





European Experience in the First Shipments of Universal Canisters Containing Compacted Metallic Waste Coming from Treatment

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with acknowledgments to F. Gendreau, J. Paschal and F. Darras

AREVA

TN International



Introduction

- ▶ **Treatment of used nuclear fuel at AREVA's La Hague plant recovers:**
 - ◆ 95% of uranium and 1% of plutonium for recycling purposes
- ▶ **Most of the waste produced can be sorted into two categories:**
 - ◆ High level activity waste (HLW) composed of fission products and minor actinides (corresponding to the 4% gap), which account for the largest share of radioactivity; this type of waste is vitrified
 - ◆ Long-lived intermediate level waste (ILW) composed of structural elements of used nuclear fuel (hulls and end pieces); this type of waste is compacted
- ▶ **This waste is conditioned in the same universal and multipurpose container (Universal Canister):**
 - ◆ CSD-V (or UC-V) for vitrified waste
 - ◆ CSD-C (or UC-C) for compacted waste



Already History: CSD-V Shipments

- ▶ **Since 1995, more than 4,400 CSD-V canisters, representing about 83% of the current total amount to be returned and about 158 packages, have been successfully returned to the countries of origin by TN International:**
 - ◆ 12 returns to Japan in TN[®]28VT (100% completed)
 - ◆ 10 returns to Germany in TS 28 V or in CastorHAW20/28CG or in TN[®]85
 - ◆ 14 returns to Belgium in TN[®]28VT (100% completed)
 - ◆ 8 returns to Switzerland in CastorHAW20/28CG or TN[®]81
 - ◆ 5 returns to the Netherlands in TN[®]28VT



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CSD-C European Return Programme

- ▶ As most of the CSD-V return programmes are nearing completion, TN International is now in charge of the CSD-C return programme, which began in 2009 with shipments to the COVRA facility in the Netherlands

Utilities	Composition of a convoy	Average number of convoys per year	Beginning date	Already performed convoys	End date
Belgium	2 TN [®] 24DH	3	2010	1	2013
Netherlands	1 TN [®] 28VT or 2 TN [®] 24DH	2	2009	3	2012
Switzerland	Up to 3 TN [®] 81	2	2009	2	2016
Germany	To be defined	To be defined	2015	-	2024

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Transport Solutions for CSD-Cs (1/2)

- ▶ IAEA Type B packaging is necessary
- ▶ TN International solutions were optimized based on the context specific to each country
- ▶ The main driving parameters were the following:
 - ◆ Type of interim storage facility: direct or in casks
 - ◆ Quantity of CSD-C to be returned
 - ◆ Existing logistics means: casks, trailers, wagons...
 - ◆ Time schedule for the returns
 - ◆ Overall costs for the returns

Transport Solutions for CSD-Cs (2/2)



Cask	Country	Adaptation	Number of CSD-Cs
TN [®] 28VT	Netherlands	Not necessary	20
TN [®] 81	Switzerland	Mainly the primary lid	20
TN [®] 24DH	Belgium & Netherlands	Mainly the primary lid and the basket	24
TGC36 *	Germany	New design	36

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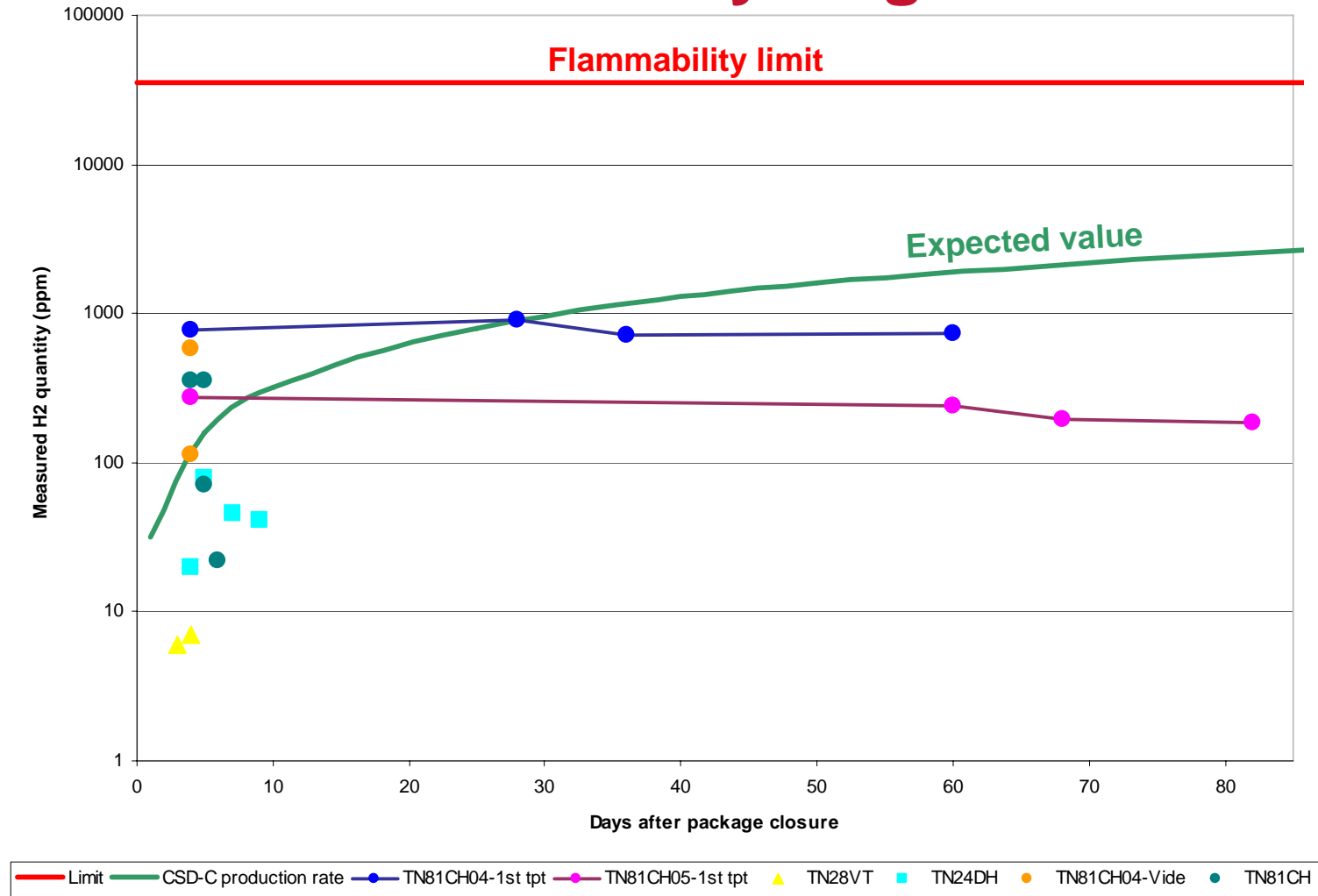
* In partnership with GNS



Issues Solved During Package Approval Procedures

- ▶ **Use of existing casks with the new CSD-C content necessitated new studies for gaseous release, shielding and criticality**
- ▶ **Various discussion points with the authorities, for instance:**
 - ◆ **CSD-C crushing behaviour**
 - ◆ **Criticality safety**
 - ◆ **Hydrogen release → Measurements performed on loaded casks**

Hydrogen Release



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Lessons Learned from the Organisation of Shipments (1/2)

► Adaptation of transport equipment



New canopies



New tarpaulins

New frame
and handling
device



Lessons Learned from the Organisation of Shipments (2/2)

► Loading and unloading procedures



► Transport operations



► No issues

- ◆ which is notably due to good preparation with blank tests

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Conclusion

- ▶ **CSD-C shipments have been implemented by relying heavily on the CSD-V shipment experience**
- ▶ **Licensing issues specific to the CSD-C content have been addressed**
- ▶ **Lessons learned and feedback from the organisation of first shipments has been excellent**
- ▶ **CSD-C returns are now taking place on a regular basis**



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