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| ONR Project assessment report  PR-01787 – Validation of package design approval certificates F/358/AF, F/358/IF and F/358/B(U)F |



ONR Project assessment report

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# Executive summary

Orano Nuclear Package Services (Orano – the applicant) has submitted an application to the Office for Nuclear Regulation (ONR) for validation of three French transport package design Certificates of Approval (CoA): F/358/AF-96 (Hw); F/358/B(U)F-96 (Hv); and, F/358/IF-96 (Hx). The package design is colloquially known as the COG-OP-30B. This project assessment report (PAR) records the conclusions and judgements of the assessments undertaken by our safety inspectors in support of the validation.

The COG-OP-30B package is used to transport natural or reprocessed uranium hexafluoride (UF6) from enrichment facilities to fuel manufacturers or conversion facilities. Cylinders with residual quantities of UF6 are returned to the enrichment facility. Type 30B cylinders containing UF6 are thermally and mechanically protected by COG-OP-30B packaging.

The COG-OP-30B design variants were first validated by the Great Britain competent authority (CA) in 2006 with the last validation expiring in May 2012.

ONR has undertaken targeted and proportionate assessments, focusing on: compliance with external dose rates; maintaining sub-criticality; compliance with the cylinder international design standard; and, the identification and analysis of operational, administrative, and managerial requirements necessary to ensure safe configuration of the package, with adequate instructions provided to package users. The ONR human factors assessor identified that the safety assessment report did not adequately identify the limits and conditions necessary to ensure safe configuration of the package and found deficiencies in the package operating instructions. An enabling approach was adopted – based on the adequacy of local operational instructions at Orano Chemistry Enrichment, Tricastin, the recommendation to the Transport Competent Authority (TCA) Head of Regulation is to restrict the consignor duties to this site until the operating instructions in the SAR are deemed to be adequate by ONR. A level 4 regulatory issue has been raised to track the improvements.

ONR is satisfied that the applicant has demonstrated that the COG-OP-30B transport package design is compliant with the relevant legal requirements. It is recommended that the TCA validates the following CoAs:

* F/358/IF-96 (Rev.3)
* F/358/AF-96 (Rev.4)
* F/358/B(U)F-96 (Rev.3)

Table 1: List of abbreviations.

|  |  |
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| Term/Acronym | Description |
| ACT | Accident Conditions of Transport |
| ASNR | Autorité de Sûreté Nucléaire et de Radioprotection |
| CA | Competent Authority |
| CoA | Certificate of Approval |
| ENU | Enriched Natural Uranium |
| ERU | Enriched Reprocessed Uranium |
| GB | Great Britain |
| NCT | Normal Conditions of Transport |
| NPS | Nuclear Package Services |
| ONR | Office for Nuclear Regulation |
| PAR | Project Assessment Report |
| SAR | Safety Assessment Report |
| SFL | Springfields Fuels Ltd |
| TCA | Transport Competent Authority |
| UF6 | Uranium Hexafluoride |
| UK | United Kingdom |

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# Permission requested

1. Orano Nuclear Package Services (NPS) (hereafter referred to as Orano) has submitted an application (Ref. [1][2]) to the Office for Nuclear Regulation (ONR) for validation of three COG-OP-30B transport package design Certificates of Approval (CoA). The safety assessment report (SAR) submitted to support the approval is comprised of a table of contents (Ref. [2]) – this references the current SAR safety modules and is an English translation of the SAR referenced in the French CoAs.
2. The requirement for validation is due to the content being fissile and in the form of uranium hexafluoride (UF6).
3. This application for package design approval has been made in accordance with the relevant legal requirements for Class 7 dangerous goods transport by road, rail and sea, as stipulated in the Certificates of Approval (CoA) referenced in Section 6. In particular:

* Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) 2025 Edition (ADR) (Ref. [3]);
* Regulation concerning the International Carriage of Dangerous Goods by Rail (RID) 2025 Edition (RID) (Ref. [4]); and,
* International Maritime Dangerous Goods (IMDG) Code 2022 Edition incorporating Amendment 41-22 (Ref. [5]) (until 31 December 2025) or IMDG Code 2024 Edition incorporating Amendment 42-24 (Ref. [6]).

International Atomic Energy Agency SSR-6 (Rev. 1) ‘Regulations for the Safe Transport of Radioactive Material 2018 Edition’ (SSR-6) (Ref. [7]) establishes the international radioactive material transport package design standards that are transposed into United Kingdom legislation via the regulations set out above. For the purpose of simplifying this project assessment report (PAR) and the CoAs, reference is made to the applicable design requirements in SSR-6.

1. This project assessment report (PAR) records the conclusions and judgements of the assessments undertaken by our safety inspectors in support of the approval.

# Background

## Approval History

1. The French competent authority (CA) approved the COG-OP-30B as Type B(U) fissile package in 1998. The design was approved as a Type A fissile and IP-2 fissile package in 2004 and has gone through a number of CA approvals up to the extant French CoAs: F/358/IF-96 (Hx) (Ref. [8]), F/358/AF-96 (Hw) (Ref. [9]) and F/358/B(U)F-96 (Hv) (Ref. [10]). All three certificates expire in May 2027.
2. The French COG-OP-30B package design approvals for the Type B(U)F, Type AF and Type IF package variants were first validated by the Great Britain (GB) CA between 2006 and 2009. They were all revalidated by the GB CA in 2011 (Ref. [11] [12] [13]) - these approvals expired in May 2012.

## Package Summary

1. The COG-OP-30B package is designed for the transport of natural or reprocessed UF6 at an enrichment of up to 5 wt.% U-235/U from enrichment facilities to fuel manufacturers or conversion facilities.
2. Packages[[1]](#footnote-2) are comprised of the contents (UF6) within two packaging components:

* Type 30B cylinders (designed to International Standard (ISO) 7195:2020 "Nuclear energy — Packagings for the transport of uranium hexafluoride (UF6)” [14] - hereafter referred to as ISO 7195).
* COG-OP-30B packaging (a steel container containing thermal and impact absorbing material required to demonstrate compliance with regulations following package testing).

1. The COG-OP-30B packaging is in two sections, with the upper half being removed for the loading / unloading of a single Type 30B cylinder. This packaging (a stainless steel cylindrical shell filled with discrete regions of phenolic foam, red cedar and balsa) provides the primary impact and thermal protection for the contents during transport.
2. The SAR distinguishes between enriched natural uranium (ENU - UF6 that contains uranium that has not previously been irradiated in a reactor) and enriched reprocessed uranium (ERU - uranium that has been irradiated in a reactor and gone through chemical reprocessing). ERU contains radionuclides that would not be present in ENU uranium and determines what package type is required. A further distinction is to separate UF6 into product (i.e., transport between 455 kg and 2276 kg of UF6) and heels (up to 11.34 kg of residual material that remain in the cylinder after emptying).
3. ENU can be filled and emptied several times between cylinder washing (undertaken during planned maintenance) - the timeframe that ENU product is left in the cylinder (known as ageing time) and the time that the cylinder is left empty (containing heel quantities – known as cooling time) will also impact the activity of the package and consequently the package classification (as well as compliance with requirements such as external dose rate limits).
4. Orano characterise the source into twelve distinct sources – the consignor must ensure that Class 7 material is transported under the correct CoA depending on activity calculations and certificate type activity limits – the activity calculated is dependant on ageing time, cooling time and the mass of UF6.

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

1. This package design has been approved by the French CA. The United States of America (USA) Nuclear Regulatory Commission has also recommended that the Department of Transportation approve the USA application for validation. The French and USA approvals have not been used to influence the scope of our assessment. We have, however, taken appropriate cognisance of the French base approval and accessed the USA project report (Ref. [15]) to ensure that issues have not been identified that could impact our validation.
2. In accordance with the approved regulatory permissioning strategy, we have carried out four proportionate and targeted technical assessments.
3. The application letter describes the changes to the SAR since the 2011 ONR approval. A design review has not been submitted. During the 2011 GB CA approval, engineering and criticality assessments were undertaken – our assessors have accounted for (where credible) the previous assessment and any regulatory queries that were raised.

## Radiation Shielding (Ref. [16])

1. Our radiation shielding assessor undertook a comprehensive assessment of chapter 4A (DOS-22-010635-013) of the SAR, considering dose rate calculations at the surface of the package during routine conditions of transport (RCT), normal conditions of transport (NCT) and accident conditions of transport (ACT) for ENU and ERU.
2. The applicants’ dose rate assessment considers:

* Radionuclide impurity values stated in ASTM C996-04 (Ref. [17]) to account for artificially produced products during irradiation. A commercial agreement requires a lower value of U-232 impurity than that stated in ASTM C996-04 – this value is used in calculations.
* Radionuclide activities with the most conservative (whilst remaining realistic) ENU and ERU ageing and cooling times to allow for radioactive decay to more onerous daughter products. This accounts for various filling / emptying / cylinder cleaning cycles.

1. Our shielding assessor reviewed the codes and libraries used for source term generation and dose rate calculations. Although the codes are not the latest versions, our assessor considers them to be adequate.
2. The applicant demonstrated that, where applicable, RCT, NCT and ACT dose rate calculations meet the regulatory requirements, except in one circumstance.
3. The RCT contact dose rate for a heeled ERU package exceeds the regulatory requirement. The operating instruction states that the consignor must ensure that dose rates for heeled ERU packages meet the regulatory dose rate limit of 2 mSv/h and that if this is not the case, packages should be cooled for longer or transported under exclusive use. Pre-shipment dose rate calculations will determine whether further cooling or exclusive use transport is required.
4. The consignor may transport UF6 under the Type IF, Type AF or Type B(U)F CoA by undertaking activity calculations based on the material being transported. As such, the consignor requires access to chapter 4A (DOS-22-010635-013 version 1.0) and chapter 0A (DOS-22-010635-002 version 1.0) of the SAR, as well as the operating instructions provided in chapter 6A (DOS-22-010635-009 version 1.0). Chapter 8A of the SAR (DOS-22-010635-003 version 1.0) requires the package designer to provide users with chapters 0A, 4A and 6A.
5. Our radiation shielding assessor concluded that the applicants SAR meets the relevant legal requirements and recommended that the ONR Transport Competent Authority (TCA) validates F/358/AF-96 (Hw), F/358/B(U)F-96 (Hv) and F/358/IF-96 (Hx).

## Engineering (Ref. [18])

1. Our engineering assessor targeted the Type B(U)F design and considered the compliance of the Type 30B cylinder and the package with the applicable transport regulations.
2. When determining the scope of assessment, account was taken for the engineering questions raised and addressed during the 2011 GB CA approval. There have not been any physical design changes to the package since the 2011 approval.
3. Updates to the SAR are mainly administrative and include: an additional socket head plug to be used; the addition of using NDT examinations during inspections; alternative leak test methods; and tie down requirements. These changes do not affect the safety performance of the package.
4. Type 30B cylinders are designed, manufactured, used and maintained in accordance with ISO 7195. Our assessor sampled the maintenance instructions (chapter 7A of the SAR). Turnaround maintenance is required prior to every shipment and more comprehensive maintenance is undertaken every 5-years or 50 shipments. Chapter 7A states that 30B cylinder is operated in accordance with the 2005 edition of ISO 7195 (as required in the regulations) and the Orano maintenance programme – this has been withdrawn and replaced with the 2020 edition of ISO 7195. Our assessor has stated that this does not impact the safety of the package. Our assessor judged that the maintenance schedule is adequate.
5. As the application has been made under transitional arrangements, paragraph 631 of SSR-6 (ageing mechanisms) has not been considered. Our engineering assessor judges that this is acceptable as the Type 30B cylinder requirements address ageing mechanisms (e.g., the cylinders are manufactured from carbon steel with a suitable coating to protect from corrosion) and the maintenance instructions require actions that will address potential degradation of COG-OP-30B parts.
6. Our engineering assessor also considered regulatory changes that could impact the mechanical, thermal and containment performance and concluded that the testing and analysis undertaken and recorded in the SAR remains valid.
7. Our engineering assessor concluded that the applicants SAR meets the relevant legal requirements and recommended that the ONR TCA validate F/358/AF-96 (Hw), F/358/B(U)F-96 (Hv) and F/358/IF-96 (Hx).

## Criticality (Ref. [19])

1. In 2011 our criticality assessor recommended approval of the COG-OP-30B package design, with a further recommendation made to ensure that the applicant considered three outstanding issues prior to the next approval. It was judged at the time that these issues would not materially impact criticality safety.
2. During the current approval, our criticality assessor targeted the three issues identified in 2011, as well as sampling other aspects of the criticality safety assessment. The applicant’s criticality safety case has addressed the issues raised in the 2011 GB CA criticality assessment.
3. Our assessor judges that the codes and library data used in the analysis are acceptable and is satisfied, through sampling of assumptions and claims within the criticality safety assessment (including the application of SSG-26 paragraph 608 (b) to exclude water ingress into the package) that the design meets the applicable transport regulations.
4. Our criticality assessor concluded that the SAR meets the relevant legal requirements and recommended that the ONR TCA validates F/358/AF-96 (Hw), F/358/B(U)F-96 (Hv) and F/358/IF-96 (Hx).

## Human Factors (Ref. [20])

1. Our human factors assessor focused on two key aspects:

* the identification and analysis of operational, administrative, and managerial requirements necessary to ensure safe configuration of the package; and,
* the provision of adequate information to users to support the safe operation and maintenance of the package.

1. The tasks that were judged to have the greatest complexity and those with the greatest potential radiological dose consequences should human error occur were targeted, including: sealing the 30B cylinder for transport; complying with the minimum and maximum fill volumes; and, lifting and unloading the COG-OP-30B package.
2. Our assessor identified that the SAR did not adequately identify the limits and conditions necessary to ensure safe configuration of the package. Orano submitted a technical note to address this that identifies the necessary limits / conditions to ensure safe configuration of the package and the risks being mitigated.
3. Deficiencies were identified within the package operating instructions. Some limits and conditions that have safety importance are not captured within the instruction and demarcation of safety important aspects are not clearly identified as safety significant to highlight their importance to users. The ISO standard and UF6 good handling practices guide (Ref. [21]) both contain limits and conditions for 30B cylinders and are referenced in the operating instruction. These documents are not designed as user instructions.
4. The operating instruction requires revising to address the concerns highlighted above. This would require a consequential revision to the French CoA’s. The immediate requirement for GB validation is to facilitate UF6 consigned from Orano Chemistry Enrichment at its Tricastin site in France, to Springfields Fuels Ltd (SFL) in GB. We have assessed the local COG-OP-30B instructions used at Tricastin – this contains the necessary limits and conditions as well as images and labelling to support the safe configuration of the package during use. This instruction has been shared with the consignee, SFL.
5. Although there are deficiencies in the Orano submission, local plant instructions ensure that operators have the necessary information to comply with the safety important activities necessary for safe configuration of the package.
6. As the validation would enable any dutyholder to consign the COG-OP 30B package, our human factors assessor considers it necessary to restrict use of the COG-OP-30B package to the Orano Chemistry Enrichment Tricastin site, for shipments to SFL. The risk is considered to be adequately controlled by local plant instructions.
7. Our human factors assessor recommended that:

* validation for the COG-OP-30B package is granted.
* the approval is restricted so that consignor and consignee duties are limited to Orano Chemistry Enrichment’s Tricastin site and SFL respectively.

1. A level 4 regulatory issue (RI-12614) has been raised to ensure that Orano improve their arrangements for the identification of the administrative controls necessary to ensure safe configuration of the package and the provision of information for use.

## Inspection (IR-53532)

1. We have not undertaken an inspection of the Orano management system to support this approval. Orano is regularly assessed and inspected by the French Competent Authority, Autorité de Sûreté Nucléaire et de Radioprotection (ASNR). France is an ADR / RID Contracting Party and ASNR has confirmed the adequacy of the Orano management system as part of their renewal in accordance with ADR / RID paragraph 1.7.3.
2. The Orano management system for transport package design is part of Orano NPS’ Quality Management System, based on recognised international standards. Orano have confirmed that there is no intention to manufacture further COG-OP-30B protective packaging. Orano NPS ‘Quality management system applicable to the COG-OP-30B package model’, DOS-22-010635-003 Version 1.0 (included in the SAR) sets out the management systems for transport participants (including design).

# Matters arising from ONR’s work

1. Our human factors assessor raised concerns identified in paragraphs 36 and 37. Improvements will be tracked via a level 4 regulatory issue (RI-12614).

# Conclusions

1. Based on the assessment activities we have undertaken, I am satisfied that the applicant has demonstrated that the COG-OP-30B transport package design is compliant with the relevant legal requirements.

# Recommendations

1. I recommend that the ONR TCA Head of Regulation validates the French package design approvals by issuing certificates:

* F/358/IF-96 (Rev.3) (Ref. [22])
* F/358/AF-96 (Rev.4) (Ref. [23])
* F/358/B(U)F-96 (Rev.3) (Ref. [24])

# References

|  |  |
| --- | --- |
| [1] | ONRW-2019369590-10817, COR-24-004155-000, Application for the United Kingdom validation of French certificates of approval. |
| [2] | ONRW-2019369590-10836, DOS-22-010635-000, General Contents. |
| [3] | United Nations Economic Commission for Europe (UNECE) Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), 2025 Edition. |
| [4] | Intergovernmental Organisation for International Carriage by Rail (OTIF) Regulation concerning the International Carriage of Dangerous Goods by Rail (RID) 2025 Edition. |
| [5] | International Maritime Organisation (IMO) “International Maritime Dangerous Goods (IMDG) Code 2022 Edition incorporating Amendment 41-22. |
| [6] | International Maritime Dangerous Goods (IMDG) Code 2024 Edition incorporating Amendment 42-24. |
| [7] | IAEA Safety Standards Series No. SSR-6 (Rev.1) Regulations for the Safe Transport of Radioactive Material 2018 Edition. |
| [8] | ONRW-2019369590-10823, F/358/IF-96 (Hx). |
| [9] | ONRW-2019369590-10819, F/358/AF-96 (Hw). |
| [10] | ONRW-2019369590-10821, F/358/B(U)F-96 (Hv). |
| [11] | ONRW-157424439-373, F/358-IF-96 Issue 2. |
| [12] | ONRW-157424439-369, F/358/AF-96 Issue 3. |
| [13] | ONRW-157424439-371, F/358/B(U)F-96 Issue 2. |
| [14] | ISO 7195:2020, Nuclear energy — Packagings for the transport of uranium hexafluoride (UF6). |
| [15] | ONRW-2019369590-23033, SAFETY EVALUATION REPORT Docket No. 71-3047 Model No. COG-OP-30B Package French Certificate F/358/AF-96 Revision Hw. |
| [16] | ONRW-2126615823-7166, Shielding Assessment for COG-OP-30B. |
| [17] | ASTM C 996-20, "Standard Specification for Uranium Hexafluoride Enriched to Less Than 5% 235U", 2020.. |
| [18] | ONRW-2126615823-7617, COG-OP-30B Engineering Assessment. |
| [19] | ONRW-2126615823-7397, Criticality Safety Assessment of the COG-OP-30B (F/358/B(U)F, F/358/AF, F/358/IF) Transport Package for the Transport of Uranium Hexafluoride. |
| [20] | ONRW-2126615823-7876, Human Factors Assessment. |
| [21] | The UF6 Manual. Good Handling Practices for Uranium Hexafluoride. USEC-651. Revision 10. July 2017. |
| [22] | ONRW-2019369590-22965, F/358/IF-96 (Rev. 3). |
| [23] | ONRW-2019369590-22967, F/358/AF-96 (Rev.4). |
| [24] | ONRW-2019369590-22968, F/358/B(U)F-96 (Rev.3). |

1. It should be noted that the package, as defined in paragraph 8, is colloquially known as the COG-OP-30B. The COG-OP-30B is actually the impact / thermal protection provided to the Type 30B cylinder. [↑](#footnote-ref-2)