



DN30-X PACKAGE FOR THE TRANSPORT OF HALEU < 20% ENRICHMENT

- PUBLIC -



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TOPICS

Introduction of participants

- 1. Overview about industry demand and background**
- 2. Routes to satisfy industry demand**
- 3. Design of the DN30-X package**
- 4. Operational issues**
- 5. DN30-X safety proof (Proprietary)**
 - 5.1 Criticality control system
 - 5.2 Overview and similarities of DN30 and DN30-X
 - 5.2 Structural analysis
 - 5.3 Criticality analysis
- 6. Licensing schedule and next steps (Proprietary)**

OVERVIEW ABOUT INDUSTRY DEMAND & BACKGROUND

■ New developments and demands from industry

- Accident tolerant fuel and DOE-NNSA tritium production: up to 10% enrichment
- Fuel for SMR projects: up to 20% enrichment
- Other HALEU projects (ref. GAIN-EPRI-NEI HALEU Webinar of April 28/29, 2020)

■ Cylinders defined in ANSI N14.1

- 5B for up to 100% enrichment, capacity 54.9 lb UF₆ (24.9 kg UF₆)
- 8A for up to 12.5% enrichment, capacity 255 lb UF₆ (115 kg UF₆)
- 30B for up to 5% enrichment, capacity 5020 lb UF₆ (2277 kg UF₆)

■ Licensing status

- No licensed PSP for 5B cylinder available
- No licensed PSP for 8A cylinder available
- DN30 PSP for 30B cylinder available (CoC USA/9362/AF-96)

ROUTES TO SATISFY INDUSTRY DEMAND

■ **Route 1: DN30 for > 5% enrichment**

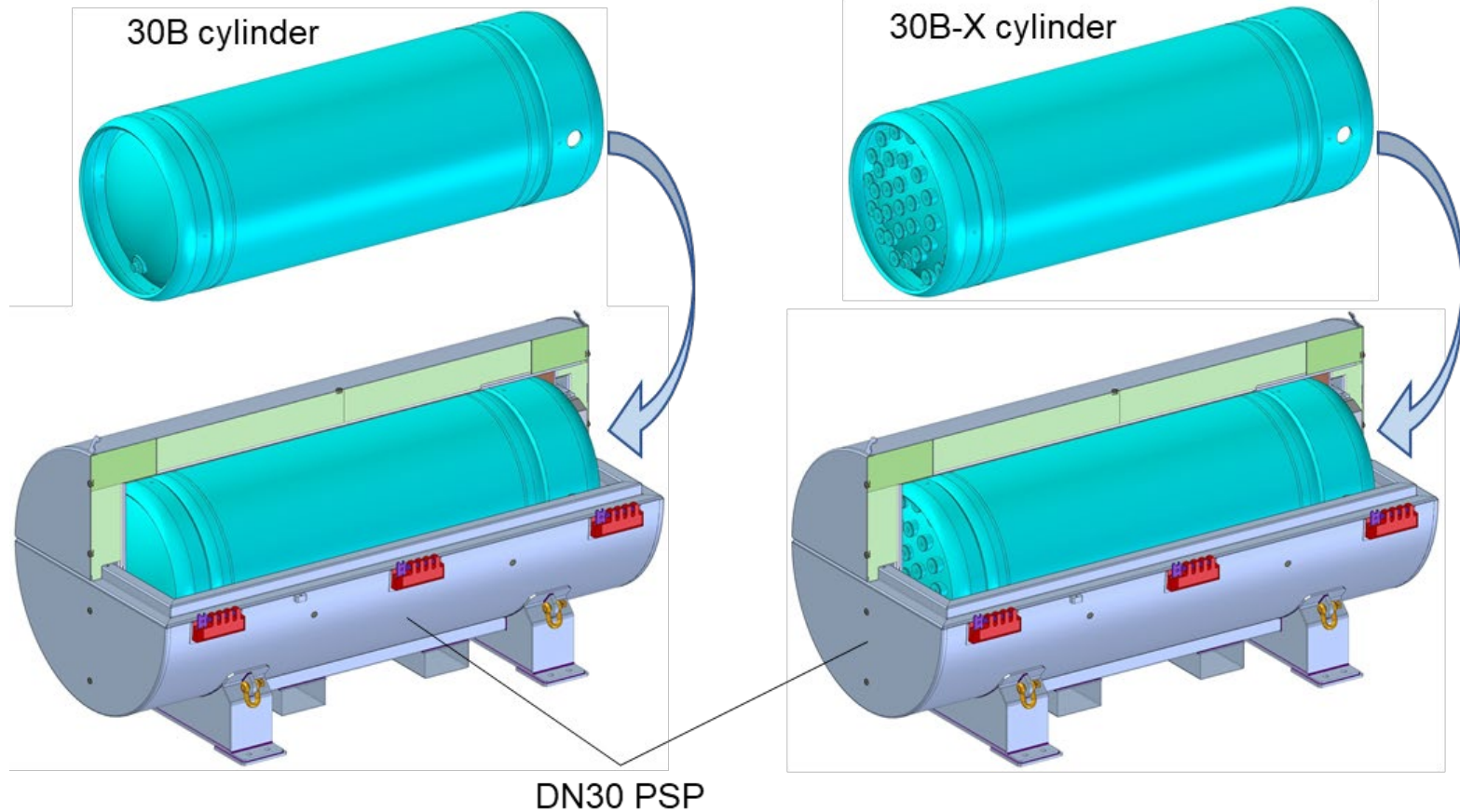
- Safe subcriticality of DN30 for > 5% enrichment **with water exclusion**
- Exception from 10 CFR 71.55 (g) (4) required (short term)
- Change of SSR-6 para. 680 (b) required (long term)
- Modification of 10 CFR 71.55 (g) (4) required (long term)

■ **Route 2: DN30-X**

- Type AF package with the DN30 PSP and the 30B-X cylinder
 - DN30 PSP unchanged from the licensed DN30 package
 - Modified 30B-X cylinder with criticality control features
- Different designs DN30-10 and DN30-20 for optimized UF₆ capacity
 - DN30-10: capacity 1600 kg UF₆ = equivalent to capacity of 14 x 8A
 - DN30-20: capacity 1250 kg UF₆ = equivalent to capacity of 50 x 5A
 - Hence considerably fewer packages and transports
- Fully compliant with 10 CFR 71 and SSR-6; no changes or exceptions required

DESIGN OF THE DN30-X

■ Basic concept



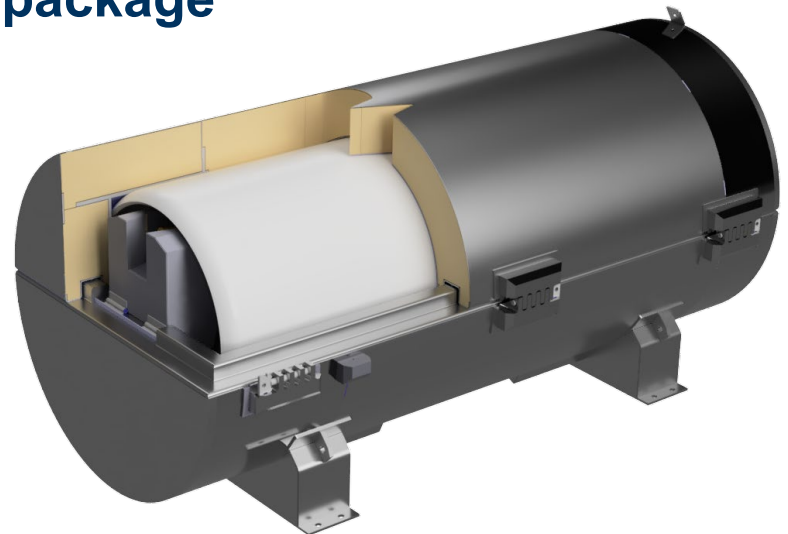
DESIGN OF THE DN30-X: THE DN30 PSP

■ The DN30 PSP as part of the DN30 package

- Designed to accommodate a standard 30B cylinder
- Provides mechanical and thermal protection for the cylinder during NCT and HAC
 - Passed the NCT and HAC drop tests with fully loaded cylinders
 - Package passed the HAC fire test even with an empty cylinder
- DN30 package is licensed in the US and France with max. 5% enrichment
 - Validations in all relevant countries available
 - More than 100 DN30 PSPs in operation today, 250 will become available this year

■ The DN30 PSP as part of the DN30-X package

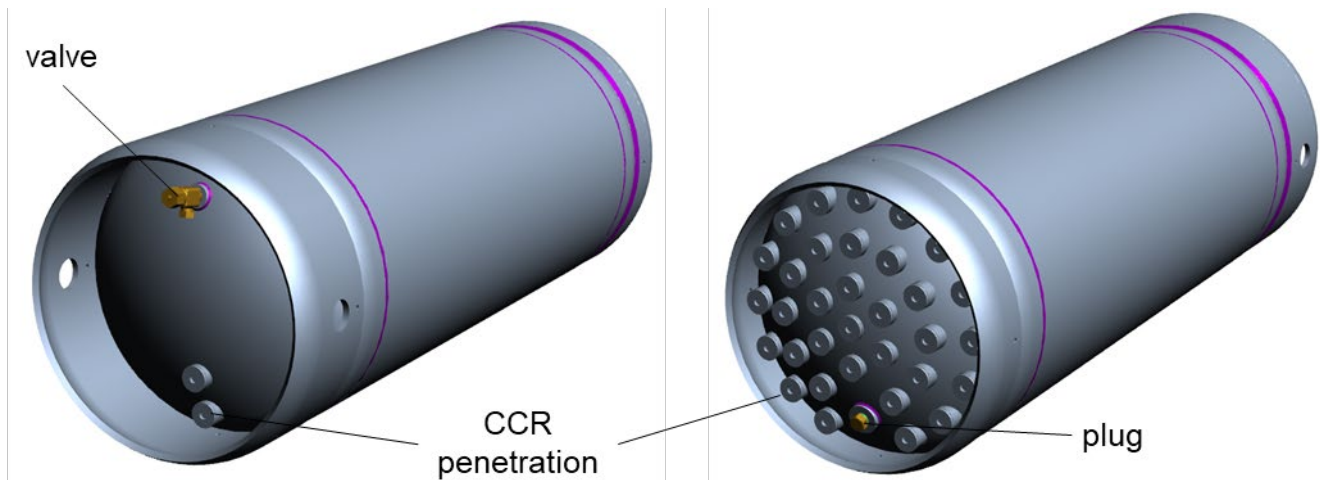
- Unchanged design, but accommodates the modified 30B-X cylinder



DESIGN OF THE DN30-X: THE 30B-X CYLINDER

■ 30B-X cylinder design

- Derived from ANSI N14.1 30B cylinder, with added criticality control system (CCS)
 - Dimensions and wall thickness identical to standard 30B cylinder
 - Valve and plug identical to standard 30B cylinder
 - Gross weight of full 30B-X identical to gross weight of full standard 30B cylinder
 - Ullage of full 30B-X is larger than ullage of standard 30B cylinder
- In the long run the 30B-X can be added to ANSI N14.1 and ISO 7195
- Can be visually distinguished from standard 30B cylinder even without further markings



OPERATIONAL ISSUES

■ 30B-X cylinder

- Operation of 30B-X cylinder
 - Dimensions identical to standard 30B cylinder
 - Valve and plug identical to standard 30B cylinder
 - Max. gross weight identical to 30B cylinder
 - MAWP 1.38 Mpa identical to 30B cylinder
 - Free flow of UF₆ in cavity by design
- Maintenance of 30B-X cylinder
 - Washing/cleaning similar to 30B cylinder (by using water)
 - Longer washing time expected due to larger internal surface area
 - Identical recertification procedure to 30B cylinder for pressure envelope
 - Hydrostatic test pressure 2.76 MPa identical to 30B cylinder
 - Additional inspection steps for CCS

■ DN30-X package

- DN30 PSP and maximal weight identical to DN30 package
 - no changes to operation and handling
- Transport on flat rack with 4 DN30
 - UF₆ per transport: 6400 kg for DN30-10, 5000 kg for DN30-20



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