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| ONR Project Assessment Report  Mk A2 AGR Transport Flask (Design No. 2834) – Assessment of Modification N0261 |



ONR Project Assessment Report

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

**Report Title**: Assessment of Modification N0261

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

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# Executive Summary

**Permission Requested**

EDF Energy Nuclear Generation Limited (the Applicant) has applied for a modification (N0261) to the Mk A2 AGR Transport Flask (Design No. 2834) (A2 flask) package design certificates for transport by road and rail within the United Kingdom. The modification requests transport of discharged AGR flasks with up to two lid bolts either missing, or not fully torqued.

**Background**

The A2 flask (variants A-E) is used to carry irradiated Advanced Gas-cooled Reactor fuel between the Applicant’s AGR nuclear power stations and the Sellafield Nuclear Licensed site. The A2 flask is categorised as a Type B(M) package.

This modification is requesting permission to transport an A2 flask discharged with up to two lid bolts missing or not fully torqued. A discharged flask has no irradiated bulk fuel or fissile components present, but contains a skip, pond water and flask furniture.

Similar flask-specific modifications for have been assessed and endorsed historically on multiple occasions by the GB Transport Competent Authority. This modification has been requested to enable the Applicant to transport discharged flasks with either up to two lid bolts missing (cannot be engaged due to mechanical damage) or not fully torqued down (due to mechanical damage to the lid bolt or receiver thread), without requesting flask-specific modifications in the event of these two fault conditions.

This will enable flasks to be transported more quickly to maintenance, supporting defueling of the AGR stations, and reduce unnecessary administrative and regulatory burdens on both the Applicant and the GB Transport Competent Authority.

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

ONR has carried out a review of the Applicant’s safety justifications for implementation of modification number N0261, to determine whether the proposed changes comply with relevant transport legislation, and whether existing safety claims remain valid. The area assessed was Engineering. Shielding and Criticality were not subject to formal assessment, however assessment notes were produced to support the decision that the modification did not challenge the safety case by these specialisms.

**Matters arising from ONR's work**

There were no matters arising from ONR’s assessment activities. All assessors were content that there was no impact to safety arising from modification N0261.

**Conclusions**

Based on the work carried out by ONR, I am satisfied that the flask will maintain containment in normal transport conditions with up to two missing or not fully torqued bolts. In the event of an accident, I am content that accumulated loss of radioactive contents in a period of one week will not breach statutory limits with up to two missing or not fully torqued bolts.

**Recommendations**

I recommend that the GB/2834 package design modification sheet for modification N0261 is endorsed.

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 |
| A2 flask | Mk A2 AGR Transport Flask (Design No. 2834) |
| CA | Competent Authority |
| CDG | The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations |
| FEA | Finite Element Analysis |
| GB | Great Britain |
| HOW2 | (Office for Nuclear Regulation) Business Management System |
| IAEA | The International Atomic Energy Agency |
| ONR | Office for Nuclear Regulation |
| PDSR | Package Design Safety report |
| RID | Regulations concerning the International Carriage of Dangerous Goods by Rail |

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# Permission Requested

1. EDF Energy Nuclear Generation Limited (the Applicant) has applied for a modification (N0261) [1] to the Mk A2 AGR Transport Flask (Design No. 2834) package design certificates for transport by road and rail within the United Kingdom for the transport of discharged AGR flasks with up to two lid bolts either missing, or not fully torqued.

# Background

## Legislation

1. This Report presents the basis of the regulatory decision by the Office for Nuclear Regulation (ONR) as Great Britain (GB) Competent Authority (CA) for the transport of Class 7 (radioactive material) dangerous goods, to grant a modification to the current Design and Shipment Approvals for the Type B(M) Mk A2 AGR Transport Flask (Design No. 2834) variant D [3].
2. This statutory duty is given to ONR through The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (CDG) 2009 [4].
3. The following modal regulations apply to allow transport by road and rail:

* Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) 2023 Edition [5];
* Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) 2023 Edition [6].

1. The above modal regulations are based on the International Atomic Energy Agency (IAEA) Regulations for the Safe Transport of Radioactive Material, currently SSR-6 [7] supported by advisory material in SSG-26 [8]

## Purpose of the Modification

1. The A2 flask (variants A-E) is used to carry irradiated Advanced Gas-cooled Reactor (AGR) fuel between the Applicant’s AGR nuclear power stations and the Sellafield Nuclear Licensed site. The A2 flask is categorised as a Type B(M) package.
2. This modification is requesting permission to transport a Mk A2 fuel flask to design number 2834 discharged with up to two lid bolts missing or not fully torqued.
3. Flasks transported under this modification will be in the discharged condition and would be transported under the GB/2834D/B(M) certificate. The galling of bolts has happened historically on occasions with flask usage and there is a history of similar modifications approved by the GB Competent Authority, as referenced in the modification application.
4. t This modification has been requested to enable the Applicant to transport discharged flasks with either up to two lid bolts missing (cannot be engaged due to mechanical damage) or not fully torqued down (due to mechanical damage to the lid bolt or receiver thread), without requesting flask-specific modifications in the event of these two fault conditions.
5. This will enable flasks to be transported more quickly to maintenance, supporting defueling of the AGR stations, and reduce unnecessary administrative and regulatory burdens on both the Applicant and the GB Transport Competent Authority.

## Overview of package design

1. The Mk A2 AGR flask has been designed for the transport of AGR fuel elements and components. 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 2 different designs) carrying the radioactive contents.
2. A discharged flask has no irradiated bulk fuel or fissile components present, but contains a skip, pond water and flask furniture.

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

1. ONR has carried out an assessment of the Applicant’s safety justifications for implementation of modification number N0261, to determine whether the proposed changes comply with relevant transport legislation, and whether existing safety claims remain valid. The areas assessed were Engineering.
2. In line with the regulatory permissioning strategy, since similar modifications have been assessed historically on multiple occasions by the GB competent authority, as referenced within Modification N0261 [1], the Engineering assessment has been carried out within this Project Assessment Report to prevent significant duplication. An assessment wasn’t deemed necessary by the shielding and criticality Inspector; however, a separate short note was produced to support this decision [9].

## Engineering

1. The Mk A2 flask has 28 lid bolts fully torqued to 900Nm (in normal transport. I am content that during normal transport operations, even with two bolts missing or not fully torqued, the Applicant’s management system requires the flask to be subject to leak tests prior to dispatch.
2. If the lid seal member fails to seal adequately, any leak paths will be identified during this test, and the flask will not be able to be dispatched, in accordance with the Applicant’s management arrangements. The Applicant’s management system was subject to ONR inspection during the previous renewal [10], and I am content that the arrangements are suitably robust that dispatch would not be possible until the flask had passed the leak test.
3. I am therefore content that for normal transport conditions, there would be no impact to safety from two missing or not fully torqued bolts.
4. In accident conditions, accumulated loss of radioactive contents in a period of one week should be restricted to not more than A2 [7]. The Applicant has subjected the flask to quarter and full-scale drop tests at 9m and 32.7m as part of its Package Design Safety Report (PDSR) [11]. At 9m, the 28 lid bolds were demonstrated to remain intact, and the seal between the lid and flask body was maintained. This has been previously assessed by ONR as part of the historic package design certificate renewals.
5. The claim by the Applicant that there would be no loss of containment upon the loss of two lid bolts is further supported by finite element analysis (FEA) [12] undertaken by the Applicant as part of the previous renewal, which was subject to ONR assessment against modification N0247 (Despatch of flask E101 with one missing lid bolt) [13]. The ONR assessment at the time concluded that the FEA adequately substantiated the loss of up to five lid bolts. I have reviewed the finite element analysis report and I am content that this judgement remains valid and is applicable to the entire fleet of A2 flasks.
6. The Applicant’s PDSR also states that the maximum activity of the contents of a discharged flask has been calculated to be 0.35 A2. Therefore, I am content that any activity release during an accident would not breach the limit of A2 in period of one week.
7. I therefore consider that in accident conditions, there would be no impact to safety from two missing or not fully torqued bolts.
8. I am content from a mechanical engineering perspective that there is no consequence to safety from two missing or not fully torqued bolts.

## Shielding

1. The shielding assessor concluded that the shielding integrity of the package design is not compromised by up to two not fully torqued or missing bolts. The assessor considered that the Applicant had demonstrated during the last full package design renewal that up to 5 bolts could be omitted without radiological consequences [9].
2. Additionally, the shielding assessor recognised that the flask still needs to meet the pre-shipment leak tests and potential package release requirements as a Type B package; and the shielding assessor considered that these will ensure achievement of the claimed shielding integrity as per the PDSR [11].
3. The shielding assessor therefore judged that discharged flasks can be safely transported under the GB/2834D/B(M) certificate with up to two missing or not fully torqued bolts.

## Criticality

1. The discharged flask does not contain any bulk irradiated fuel and is currently approved as a Type B(M) package design approval under GB/2834D/B(M). Hence, there can be no criticality safety implications associated with Modification N0261.

# Matters Arising from ONRs Work

1. There were no matters arising from ONR’s assessment activities. All assessors were content that there was no impact to safety arising from modification N0261 [1].

# Conclusions

1. Based on the work carried out by ONR, I am satisfied that the flask will maintain containment in normal transport conditions with up to two missing or not fully torqued bolts. In the event of an accident, I am content that accumulated loss of radioactive contents in a period of one week will not breach statutory limits with up to two missing or not fully torqued bolts.

# Recommendations

1. I recommend that the GB/2834 package design modification sheet for modification N0261 [1] is endorsed.

# References

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| [1] | EDF Energy Nuclear Generation, “E/REP/BRDB/0007/AGR/03 - MODIFICATION NUMBER N0261 Issue 2”. |
| [2] | ONR, “NS-TAST-GD-099 (Issue 2.2) - Transport Engineering Assessment”. |
| [3] | ONR, “GB/2834D/B(M) Rev. 12 (expiry date of end of 30 September 2027)”. |
| [4] | The Carriage of Dangerous Goods and use of Transportable Pressure Equipment (2009) Regulations. |
| [5] | Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), 2023. |
| [6] | Regulations concerning the International Carriage of Dangerous Goods by Rail (RID), 2023. |
| [7] | IAEA, “Regulations for the Safe Transport of Radioactive Material, Specific Safety Requirements Number SSR-6, 2018”. |
| [8] | IAEA, “SSG-26, Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material, 2012 Edition”. |
| [9] | ONR, email Subject GB/2834 Modification N0261 - Shielding & Criticality Implications, Wired Ref.ONRW-2019369590-3465”. |
| [10] | ONR-TD-PAR-22-002, “ Competent Authority Certificate Renewal for package GB/2834 (Modification number N0219), CM9 Reference: 2022/39499”. |
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| [12] | Frazer Nash Consultancy, “FNC 57456/48065R - A2 Fuel Flask Finite Element Model Full Scale Model : Stage 2 Sensitivity Analysis Report, Issue 1, 2019”. |
| [13] | ONR, “ONR-TD-DR-22-002, Assessment of Modification N247 - Despatch of flask E101 from HNB with 1 missing lid bolt. |