and their inclusion in the package operating and handling instructions. We managed this with the applicant via a regulatory issue (ref. [32]). The applicant has made the necessary changes to the package operations and maintenance manual (POMM) to provide end-users with information about the safety important operational steps for receipt and dispatch of the flask for transport and the regulatory issue has been addressed and closed.

## Shipment Approvals

### ‘C’ Package Variant

1. The applicant requested approval for transport of the ‘C’ package variant by road and rail in the UK. Transport of the Mk A2 AGR flask by these modes is well-established between AGR stations and Sellafield. At the previous renewal, we granted shipment approval by road and rail for the ‘A’, ‘B’, ‘D’ and ‘E’ package variants and I judge that shipment approval for the ‘C’ package variant can be given on the same basis.
2. We have previously issued separate certificates for the package design and shipment approvals for the ‘C’ package variant. I judge it would be more efficient to issue a combined certificate of approval.

### Sea Transport of the ‘D’ and ‘E’ Package Variants

1. We engaged with the applicant to review their safety case arrangements for the management of sea transport and compliance with relevant legislation, such as IMDG Code (ref. [33]).
2. The applicant confirmed that the addition of sea transport for the ‘D’ and ‘E’ package variants is being sought as a strategic alternative option to facilitate PIE work at an overseas facility. The applicant’s arrangements recognise that sea transport is not a routine activity for the Mk A2 AGR flask and would be progressed as a “special provision move” project over a number of months. This would include liaison with ONR on specific details including the vessel type, shipping company, transport route, emergency plans and necessary notifications, as well as formal engagement with other regulators and overseas competent authorities (ref. [34]).
3. The applicant confirmed that each sea transport would be submitted as a modification to ONR, consistent with their PDSR (ref. [35]).
4. I judge that the modification does not provide all the information required for a shipment approval for sea transport as required by SSR-6 para 827. I therefore recommend that the design approval for the ‘D’ and ‘E’ package variants is revised to include sea transport, with shipment approval given for road and rail in the UK only. Shipment approval for transport by sea will be assessed under future modifications to be submitted by the applicant.

# Matters Arising from ONRs Work

1. Our assessment of this modification application has identified that the applicant’s proposal for sea transport of the ‘D’ and ‘E’ package variants does not provide all of the information required to grant shipment approval for that mode of transport, as required by SSR-6 para 827. The applicant will need to submit a request for shipment approval by sea under future modifications for specific sea transport consignments.
2. Our assessment also identified some inconsistencies between the applicant’s PDSR and POMM and the extant certificates of package design and shipment approval for all variants of the GB/2834 package. These relate to details of flask shipment and AGR fuel that are not safety significant. We will address this by making the necessary changes to all certificates in parallel with those required for approval of this modification. The applicant has committed to resolving the inconsistencies in their documentation and we will monitor and track progress via a regulatory issue (RI-12219).

# Conclusions

1. I conclude that the proposed modification provides an adequate justification for:

* combined package design and shipment approval of the ‘C’ package variant for transport by road and rail; and
* package design approval of the ‘D’ and ‘E’ package variants by road, rail and sea;
* shipment approval of the ‘D’ and ‘E’ package variants by road and rail only.

# Recommendations

1. I recommend that the competent authority grants combined package design and shipment approval of the ‘C’ variant and the addition of sea transport to the package design approval of the ‘D’ and ‘E’ package variants, as proposed by Modification N0251. This will necessitate the issue of the following revised certificates of package design and shipment approval for the ‘C’, ‘D’ and ‘E’ variants of the Mk A2 AGR flask under the GB/2834 CA identification mark:

* GB/2834C/B(M)F (Rev.13);
* GB/2834D/B(M) (Rev.14);
* GB/2834D/B(M)T (Rev.17);
* GB/2834E/B(M) (Rev.6); and
* GB/2834E/B(M)T (Rev.5).

1. I further recommend that the competent authority resolves the identified issues with the remaining GB/2834 certificates by issue of the following revised certificates of combined package design and shipment approval for the ‘A’ and ‘B’ variants of the Mk A2 AGR flask under the GB/2834 CA identification mark:

* GB/2834A/B(M)F (Rev.14);
* GB/2834B/B(M)F (Rev.14).

# References

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| [1] | EDF, Modification N0251, NSLGEN32823, "Mk A2 AGR Flask. Increase in the Major Maintenance Period from 4 to 5 Years and Committed Updates to the PDSR from Modification N0219", April 2023, WIReD Ref: ONRW-2019369590-2268. |
| [2] | EDF, "EDF Energy Nuclear Generation - Modification Number N0251 Issue 1", February 2023, WIReD Ref: ONRW-2019369590-2271. |
| [3] | ONR, "Certificate of Approval of Package Design for the Carriage of Radioactive Material, GB/2834A/B(M)F (Rev.12)", CM9 Ref: 2022/52758. |
| [4] | ONR, "Certificate of Approval of Package Design for the Carriage of Radioactive Material, GB/2834B/B(M)F (Rev.12)", CM9 Ref: 2022/52759. |
| [5] | ONR, "Certificate of Approval of Package Design for the Carriage of Radioactive Material, GB/2834D/B(M) (Rev.12)", CM9 Ref: 2022/52762. |
| [6] | ONR, "Certificate of Approval of Package Design for the Carriage of Radioactive Material, GB/2834E/B(M) (Rev.4)", CM9 Ref: 2022/52763. |
| [7] | ONR, "Certificate of Approval for the Shipment of Radioactive Material, GB/2834A/B(M)FT (Rev.15)", CM9 Ref: 2022/52766. |
| [8] | ONR, "Certificate of Approval for the Shipment of Radioactive Material, GB/2834B/B(M)FT (Rev.13)", CM9 Ref: 2022/52767. |
| [9] | ONR, "Certificate of Approval for the Shipment of Radioactive Material, GB/2834D/B(M)T (Rev.16)", CM9 Ref: 2022/52768. |
| [10] | ONR, "Certificate of Approval for the Shipment of Radioactive Material, GB/2834E/B(M)T (Rev.4)", CM9 Ref: 2022/52769. |
| [11] | ONR, WIReD Permissioning Record PR-01211. |
| [12] | ONR, "Certificate of Approval of Package Design and Shipment for the Carriage of Radioactive Material, GB/2834A/B(M)F (Rev.13)", WIReD Ref: ONRW-2019369590-4719. |
| [13] | ONR, "Certificate of Approval of Package Design and Shipment for the Carriage of Radioactive Material, GB/2834B/B(M)F (Rev.13)", WIReD Ref: ONRW-2019369590-4720. |
| [14] | ONR, "Certificate of Approval of Package Design and Shipment for the Carriage of Radioactive Material, GB/2834D/B(M) (Rev.13)", WIReD Ref: ONRW-2019369590-4721. |
| [15] | ONR, "Certificate of Approval of Package Design and Shipment for the Carriage of Radioactive Material, GB/2834E/B(M) (Rev.5)", WIReD Ref: ONRW-2019369590-4722. |
| [16] | ONR, WIReD Permissioning Record PR-01479. |
| [17] | ONR, "Safety Case Requirements Assessment of Modification N0219", ONR-TD-AR-22-003, CM9 Ref: 2022/31401. |
| [18] | ONR, "Compliance Inspection - Nuclear Transport - EDF", May 2023, WIReD Inspection Record IR-52708. |
| [19] | United Nations Economic Commission for Europe (UNECE), Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) 2023 Edition, www.unece.org. |
| [20] | Intergovernmental Organisation for International Carriage by Rail (OTIF), Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) 2023 Edition, www.otif.org. |
| [21] | The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (CDG) 2009, (SI 2009 No. 1348). www.legislation.gov.uk. |
| [22] | ONR, "Transport Permissioning Assessment", TRA-PER-GD-001 Revision 3, February 2021, CM9 Ref: 2021/14609. |
| [23] | ONR, "Technical Assessment Note: Radiation Protection - Criticality, GB/2834/B(M)F", July 2022, CM9 Ref: 2022/17332. |
| [24] | ONR, "GB/2834 Modification N0251 - Criticality Safety", Internal ONR Email, April 2023, CM9 Ref: 2023/23271. |
| [25] | ONR, "Shielding Assessment for GB/2834 - Mk A2 AGR Transport Flask - Modification N0251", June 2023, CM9 Ref: 2023/24695. |
| [26] | International Atomic Energy Agency, IAEA Safety Standards for Protecting People and the Environment, Specific Safety Requirements No. SSR-6, "Regulations for the Safe Transport of Radioactive Material", 2018 Edition. www.iaea.org. |
| [27] | ONR, "GB/2384/B(M)F Mod N0251 - Q1AR Assessment Review Form", May 2023, CM9 Ref: 2023/24691. |
| [28] | ONR, RI-10967, "GB/2834 Renewal - Additional Shielding Modelling". |
| [29] | ONR, "Mechanical Engineering Assessment of EDF Mk A2 AGR Flask Category A Transport Modification N0251", September 2023, WIReD Ref: ONRW-2126615823-1157. |
| [30] | ONR, "Mechanical Engineering Assessment of Modification Number N0219", ONR-TD-AR-22-002, December 2022, CM9 Ref: 2022/28675. |
| [31] | ONR, "EDF Energy Nuclear Generation Limited, GB/2834/B(M) A-E Package Approval - Human Factors Assessment in Support of the Safety Case Requirements Assessment", ONR-TD-AR-22-004, June 2022, CM9 Ref: 2022/35261. |
| [32] | ONR, RI-10869, "GB/2834/B(M) Flask - Improvements to the Identification of the Necessary Administrative and Operational Limits and Controls and their Inclusion in Operator Instructions". |
| [33] | International Maritime Dangerous Goods (IMDG) Code 2022 Edition incorporating Amendment 41-22. |
| [34] | EDF, "Sea Transport Follow-Up", Email from EDF, January 2024, WIReD Ref: ONRW-2019369590-6421. |
| [35] | EDF, E/REP/BRDB/0007/AGR/03, "Package Design Safety Report for the Mk A2 AGR Flask Design No 2834", Rev 14, November 2023, WIReD Ref: ONRW-2019369590-12807. |