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UX-30 User Group: An Industry Players Global Approach to Safely and Efficiently Managing Transport Package Use

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Abstract

The UX-30 is the most widely used protective shipping package (PSP) for transportation of enriched UF₆ in 30B cylinders. Worldwide about 2,000 PSPs are in use today. The UX-30/30B is approved for transport through and within eleven countries by validation of the U.S. Department of Transportation (DOT) certification.

The formation of the UX-30 Users Group is the result of discussions among key UX-30 stakeholders, with a common vision to ensure the safe operation and long term viability of the package, and to in-state an open communication platform allowing strong collaboration among the Group and serving the Industry best interests.

The UX-30 Users Group purpose is to:

- Maintain worldwide licensing approvals;
- Strengthen operations;
- Improve maintenance and acceptance testing; and
- Sustain the useful life of the package.

Besides CHT, the US Nuclear Regulatory Commission (NRC) certificate of compliance holder, and AREVA TN, the UX-30 User Group is composed of members and users. Members are UX-30 registered users in the US, who are authorized to act on behalf of CHT as the applicant for foreign validations. The members are URENCO, WESTINGHOUSE, CENTRUS and AREVA. Users are continuously informed of any new relevant information and encouraged to share operating and maintenance experience with members.

After nearly 3 years of common collaboration, the Group managed to enhance and harmonize the package operation, coordinate certificates and licenses extensions worldwide, and establish formal and structured communication principles between the numerous stakeholders. As a best practice, the UX-30 User Group will remain alive in anticipation of future global licensing activities; and to continue offering a means for subject matter experts to collaborate with Users, maintain an awareness of operation and maintenance experience, and promote uniform requirements for transport of enriched UF₆.

This paper will describe the goals and achievements of the User Group and provide an update on the UX-30 worldwide licensing approvals, as well as the benefits of an industry leader collaboration to share best practices and enhance safe and reliable usage of transportation packaging.

Introduction

The UX-30 overpack is the industry standard for international Class 7 transportation of 30B type cylinders containing uranium hexafluoride (UF₆) between enrichment facilities and fuel manufacturers. UF₆ is a compound used in the uranium enrichment process that produces fuel for nuclear reactors.

The UX-30 overpack is a horizontal cylinder split horizontally in two stainless steel half-shells with a stepped and gasketed joint (Figure 1). The two half-shells are assembled by ten retractable ball locking pins secured to the package by stainless steel cables. The 6-inch space separating the inner and outer overpack shells is filled with an energy-absorbing closed-cell polyurethane foam material. The overpack ensures mechanical and thermal protection, whereas containment and criticality control is provided by the 30B cylinder.

It is approved by the U.S. NRC as a type B package to transport UF₆ from natural and reprocessed uranium enriched up to 5% in U-235 with a 30B or a 30C cylinder. It is also licensed in eleven countries around the world. Today, a fleet of more than two thousand UX-30 overpacks is operated and transported by multiple worldwide users.

Four to five years ago, several issues related to the disengagement of ball lock pins which ensure the closure of the two half shells of the UX-30 package impacted international shipments, highlighting the need to share information between users and to implement best inspection and maintenance practices. The formation of the UX-30 User Group was the result of discussions among key UX-30 stakeholders, with a common vision to ensure the safe operation and long term viability of the package.



Figure 1: UX-30 Overpack

These stakeholders include: Columbiana Hi Tech, LLC (CHT); AREVA Inc. and TN International (AREVA TN); and the UX-30 packaging members and users.

The members are registered users of the UX-30 package in the U.S.; and currently include URENCO, Westinghouse Electric Company, CENTRUS and AREVA Enrichment. The members are authorized to act on behalf of CHT as the applicant for validation in other countries. The users are UX-30 overpack owners and carriers, and are encouraged to share operating and maintenance experience with members. Technical inquiries have been coordinated through the members of the User Group with CHT maintaining design authority for the UX-30. In this context, the UX-30 User Group was launched to facilitate collaboration between users to ensure sustainable international use of the UX-30 to safely transport uranium hexafluoride. Through the UX-30 User Group, operation and maintenance experience is shared, and licensing activities are coordinated with the respective competent authorities. This collaboration provides confidence to stakeholders and competent authorities that the UX-30 is being operated and maintained in full compliance with regulatory requirements.

The UX-30 User Group mission includes:

- Maintaining a complete safety analysis to demonstrate that the package meets the requirements of the U.S. NRC and IAEA regulations;
- Developing a safety basis that meets the IAEA regulations, in addition to working with individual competent authorities to address country specific requirements; and
- Offering a means for subject matter experts to collaborate with users, maintain an awareness of operation and maintenance experience, and promote uniform requirements for transport of enriched UF₆.

UX-30 User Group Objectives

The overall objective of the User Group is to collaborate between the members to ensure the sustainability of the UX-30 overpack globally, which consists of the proper maintenance, operation, and licensing activities necessary to provide confidence to each stakeholder for safe and efficient operation and business.

Over the past three years, User Group meetings were held with the following objectives:

- Operation Excellence:
 - o Share experience and best practices among users to improve operational efficiency and maintenance program;
 - o Define common standards for operation, maintenance and inspection in compliance with the Safety Analysis Report (SAR) and Competent Authorities' (CA) requests, documented in a new maintenance manual;
- Licensing Strategy:
 - o Take into account the licensing constraints in each country and define the best common and sustainable strategy for license validation renewal worldwide;
 - o Defined and agreed upon members' roles and responsibilities;
 - o Develop and share risk analysis assessment and results.

The outcomes of this global approach included:

- The issuance of U.S. NRC and DOT certificates, a consolidated approach to renewals, and worldwide license validations granted in accordance to deadlines and requirements in each country;
- Common operational and maintenance standards implemented in accordance with users' processes and constraints, ensuring efficient long-term usability of the UX-30 fleet;
- The extension of the lifetime of the overpack, while limiting the investment required by the Users.

UX-30 User Group Scope of Work and Organization

The work scope proposed consisted in launching all the necessary licensing activities worldwide and developing a detailed and exhaustive maintenance and operation manual, while coordinating all stakeholders' initiatives and constraints (Figure 2).

After the members attended several user group meetings and conference calls, the industry members agreed on the main activities to complete, the targeted deadline, as well as the entity leading the effort. The official initiative started during PATRAM 2013 in San Francisco, where the first UX-30 User Group took place.

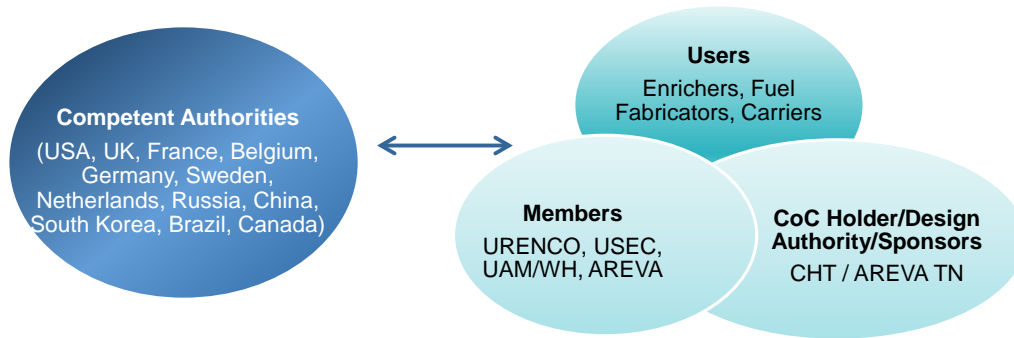


Figure 2: UX-30 Stakeholders

The members agreed to share responsibilities and act as applicants for foreign validations in their correspondent countries on behalf of CHT. Once roles and responsibilities were agreed upon by each member, interaction protocols with local Competent Authorities were clarified. As presented in Figure 3, each stakeholder has a defined role in the communication structure; and each member kept a geographical leadership in its country of origin to interact with the local competent authority while maintaining certificate holder awareness.

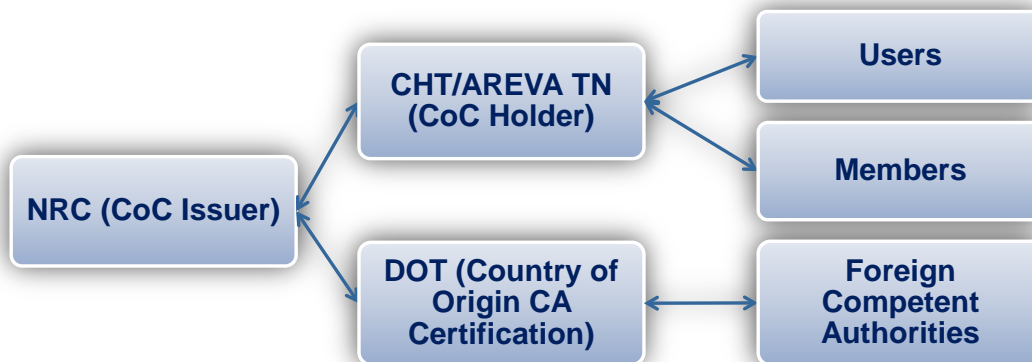


Figure 3: UX-30 Stakeholders Interactions

UX-30 User Group Common Licensing Activities

The UX-30 packaging has been developed and licensed in the United States of America as the country of origin. The UX-30 package has been approved as a type B(U) fissile material package. The package approval identification in the country of origin is USA/9196/B(U)F-96. As presented in Table 1, CHT as the certificate holder is responsible for approvals in the U.S. and applied for renewal of country of origin certificates beyond the expiration in February 2016. The latest U.S. NRC (revision 29), U.S. DOT certificate (revision 32), and revalidation in other countries are valid until December 31, 2019, with exception of China validation valid until June 30, 2019.

Once the U.S. DOT competent authority certificate was issued, the validation process started in other countries under the provisions in SSR-6 para. 840. Since several validations were expiring at a different time, the members worked in collaboration for the validations to follow the same planning. The members, URENCO, WESTINGHOUSE and AREVA took the lead on the validation in Germany, UK, Netherlands, Sweden, and France, while CHT/AREVA TN coordinated the validation renewals together with TENEX, CNEIC, KNF, and Brazilian and Canadian competent authorities. Approvals took the form of endorsement of the original certificate in most countries and issuance of a separate approval in others. Approval of the original certificate was supplemented by additional conditions in some countries, including restrictions placed to limit the contents to Type A quantities and country specific approval identification marking requirements.

List of Approval Certificates					
Applicant	Country	Issuance	CA Certificate	Rev.	Reference
CHT	USA (NRC)	December 31 st 2014	USA/9196/B(U)F-96	29	[1]
	USA (DOT)	March 23 rd 2015	USA/9196/B(U)F-96	32	[2]
	Brazil	April 27 th 2015	-	-	[3]
	Canada	May 7 th 2015	CDN/E150/-96	23	[4]
AREVA TN	Belgium	February 26 th 2016	B/93/AF-96	1.0	[5]
	France	February 15 th 2016	F/538/AF-96	v	[6]
UAM/WH	Sweden	December 14 th 2015	-	-	[7]
URENCO	Germany	December 9 th 2015	D/5426/B(U)F-96	5	[8]
	United Kingdom	February 10 th 2016	GB/5121/B(U)F-96	1	[9]
	Netherland	April 22 nd 2015	NL/0238/AF-96	6	[10]
TENEX	Russia	June 27 th 2015	RUS-2332-B(U)F-96T	7	[11]
KNF	South Korea	December 04 th 2014	ROK/0005/B(U)F-96	10	[12]
CNEIC	China	June 13 th 2014	GUO HE AN FA [2014]NO. 126	-	[13]

Table 1: UX-30 Approval Certificates

To ease the revalidation process in Europe and to address European safety authorities requests for additional information and safety demonstrations, CHT and AREVA TN prepared a specific appendix to collect and organize the complementary justifications and analysis to be provided in addition to the UX-30 packaging SAR, if considered necessary by the applicant. Most of these additional justifications and analysis were requested by European Competent Authorities and covered structural, thermal, shielding, safety criticality, and corrosion demonstrations. To complete this exercise the members shared engineering resources, calculations and results, resulting in a global and successful coordination effort.

In parallel, to better inform each concerned competent authorities of the UX-30 User Group initiative and goals, an official communication was prepared and shared with each regulator in August 2014 [14]. In November 2014, CHT and AREVA TN participated to the TRANSSC29 International Atomic Energy Agency Nuclear Safety and Security Meeting in Vienna, Austria on behalf of the World Nuclear Transport Institute, to expose the progress achieved by the group, and more globally to present the industry leaders' initiatives to collaborate, share best practices, and enhance the safe and reliable usage of the transportation packaging.

UX-30 Overpack Operations and Maintenance Manual

The purpose of the UX-30 Operations and Maintenance Manual [15] (Figure 4) was to provide general information and requirements associated with the operation and maintenance of the UX-30, in order to help users to safely handle the packaging.

The manual is composed of several sections, including:

- Overpack characteristics and Equipment Description
- Regulatory approval
- Personal Qualification
- Operating Procedures: Loading/unloading, opening/closing/sealing, lifting, decontamination, interfacing with equipment, marking and labelling, lashing, and more
- Maintenance, repair, cleaning
- Recommended spare parts
- Inspection: First use, periodic, typical inspection findings and recommended actions



Figure 4: UX-30 Maintenance Manual

In order to have a common and clear vision on maintenance, visual standards were developed as presented in Table 2; and detailed maintenance, inspection and repair instructions were shared with the users.





Table 3: Color Code Standards for UX-30 Overpack Surface Condition				
Code	Pictures	Description	Color	Corrective Actions to be Taken
1		No surface corrosion	Fully Acceptable	None
2		Little surface corrosion (< 20% surface)	Acceptable (all shipments)	Within the next 3 months, clean Overpack according to Section 4.1.3
3		Moderate corrosion (< 50% surface)	Acceptable (US shipments)	Prior to next shipment, clean Overpack according to Section 4.1.3
4		Extensive corrosion (< 50% surface)	Not Acceptable	Prior to next shipment, clean Overpack according to Section 4.1.3





Table 4: Color Code-Standards for UX-30 Cradle Surface Condition				
Number/ Code	Pictures	Description	Color	Corrective Actions to be Taken
1		No surface corrosion	Fully Acceptable	None
2		Little surface corrosion (< 20% surface)	Acceptable (all shipments)	Within the next 3 months, refurbish cradle
3		Moderate corrosion (< 50% surface)	Acceptable (US shipments)	Prior to next shipment, refurbish cradle
4		Extensive corrosion (< 50% surface)	Not Acceptable	Remove from service and refurbish cradle

Table 2: Maintenance Manual Visual Standards

Conclusion

The UX-30 user group was launched driven by a market necessity for the industry leaders to collaborate more on maintenance and licensing activities. It resulted in three years of interactions and common initiatives that allowed to successfully extending the UX-30 certificates and foreign validation until December 31st, 2019.

It also offered a means for subject matter experts to collaborate with the members and users, in order to maintain an awareness of operation and maintenance experience, and promote uniform requirements for transport of enriched UF6. This industry leader’s collaboration provides confidence to stakeholders and competent authorities that the UX-30 is being operated and maintained in full compliance with regulatory requirements, and ensures sustainable international use of the UX-30. As a best practice, the UX-30 User Group will remain alive in anticipation of future global licensing activities; and to continue offering a means for an open communication between stakeholders.

Acknowledgments

To all the users and stakeholders that have taken part in the UX-30 User Group, and especially the members URENCO, WESTINGHOUSE, CENTRUS and AREVA that have been actively involved and contributed to the success of the initiative.

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