UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 23, 2017

MEMORANDUM TO: Anthony H. Hsia, Deputy Director
Division of Spent Fuel Management
Office of Nuclear Material Safety
and Safeguards

FROM: Pierre Saverot, Project Manager **/RA/**
Spent Fuel Licensing Branch
Division of Spent Fuel Management
Office of Nuclear Material Safety
and Safeguards

SUBJECT: SUMMARY OF APRIL 4, 2017, MEETING WITH DAHER NUCLEAR TECHNOLOGIES GMBH

Background

On April 4, 2017, a Category 1 public meeting was held at the U.S. Nuclear Regulatory Commission (NRC) headquarters in Rockville, MD, between the NRC staff and representatives from Daher Nuclear Technologies GmbH (DNT) to discuss the development of the design and testing of the DN30 protective structural packaging for UF_6 cylinders. This meeting was a continuation of the June 2, November 2, 2011, and June 6, 2012 meetings with Transport Logistics International (TLI) and Nuclear Cargo + Service GmbH (NCS) for which the respective meeting summaries can be accessed at the Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML111801105, ML11325A105, and ML12170A114.

The meeting was noticed on February 21, 2017 (ML17052A058). The meeting attendance list and the presentation are provided as Enclosure Nos. 1 and 2, respectively.

Discussion

In 2015, NCS was renamed DNT. Design improvements and modifications were made on the DN30 protective structural packaging for UF_6 cylinders, and drop tests and fire tests were conducted. DNT presented the safety analysis approach for the package, explained the changes made to the design of the DN30 package, including (i) the addition of thermal plugs, thermal protection, rotation preventing devices, housing for the valve protecting device, and (ii) changes in steel grade, steel thickness, and foam composition with a new manufacturing method. DNT explained in particular that (i) AISI S 165M was found to be susceptible to breaking, (ii) a 2 mm thick mantle shell had developed cracks, (iii) gases were heating the valve during a fire, thus necessitating the addition of a housing, (iv) pitting corrosion was induced by the phenolic foam which was then replaced by a polyisocyanurate (PIR) foam. Staff asked if the PIR foam was temperature sensitive, or strain-rate sensitive, and requested foam data at -40ºC, as well as test data to track its performance.

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Staff communicated its expectations on an application that shall present a convincing story with a precise language, include sensitivity studies, address margins of safety, model the behavior of the package with the material properties, justify the angles of the drop tests (e.g., 18º), clearly identify the most damaging configuration, include details of the benchmarking as part of the submittal, and indicate tolerances on the licensing drawings. Staff asked also DNT to clarify if any gap, opening, or chimney effect had been observed on the closure system after the drop and fire tests.

DNT explained that the initial modeling the contents of the package with steel balls was too conservative and that heavy concrete is now used. DNT referred to the old "Tenerife" experiments to explain that not all of the UF_6 will settle at the bottom of the cylinder: a layer of UF_6 will stay on the top and might drop during transport. DNT responded to staff's questions on the leakrates presented as a function of several test sequences: the 10^{-5} Pa.m^3/s leakrate is based on the containment analysis for UF_6, while the difference between a 4.9 10^{-9} and a 4.10^{-6} Pa.m^3/s leakrate, in sequences 1 and 2, is explained by the fact that a prototype was tested while the measurement background was not good enough to have a lower leakrate measurement. Different 30B cylinders and prototypes were also tested each time for sequences 3, 4 and 5. Staff said that the applicant should show either that the containment calculations were performed to ANSI N14.5-2014, or that any containment calculations performed using ISO 12807 are equivalent to ANSI N14.5.

Staff shared with DNT is expectations on the use of "old" thermal codes: in particular, the thermal analysis should be fully described in the application (e.g. thermal model description and geometry, modes of heat transfer, application of the heat sources, boundary conditions, material properties, model meshing and convergence, peak component temperatures and associated limits, plots showing temperature profiles, consideration of any combustion of package components, etc.). DNT should also describe how the code is benchmarked and reference published results, provide standardized verification problems using this code, as well as comparisons to theoretically predicted results. Well documented and commented input/output thermal model files should also be provided for the staff to verify all the information described above.

DNT explained that the fire tests used two prototypes, A and B, previously damaged from the combination of testing sequences 1 and 2: the prototypes were preheated to reach NCT temperatures. Staff said that the application should clarify why the use of empty 30B cylinders would be considered more conservative. DNT explained the importance of the melting of the tin lead solder of the valve and plug threads.

Regarding the criticality evaluation, staff asked the applicant to clarify how the impurities were either "defined" or "determined" as a maximum possible, and to explain the basis for the assumption of 11.4 kg of impurities from the filling and extraction operations. Staff also asked to justify the most reactive arrangement, clarify the assumed geometry when a 30B cylinder is partially filled, consider water moderation between packages, explain if and how water inleakage is assumed, and provide the benchmarking of the SCALE code in the application. Staff also stated that a k_{eff} of 0.942 is likely to raise some questions during the review of the application, even if it includes biases and margins.

Staff said that the application shall (i) include complete data on the performance characteristics of materials such as foam, valve, Microtherm intumescent material, insulation, etc., at -40ºC, (ii) provide all components temperature limits, e.g., valve, foam, intumescent materials, (iii) specify that there is no water inleakage during HAC in addition to no water ingress into the 30B cylinder under RCT and NCT, (iv) describe the variations in the 30B fill ratio because a partially filled

cylinder may be more susceptible to hydraulic failure than a full cylinder, and (v) explain how the pressure of potential UF_6 contents was taken into account due to the fact that the 2016 fire test was performed on an empty 30B cylinder.

Staff stated that (i) the package operating procedures shall (a) ensure that the valve is properly closed and leak tested and (b) demonstrate that the valve protection device is properly installed, and (ii) the package acceptance and maintenance procedures should (a) specify that each cylinder is hydrostatically tested and maintained in accordance with ANSI N14.1 and 49 CFR 173.420, as well as (b) address the acceptance testing done to demonstrate the performance of the foam during its service life.

The Safety Analysis Report of the DN30 is written in accordance with the European PDSR Guide but staff will have a cross-reference document between the PDSR and Regulatory Guide 7.9 to conduct its review.

NCS has an approved NCS Quality Assurance (QA) Manual on file (ML112930597), approved by staff in December 2011 (QA Docket No.: 071-00951; ML113360368). Staff noted that name changes, i.e., from NCS to DNT, and all organizational changes impacting QA have to be transmitted to the NRC staff for review. The decision of whether or not to inspect DNT for "design control activities" will be taken after submittal of the application; however, there will be an NRC inspection of the packaging fabrication in Germany, as it is done for all packages with an NRC Certificate of Compliance.

DNT is currently contemplating a submittal for late September 2017. Staff made no regulatory commitment during the meeting.

Docket No. 71-9362
CAC No. L25194

Enclosures:
1. Meeting Attendees
2. Presentation

SUMMARY OF APRIL 4, 2017, MEETING WITH DAHER NUCLEAR TECHNOLOGIES GMBH,
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Distribution: Attendees, M. Layton

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ADAMS Package No.: ML17144A079 Memo No.: ML17144A080 Presentation: ML17144A081

OFC	SFM	E	SFM	C	SFM			
NAME	PSaverot		SFigueroa		JMcKirgan			
DATE	04/06/2017		04/07/2017		05/23/2017			

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Meeting Between DNT and the
Nuclear Regulatory Commission
April 4, 2017
Meeting Attendees

NRC/NMSS/DSFM

Pierre Saverot
Antonio Rigato
JoAnn Ireland
Veronica Wilson
Caylee Kenny
David Tang

DNT

Alexia Favre
Franz Hilbert

DAHER TLI

Phil Sewell

Enclosure 1