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| ONR Project Assessment Report  PR-01039: GB/3358W Modification 008 – Application for Approval of an Extension to Allowable Contents |



ONR Project Assessment Report

**Project Name**: PR-01309: GB/3358W Modification 008

**Report Title**: Application for Approval of an Extension to Allowable Contents

**Dutyholder/ Applicant**: Magnox Ltd

**Report Issue No**.: 1

**Publication Date**: Nov-23

**Document ID**: ONRW-2019369590-4367

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# Executive Summary

In October 2022, Magnox Ltd (the applicant), applied for approval of a Category A modification (Modification 008) to extend the allowable contents for the DN3358W Modular Flask package design most recently approved in certificate GB/3358W/B(M)F-96 (Rev.3).

The applicant uses the Modular Flask for transporting Dragon fuel from Harwell to Sellafield as part of its Nuclear Materials Transfer (NMT) Programme.

In January 2022, the competent authority (CA) approved a five-year renewal of the package design with an expiry date of September 2026. The criticality assessment of the application for this renewal, and subsequent decision justification, concluded that the allowable package content should be limited to uranium fuels containing Highly Enriched Uranium (HEU) with nominal thorium content. The applicant undertook to perform additional criticality safety analysis to fully underpin the transport criticality safety of the remaining Dragon fuel inventory under a future modification submission.

In accordance with the regulatory permissioning strategy the Office for Nuclear Regulation (ONR) has conducted a targeted and proportionate assessment of Modification 008. The applicant has classed the modification as Category A and relevant regulatory guidance states that we undertake a full review supported by assessment to the extent necessary to show that the modification is safe.

The review identified that areas of engineering, criticality and safety case requirements (SCR) required assessment. The review confirmed that a radiation shielding assessment would not be conducted as the assessment undertaken in support of the last renewal covered the entire Dragon fuel inventory, including those fuels that are the subject of this modification.

It is concluded that the proposed modification provides an adequate justification for the safety of the Dragon fuel inventory that was excluded from GB/3358W/B(M)F-96 (Rev.3).

It is recommended that the CA should grant approval of the inclusion of the Dragon fuel inventory that was excluded from GB/3358W/B(M)F-96 (Rev.3) by endorsing Modification 008 and issuing the combined package design and shipment approval GB/3358W/B(M)F (Rev.4).

Table 2: List of abbreviations

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| Term/Acronym | Description |
| CA | Competent Authority |
| CoA | Certificate of Approval |
| GB | Great Britain |
| LEU | Low Enriched Uranium |
| HEU | High Enriched Uranium |
| NMT | Nuclear Material Transfer |
| ONR | Office for Nuclear Regulation |
| PDSR | Package Design Safety Report |
| SCR | Safety Case Requirements |
| TRMS | Turn Round Maintenance Schedule |
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# Permission Requested

1. In October 2022, Magnox Ltd (the applicant), applied for approval of a Category A modification [1] to extend the allowable contents for the DN3358W Modular Flask package design most recently approved in certificate of approval (CoA) GB/3358W/B(M)F-96 (Rev.3) [2].

# Background

## Regulatory History

1. The DN3358W package design is known as the Modular Flask, and the applicant uses it for transporting Dragon fuel from Harwell to Sellafield. Our first approval of the package design was issued in September 2016 [3].
2. In January 2022, we issued a five-year renewal of the package design approval with an expiry date of September 2026 [2]. Our criticality assessment of the application for this renewal [4], and subsequent decision justification [5], concluded that we should limit the allowable contents for the package to uranium fuels containing HEU with nominal thorium content. The applicant undertook to perform additional criticality safety analysis to fully underpin the transport criticality safety of the remaining Dragon fuel inventory under a future modification submission.

## Scope of Application

1. The modification submitted by the applicant [6] seeks to extend the allowable contents of the package to include the remaining materials that are intended to be transported using the Modular Package, as part of the Nuclear Materials Transfer (NMT) Programme, currently operating from the applicant’s Harwell site.

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

1. In accordance with the regulatory permissioning strategy we have conducted a targeted and proportionate assessment of the proposed modification. The applicant has classed the modification as Category A and relevant regulatory guidance [7] states that we undertake a full review supported by assessment to the extent necessary to show that the modification is safe.
2. The review identified that areas of engineering, criticality and safety case requirements (SCR) required assessment. The review confirmed that we would not need to conduct a radiation shielding assessment as the assessment undertaken in support of the last renewal covered the entire Dragon fuel inventory, including those fuels that are the subject of this modification.

## Criticality [8]

1. The scope of this assessment recognised that our understanding, and acceptance of the baseline criticality model is well-established from prior approvals. Consequently, it was unnecessary to revisit this model for this application.
2. We restricted our assessment scope to:

* consideration of an increased C:U ratio for Dragon fuel compacts;
* consideration of reactivity effects with irradiation for all Dragon fuel types; and
* development of appropriate fissile mass limits for the GB/3358W/B(M)F approval to cover the entire Dragon fuel inventory.

1. Previous package design approvals for the DN3358W package have included general conditions of clearance for uranium-235 with limited or unlimited graphite content which did not require the fissile material to be within third length cans or the borated Vitrite® liner to be present within the flask cavity. During our assessment of the modification, the applicant advised us that it did not require these conditions of clearance for the Dragon fuel shipments under the NMT programme. The criticality assessment has recommended that we remove these conditions of clearance from the revised CoA.
2. The applicant has proposed some new conditions of clearance for Dragon fuel in the DN3358W package design [6]. Our criticality assessor has examined these proposals and agreed them as the basis for the new conditions of clearance that we should add to the CoA. One minor difference was the stipulation of a maximum initial enrichment of 93.5% as modelled in the applicant’s criticality assessment, rather than 94% proposed.
3. Our criticality assessor concluded that the modification supports the DN3358W package design meeting the requirements for fissile material detailed within SSR-6 [9] under routine, normal and accident conditions of transport.
4. Our criticality assessor recommended that:

* from a criticality safety perspective, the CA approves the proposed modification;
* that we revise the extant CoA to cover those Dragon cans that we excluded at the last renewal of the DN3358W package design approval; and
* we should stipulate the criticality safety conditions and limits set out in Appendix A of our criticality assessment report, in full, in the new CoA.

## Engineering [10]

1. The proposed modification does not impact the Package Design Safety Report (PDSR) engineering claims, arguments and evidence. However, during review of the PDSR it is apparent that the package design life was originally 20 years.
2. The renewal of the package design approval issued in January 2022 was based on a claim that the design life would support operation up to 2030. However, we did not conduct an assessment of these claims. Recent examination of the technical report supporting this claim identified inconsistencies in the arguments, such that there are contradictions that suggest the applicant may have only justified use of the package up to the end of 2022 for some components. Furthermore, the applicant conducted the design life review in 2014, and does not provide a sufficiently current assessment of the operational life of the package at the date of application for renewal.
3. Our engineering assessor has examined the package design life arguments and justification for continued use, to identify whether adequate justification for continued operation exists.
4. The applicant has substantiated the design life through claims on operating and maintenance history. We have supported our assessment via inspection of the maintenance history and adequacy of operating/maintenance instructions [11]. Our Human Factors specialist inspector supported these inspections and Section 3.3 presents details of findings.
5. Our engineering assessment concludes that the applicant has appropriately considered ageing and degradation mechanisms, and that maintenance requirements adequately reflect the design life of the package.
6. Our engineering assessment recommends we approve Modification 008.

## Safety Case Requirements [12]

1. The focus of our SCR assessment was to determine whether the applicant had adequately implemented the revised content limits in the operational documentation.
2. In support of this assessment, we identified that the modification had not identified that the DN3358W Turn Round Maintenance Schedule (TRMS) required a revision to clearly identify the revised content limits. The applicant revised the TRMS to adequately reflect the revised content.
3. Our SCR assessment concludes that the applicant has adequately implemented its proposed modification in the supporting operational documentation, and that these operational documents meet relevant good practice regarding their content and design.
4. Our SCR assessment recommends that CoA for the package design is updated to include the revised TRMS and that the CA grants approval of the proposed modification.

## Requirements for Approval of Shipment

1. The package design does not conform to the requirements of paragraph 639 of SSR-6 and consequently CA approval of shipment is required. The proposed modification does not affect the basis for issue of the current combined package design and shipment approval [2]. The applicant has also confirmed the predicted duration of the NMT programme [13], and the required period for the shipment approval is considered in Section 4.

# Matters Arising from ONRs Work

1. The matters arising from the work conducted by ONR specialist are summarised as follows:

* The engineering assessment identified a shortfall with the painting specification for new paint sourced by the applicant for flask maintenance. However, this shortfall does not affect the basis of the permission for Modification 008 or compromise the integrity of the flask. The paint provides a corrosion barrier, and the applicant only uses the new paint for touch-up purposes, rather than recoating the original paint. Our engineering assessor raised a Level 4 regulatory issue requiring the applicant to justify the adequacy of the new paint specification [14]. The applicant must address the regulatory issue prior to the next annual maintenance.
* During our assessment of the modification and the revision of the CoA to include the revised content limits we reviewed and discussed the period of validity of the certificate with the applicant. The applicant had originally envisaged that it would complete the Dragon fuel moves before the expiry date of September 2026 on the extant CoA. However, the applicant now anticipates that the transfers may extend into 2027. The applicant has provided a revised estimate of timescales for completion of the Dragon fuel transfers from Harwell to Sellafield and an estimate of the costs to seek an extension or design renewal to the CoA [13]. I propose that the updated CoA should be issued for a period of five years based on the following reasons:
  + Cost saving to the applicant arising from production of an application for extension or renewal of the CoA and the associated regulatory costs of undertaking the renewal.
  + Reducing risk of disruption to hazard reduction at Harwell.
  + Removing unnecessary regulatory effort from the CA permissioning programme
  + The work undertaken for Modification 008 and planned work for the N&P design variant is sufficient to provide regulatory assurance of continued safe operation and legal compliance for a further five years.

# Conclusions

1. Based on the work we have carried out; I am satisfied that the proposed modification provides an adequate justification for the safety of the Dragon fuel inventory that was excluded from GB/3358W/B(M)F-96 (Rev.3) [2].

# Recommendations

1. I recommend that the CA should grant approval of the inclusion of the Dragon fuel inventory that was excluded from GB/3358W/B(M)F-96 (Rev.3) [2] by endorsing Modification 008 [6] and issuing the combined package design and shipment CoA GB/3358W/B(M)F (Rev.4) [15].

# References

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| [1] | “Application for Modification to Alloawable Content for GB/3358W Type B(M)F Modular Flask, ONR-2019369590-115”. |
| [2] | “Certificate GB/3358W/B(M)F-96 (Rev.3), CM9: 2022/6408”. |
| [3] | “Certificate GB/3358W/B(M)F-96 (Rev.0), CM9: 2015/310841”. |
| [4] | “ONR-SDFW-AR-21-040, Criticality Assessment for GB Approval of the GB/3358W Package Design for Dragon Fuel, GB/3358W/B(M)F, ONRW-2126615823-186”. |
| [5] | “ONR-SDFW-DR-21-018: Decision Record, GB/3358W/B(M)F, Application for continued use beyond existing licence date of September 2021, CM9 2021/93133”. |
| [6] | *Modular Flask DN3358W Application for Approval of Modification - Extension to Allowable Contents, Ref: 96281/DE/MOD/008 Issue B, ONRW-2019369590-116.* |
| [7] | “TRA-PER-GD-001 Issue 3, ONR Transport Permissioning Guide”. |
| [8] | “AR-01041: GB/3358W Mod 008 - Criticality Assessment for the Transport of Dragon Fuel in the GB/3358W/B(M)F Package, ONRW-2126615823-638”. |
| [9] | *IAEA Safety Standards: SSR 6, ‘Regulations for the Safe Transport of Radioactive Material (2018 Edition)’, IAEA, Vienna, 2018.* |
| [10] | “AR-01080: GB3358W - Technical Note - Engineering Assessment for GB3358W Mod N008, ONRW-2126615823-785”. |
| [11] | IR-52061: GB/3358W Modification Inspection. |
| [12] | “AR-01032: GB/3358W Mod 008 - Safety Case Requirements Assessment”. |
| [13] | “Email: Details of Dragon Fuel programme and costs associated with delays and package design renewal, ONRW-2019369590-4673”. |
| [14] | “RI-11218: Paint Specification Shortfalls - GB/3358W”. |
| [15] | “Certificate GB/3358W/B(M)F (Rev.4), ONRW-2019369590-4368”. |