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| ONR Project Assessment Report  PR-01060 Approval of Package Design for Transport of Uranium Hexafluoride (Model UX30-5A/8A) – Transport Package Design Approval |



ONR Project Assessment Report

**Project Name**: PR-01060 Approval of Package Design for Transport of Uranium Hexafluoride (Model UX30-5A/8A)

**Report Title**: Transport Package Design Approval

**Dutyholder/ Applicant**: Orano TN

**Authored by**:

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# Executive Summary

Orano TN (the applicant) submitted an application for a certificate of approval (CoA) of a transport package design model UX-30 5A/8A (Type IF), which is an industrial package for fissile material including uranium hexafluoride (UF6).

The UX-30 5A/8A is a new package design and is developed for a specific shipment of the legacy UF6 5A and 8A cylinders, which are intended for transport from the Institute of Nuclear Energy Research (INER), Taiwan (RoC) to Urenco UK (UUK), Capenhurst. The application for the CoA is limited to the 26 UF6 5A and 8A cylinders that are identified by unique serial numbers.

ONR’s initial engineering assessment of the safety submissions identified shortfalls against the transport safety regulations. Consequently, Orano TN has provided supplementary information to clarify the rationale and requested for a CoA under a special arrangement as defined in the transport safety regulations.

ONR specialist assessors have assessed the applicant’s claims, arguments and evidence by sampling submitted information, considering operational conditions and judging them against applicable standards and guidance, in accordance with the regulatory permissioning strategy of the ONR. The assessment included undertaking online meetings to sample the adequacy of the implementation of the management system, quality plan and control of change.

It is concluded that the applicant has provided adequate arguments and evidence to support the safety case claims and demonstrated the package design model UX-30 5A/8A is compliant with the safety requirements specified in the relevant transport regulations.

It is recommended that the Great Britain transport competent authority issues a CoA under special arrangement (identification mark: GB/4123/X) for the package design model UX-30 5A/8A until 30 April 2025 for transport by road, rail and sea. Additionally, it is recommended that the GB CoA should include the requirements to use ISO freight containers as an overpack to provide protection from solar conditions as compensatory measures, and to provide the details of the shipment arrangements at least 7 days before the shipment.

Table 2: List of abbreviations

|  |  |
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| Term/Acronym | Description |
| ADR | Agreement concerning the International Carriage of Dangerous Goods by Road |
| BMS | Business Management System |
| CA | Competent Authority |
| CoA | Certificate of Approval |
| GB | Great Britain |
| INER | Institute of Nuclear Energy Research |
| LSA | Low Specific Activity Material |
| ONR | Office for Nuclear Regulation |
| PSP | Protective Shipping Packaging |
| RID | Regulation concerning the International Carriage of Dangerous goods by Rail |
| RoC | Taiwan |
| SCR | Safety Case Requirements |
| UF6 | Uranium Hexafluoride |
| UUK | Urenco UK |

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# Permission Requested

1. Orano TN (the applicant) submitted an application for a certificate of approval (CoA) of a transport package design to contain uranium hexafluoride (UF6). This package is a Type IF industrial package design for fissile material (model UX-30 5A/8A) (ref. [1]).
2. The application for the CoA is limited to the 26 UF6 5A and 8A cylinders that are identified by unique serial numbers (ref. [1]).

# Background

1. The package model UX-30 5A/8A has an unlimited A2 value and meets the requirements for low specific activity (LSA II) material. It is a new package design and is developed for the specific shipment of the legacy UF6 5A and 8A cylinders, which are intended to be transported from the Institute of Nuclear Energy Research (INER), Taiwan (RoC) to Urenco UK (UUK), Capenhurst.
2. These cylinders were fabricated in the 1980s and filled with either depleted uranium or uranium enriched in U-235 to 3.25 weight percent. All 5A and 8A cylinders were fabricated to the ANSI N14.1, the standard for UF6 cylinders used for transport that was in effect at the time of procurement. There has been no other use of the cylinders after completion of the filling. The cylinders have been stored indoors in a controlled environment, maintained and inspected as required according to ISO 7195 or ANSI N14.1 (ref. [1]).
3. The packaging consists of three components, including:

* the UX-30 outer protective shipping packaging (PSP) that ONR has previously approved for the transport of 30B UF6 cylinders;
* the 5A and 8A cylinders specified in ISO 7195 for transport; and
* a new and unique inner 5A and 8A PSP, which provides secondary protection of the smaller 5A and 8A cylinders.

1. The mechanical specialist assessor’s initial assessment of the package design safety report (ref. [2]) identified shortfalls against the requirements of the relevant transport safety regulations applicable to the safe transport of uranium hexafluoride material. The shortfalls included an inability to test the cylinder internal pressure and a few cylinders were filled above the prescribed limit (ref. [3]).
2. Consequently, Orano TN has provided supplementary information to clarify the rationale and requested for a CoA under special arrangement (ref. [4]).
3. Additionally, Orano TN has requested an approval for the package design to allow the commencement of the packaging fabrication before the shipment arrangements are finalised in order to meet the programme schedule. To support this request, Orano TN has provided additional information about the shipment arrangements and agreed to provide relevant details at least 7 days before the shipment (ref. [5]).

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

1. The assessment and inspection work has been undertaken in accordance with ONR guide “Transport Permissioning Assessment” (Ref. [6]), which states that, for a special arrangement submission, a full review of the safety case shall be carried out in addition to the confirmation that any compensatory measures for special arrangement are equivalent or better than ADR/RID requirements to support regulatory decisions.
2. After carrying out a high-level review of the relevant submissions, I held a pre-job brief meeting on 19/12/2022 (ref. [7]) with the relevant specialist inspectors to brief the assessment team about the dutyholder and the project expectations. We concluded that a full review and proportionate sampling should be undertaken to reach a valid regulatory decision for the following reasons:

* the package design model UX-30 5A/8A is new;
* ONR has not previously assessed the overall design package model UX-30 5A/8A;

1. All assessments were undertaken in line with the relevant requirements of the ONR HOW2 Business Management System (BMS) and its associated guidance.

## Criticality Assessment

1. Following ONR guidance in “Transport Permissioning Assessment” (ref. [6]) and “Transport Criticality Technical Assessment” (ref. [8]), the specialist assessor has undertaken a full review of the criticality safety analysis and justification provided in the safety case and the supporting documentation (ref. [1]).
2. The specialist assessor concluded that the package design model UX-30 5A/8A meets the relevant transport safety regulations (ref. [9]) as implemented in the UK law under routine, normal and accident conditions from a criticality safety perspective.
3. The specialist assessor recommends the package design model UX-30 5A/8A is approved and is limited to the 26 UX-30 5A and 8A cylinders.

## Shielding Assessment

1. As guided by ONR guide “Transport Permissioning Assessment” (ref. [6]), the specialist assessor has taken a proportionate and targeted shielding assessment as there is no significant gamma or neutron source term.
2. The specialist assessor used the “Q1” regulatory queries process to seek justification to ensure suitable and sufficient shielding is in place as the initial submission pack did not have a formal shielding assessment.
3. The specialist assessor’s assessment (ref. [10]) concluded that the applicant has provided suitable and sufficient arguments and evidence to demonstrate adequate shielding is in place to support safe transportation of package model UX-30 5A/8A. Therefore, the specialist assessor recommends the package design model UX-30 5A/8A is approved and is limited to the 26 UX-30 5A and 8A cylinders.

## Mechanical Engineering Assessment

1. The specialist assessor focused the assessment of the following engineering aspects of the safety case.

* Justification of original manufacture and design specification against current standards;
* Historical inspection, maintenance and storage records;
* Details on fill condition; and
* Design of internal furniture to meet required standards.

1. The initial assessment undertaken by the specialist assessor identified shortfalls against the relevant safety regulations, including over-filled cylinders and lack of cylinder internal pressure measurement. To address these shortfalls, the specialist inspector recommended that the package design should be approved under special arrangement (ref. [3]), and requested that the applicant provide additional evidence of compensatory measures.
2. The specialist assessor’s assessment (ref. [11]) concluded that the applicant has provided suitable and sufficient additional evidence to address the identified shortfalls.
3. Overall, the specialist assessor recommends:

* the package design is approved as a special arrangement;
* a closed ISO 20-foot freight container should be used as an overpack to provide protection from solar conditions and to be included as one of the requirements in the CoA as a compensatory measure.

1. Additionally, the specialist assessor has two observations:

* the applicant should be reminded that if they are requesting approval under multiple modes of transport the application should specifically identify that it is compliant with the relevant requirements for that mode of transport;
* Due to the deviations in marking/stamping, these cylinders should only be used for this single transport activity.

1. As this application is for a single shipment of 26 UX-30 5A/8A cylinders only, these observations are no longer relevant (ref. [12]).

## Safety Case Requirements Assessment

1. Following ONR guidance in “Transport Permissioning Assessment” (ref. [6]) and “Safety Case Requirements Assessment” (ref. [13]), the specialist assessor has undertaken a full review of the safety submissions.
2. To ensure adequate arrangements are in place to support the approval of the new package design model UX-30 5A/8A for “Special Arrangement” after ONR identified regulatory shortfalls during the initial assessment, the specialist assessor used online meetings and email correspondence to ensure regulatory queries were adequately addressed, and clarified ONR regulatory expectations in respect of shipment arrangements between the applicant and INER.
3. Additionally, the specialist assessor held online meetings to examine the adequacy of the management system, control of changes, implementation of the management system and non-conformities.
4. The specialist assessor considered that the applicant has provided adequate arguments and evidence to demonstrate the adequacy of the arrangement for a special arrangement and the compensatory measures where required (ref. [14]).
5. The specialist assessor recommends that the package design model UX-30 5A/8A is approved under a special arrangement that is limited to the 26 UX-30 5A/8A cylinders for transport by road, rail and sea.

# Matters Arising from ONRs Work

1. None.

# Conclusions

1. Based on the above assessments, I conclude that the applicant has provided adequate arguments and evidence to support approval under special arrangement.

# Recommendations

1. Based on the above conclusion, I recommend that:

* the GB transport competent authority issue a GB CoA under special arrangement (identification mark: GB/4123/X) for the package design model UX-30 5A/8A valid until 30 April 2025 for transport by road, rail and sea;
* the GB CoA should include the requirement to use ISO freight containers as an overpack to provide protection from solar conditions as a compensatory measure; and
* the GB CoA should include a requirement to provide shipment arrangements at least 7 days before the shipment.

# References

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| [1] | Application for Certificate of Approval (CoA) for Model No. UX-30 5A/8A Transportation Package, reference B12-E-61410-00, date September 16, 2022 (WiReD ID ONRW-2019369590-369). |
| [2] | Package Design Safety Report and supporting documentation for UX-30 5A/8A, Industrial Package Design for Fissile Material (Type IF) for Uranium Hexafluoride (WiReD ID ONRW-2019369590-369). |
| [3] | Engineering initial assessment of non-compliance to transport safety regulations, WiReD ID ONRW-2019369590-6035. |
| [4] | Supplementary Information for Certificate of Approval for Special Arrangements for Model No. UX-30 5A/8A Transportation Package, reference B12-E-62851-00, date November 7, 2023 (WiReD ID ONRW-2019369590-4750). |
| [5] | UX-30 5A/8A Additional Information of Shipment Arrangements, Radiation Risk Assessment, Emergency Plan (AR-01187 WiReD ID ONRW-2126615823-1969). |
| [6] | TRA-PER-GD-001 ONR Guide, Transport Permissioning Assessment, Revision 3, issue dated February 2021. |
| [7] | PR-01060 "progress" tab dated 19/12/2022 "Pre-job brief". |
| [8] | NS-TAST-GD-097 Criticality Safety Assessment of Transport Packages, Revision 2, issued date April 2022. |
| [9] | AR-01051 Criticality Assessment for the UX-30 5A/8A Transportation Package, WiReD ID ONRW-2126615823-365. |
| [10] | AR-01052 Radiation Protection - Shielding/Dose Rate Assessment for the UX-30 5A/8A Transportation Package, WiReD ID ONRW-212661583-997. |
| [11] | AR-01166, UX-30 5A/8A Package Design Mechanical Assessment report, WiReD ID ONRW-2126615823-1857. |
| [12] | AR-01166 Mechanical Assessment Report Observations. |
| [13] | ONR Guide - ONR Transport Permissioning Process Guide. TRA-PER-GD-002. |
| [14] | AR-01187 Safety Case Requirements Assessment Report, WiReD ID ONRW-2126615823-1970. |
| [15] | NS-TAST-GD-099 Transport Engineering Assessment, Issue No. 2.2, date May 2023, record ref. 2020/139070. |
| [16] | IAEA SSR-6 Regulations for the Safe Transport of Radioactive Material 2018 edition, Rev. 1. |