

July 3, 2007

MEMORANDUM TO: Robert J. Lewis, Acting Deputy Director
Licensing and Inspection Directorate
Division of Spent Fuel Storage and Transportation, NMSS

FROM: Nancy L. Osgood, Senior Project Manager */RA/*
Licensing Branch
Licensing and Inspection Directorate
Division of Spent Fuel Storage and Transportation, NMSS

SUBJECT: SUMMARY OF JUNE 13, 2007, MEETING WITH THE DEPARTMENT
OF ENERGY REGARDING THE PAT-1 PACKAGE

Background

On June 13, 2007, a meeting was held in Rockville, Maryland, at the request of the Department of Energy/National Nuclear Security Administration (DOE) to discuss the PAT-1 package. The PAT-1 package is authorized for the transport of up to 2 kg of plutonium dioxide by air. DOE is preparing an amendment request for authorization of plutonium metal contents. The meeting was held to discuss technical issues that will be addressed in the amendment request. The meeting was closed to the public due to discussion of sensitive (security-related) information regarding the proposed payloads. Enclosure 1 is the list of meeting attendees.

Discussion

Contents. DOE is evaluating a new plutonium content for the PAT-1 package, namely plutonium metal in the form of samples, test specimens, and bulk plutonium metal. The plutonium may be wrapped in tantalum foil for contamination control, and will be contained within aluminum ampoules. The samples are contained in disks that are bolted together. The test specimens are metal pieces of various shapes and sizes, which are packaged within 1 to 3 aluminum ampoules. The bulk plutonium will be recast into hollow dome shapes to provide a good load spreading geometry while still keeping the mass of the fissile material and packaging materials within the limits specified in the current certificate. The maximum mass of plutonium for the different content forms is 900 grams.

Materials Properties. The temperature in the containment vessel under the fire test conditions (10 CFR 71.74(a)(5)) was included in the original safety analysis report, and was conservatively calculated as 582°C for a period of 4 days. The contents will be shipped in an inert atmosphere to eliminate the possibility of pyrophoric reactions during transport. Water will be eliminated to prevent radiolysis and corrosion of the metals. The various forms of plutonium, i.e., samples, test specimens, and the bulk plutonium, will be transported within aluminum ampoules that act as eutectic prevention barriers. Phase diagrams were presented for various plutonium-metal mixtures that showed the temperatures that result in possible eutectic formation. It was noted that adding different materials, including different types of stainless steel that have different chemical constituents, may significantly affect the eutectic formation temperature. DOE/LANL

will conduct experiments and tests to confirm the eutectic temperatures for the plutonium coupled with the specific aluminum and stainless steel compounds to be used in the PAT-1 packaging. LANL also proposed performing an experiment that would simulate possible failure of the aluminum eutectic barrier.

Containment Vessel and Contents Structural Interaction. DOE/SNL has performed a structural assessment of the interaction of the contents with the containment vessel (TB-1). The assessment was based on the results of the physical tests conducted in the 1970s to support initial package certification. The post-test damaged condition was used to estimate package deceleration under the 129 m/s impact test (10 CFR 71.74(a)(1)). These decelerations were used to calculate the structural response of the containment vessel due to the loading from the various contents and to demonstrate the structural integrity of the aluminum vessel used as a eutectic prevention barrier. The analyses performed to date indicated that the eutectic prevention barrier experienced plastic deformation, but did not fail, and that the containment vessel remains elastic. On using the energy balance method to back-calculate the impact g-loads exerted on the TB-1 vessel, the staff commented that a PRONTO drop analysis of the package would provide a better estimate of the impact loading during the tests. This would add confidence in the g-load estimate established as a bounding condition for the proposed amendment. A much less detailed TB-1 model than that presented could suffice for this purpose. The adequacy of the containment closure system should also be confirmed. SNL plans to perform physical tests to simulate the contents impacting the eutectic prevention barrier backed by a simulated segment of the containment vessel to confirm the analytical results, and material response. The simulated segment of the containment vessel will be made of the same material as the TB-1, and match the geometry of the TB-1.

Criticality. A criticality analysis for the new contents has been performed that indicated a lower k-eff than previously calculated for the plutonium oxide contents. This was due to the lower fissile loading (900 grams plutonium metal vs. 2 kg plutonium oxide). An analysis was also performed to confirm previous calculations performed for the oxide payload. The staff noted that the criticality analyses should consider homogeneous and heterogeneous loads and optimum moderation of the contents, and should include calculations of arrays of packages and appropriate benchmarking. The application will include an evaluation of the new fissile material by air requirements of 10 CFR 71.55(f).

Schedule. DOE indicated that the approval is needed by February 2008 to support DOE schedules. Based on the additional tests and application preparation to be performed, DOE estimated that the application will be submitted in late summer or early fall 2007. DOE will provide NRC a more detailed schedule in the near future. DOE will coordinate with DOE Headquarters Package Certification Program (EM-60) regarding prioritization of all DOE requests being reviewed by NRC.

Docket No. 71-0361
TAC No. L24082

Enclosure: Meeting Attendee List

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OFC	SFST	E	SFST		SFST	
NAME	NLOsgood		MRDeBose		RANelson	
DATE	06/27/07		06/28 /07		07/03/07	

MEETING ATTENDEES
Meeting Between the DOE/NNSA and NRC
Regarding the PAT-1 Package
June 13, 2007

Gordon Bjorkman	NRC/SFST
Michel Call	NRC/SFST
Larry Campbell	NRC/SFST
Jerry Chuang	NRC/SFST
Zahira Cruz	NRC/SFST
Bob Einziger	NRC/SFST
Jessica Glenny	NRC/SFST
Shana Helton	NRC/SFST
Charles Interrante	NRC/SFST
Natreon Jordan	NRC/SFST
Zhian Li	NRC/SFST
Bob Nelson	NRC/SFST
Nancy Osgood	NRC/SFST
Jeremy Smith	NRC/SFST
Alexis Sotomayor	NRC/SFST
David Tang	NRC/SFST
Rob Temps	NRC/SFST
Bob Tripathi	NRC/SFST
An Vu	NRC/SFST
Maximo Barela	DOE/NNSA
Tim Beville	DOE/NNSA/NA-118
Paul Mann	DOE/NNSA/NA-171
Jim Tollison	SAIC
Robert Kalan	Sandia National Laboratory
J. D. Smith	Sandia National Laboratory
Richard Yoshimura	Sandia National Laboratory
Richard Mason	Los Alamos National Laboratory