orano

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June 11, 2019
E-54475

U.S. Department of Transportation
Attn: Mr. Richard W. Boyle, Chief
Pipeline & Hazardous Materials Safety Administration
Radioactive Materials Branch
1200 New Jersey Avenue, S.E.
East Building, PHH-20
Washington, DC 20590

Subject: Application for Revision of Competent Authority Certification, USA/0565/B(U)F-96 for Validation of French Competent Authority Certificate F/357/B(U)F-96 (Eah) for the Model No. TN-MTR – RSI Response

References:

[1] Competent Authority Certification for a Type B(U)F Fissile Radioactive Materials Package Design Certificate USA/0565/B(U)F-96, Revision 3, dated April 21, 2009

[2] French Package Model Approval Certificate F/357/B(U)F-96 (Eah), dated December 26, 2018

[3] U.S. NRC letter dated May 8, 2019, "Subject: Application for the Model No. TN-MTR Transport Package – Supplemental Information Needed"

[4] TN letter E-53729 dated Feburary 27, 2019, "Subject: Application for Revision of Competent Authority Certification, USA/0565/B(U)F-96 for Validation of French Competent Authority Certificate F/357/B(U)F-96 (Eah) for the Model No. TN-MTR"

Dear Mr. Boyle:

TN Americas LLC, on behalf of TN International, requests a revision to the Competent Authority Certification (CAC) USA/0565/B(U)F-96 [1] to revalidate contents consisting of a radioisotopic thermal generator (RTG) with types: Gisete 4, Gisete 5, or Gisete 8, placed in a special-purpose internal fitting, as described in the French competent authority Package Model Approval Certificate F/357/B(U)F-96 (Eah), Appendix 16 index ah [2].

Supplemental information needed by the U.S. Nuclear Regulatory Commission staff [3] in connection with its acceptance review of the Model No. TN-MTR package application [4] is provided as enclosure 1.

Should you or your staff have any questions or require additional information to support review of this application, please contact Mr. Peter Vescovi by telephone at 336-420-8325, or by e-mail at Peter.Vescovi@Orano.group.

Sincerely,

Jay Thomas
Director of Transportation
TN Americas LLC

cc: Michael Conroy, U.S. Department of Transportation

Enclosures:

1. Supplemental Information for Revalidation of F/357/B(U)F-96 (Revision Eah)
2. Chapter 2A – Appendix 10, DOS-16-00173678-216 Rev. 2

Enclosure 1 to E-54475

Supplemental Information for revalidation of F/357/B(U)F-96 (Revision Eah)

THERMAL EVALUATION

Provide Chapter 2A-10 that presents the thermal analysis for the CESOX content, which bounds the Gisete content.

Chapter 2A (page 10/13) indicated that a thermal analysis for the TN-MTR with either a Gisete 4, Gisete 5 or Gisete 8 radioisotopic thermal generator content was not provided because its thermal performance is bounded by the TN-MTR containing the CESOX contents. However, page 9/13 stated that the thermal analyses associated with the CESOX content is presented in Chapter 2A-10. The information in Chapter 2A-10, including the package surface temperature and the allowable temperature of the Gisete content, is used to show that thermal regulations are met.

This information is needed to demonstrate compliance with 2012 IAEA requirements in Specific Safety Requirements No. SSR-6, "Regulations for the Safe Transport of Radioactive Material 2012 Edition", including paragraph 659(b)(i).

Supplemental information:

Chapter 2A – Appendix 10, "Thermal Analysis of the TN-MTR Packaging with CESOX Content and Its Internal Fittings," DOS-16-00173678-216 Rev. 2 is provided as Enclosure 2.

SHIELDING EVALUATION

Provide the source term for the radiological source considering bremsstrahlung.

The applicant has requested revalidation of the TN-MTR package with contents for the Gisete 4, Gisete 5 and Gisete 8 radioisotopic thermal generator. These include a Sr-90 source encased in a tungsten alloy or depleted uranium shield. Sr-90 is a beta emitter, which decays to Y-90, which is also a beta emitter, before decaying to a stable nuclide. The beta radiation would be stopped within the TN-MTR packaging. However, high energy betas, especially those emitted from Y-90 which has a maximum beta energy of 2.27 MeV, when interacting with high Z material, such as tungsten or depleted uranium, will generate bremsstrahlung photons. The applicant shows calculated dose equivalent rates within Chapter 4 – Appendix 14 DOS-18- 011415-045, Version 1.0, "Safety Analysis Report, TN-MTR," Orano TN. However, there is not enough information for the staff to review how the bremsstrahlung photons were accounted for in this analysis.

The staff requests that the applicant provide the following:

1. Information and justification on the radiological source term used to demonstrate that the TN-MTR with the Gisete radioisotopic thermal generator contents meets SSR-6 radiation levels. Section 5.2.2 of the SAR states: "The source is considered as a pure primary gamma emitter." The staff requests that the applicant provide the gamma source term used (i.e. energy spectrum and photons/sec) and justify that it accounts for the bremsstrahlung photons expected.

2. Clarifying information on the code used to generate the radiological source term. Section 5.1 of the SAR states: "Source calculations are made using the ORIGEN-ARP program (SCALES system)." The staff requests that the applicant clarify if this is a typographical error as ORIGEN-ARP is an interpolation program for spent nuclear fuel source terms and does not generate beta or bremsstrahlung source terms.

Supplemental information:

The gamma source terms used in the demonstration, to justify that the TN-MTR with the Gisete radioisotopic thermal generator meets SSR-6 radiation levels, are presented in the table below. These source terms have been calculated using the ORIGEN code of SCALE6 package (through the ORIGEN-ARP interface) taking into account the gamma emission generated by bremsstrahlung on an uranium oxide matrix. A 62 energy group structure has been used to represent the full gamma spectrum.

In addition, in the 3D radiation transport calculation, the Gisete radioisotopic thermal generator has been modelled as a punctual source without any structural shielding. From Orano TN point of view, these assumptions lead to penalizing equivalent dose rates calculated around the TN-MTR cask

Energy group structure		Emission density (□s/MeV)
E_{low} (MeV)	E_{high} (MeV)	
$1.0000*10^{-2}$	$1.0000*10^{-1}$	$4.403*10^{15}$
$1.0000*10^{-1}$	$3.0000*10^{-1}$	$5.485*10^{14}$
$3.0000*10^{-1}$	$4.0000*10^{-1}$	$2.264*10^{14}$
$4.0000*10^{-1}$	$4.5000*10^{-1}$	$1.349*10^{14}$
$4.5000*10^{-1}$	$5.0000*10^{-1}$	$6.636*10^{13}$
$5.0000*10^{-1}$	$5.5000*10^{-1}$	$6.004*10^{13}$
$5.5000*10^{-1}$	$6.0000*10^{-1}$	$5.550*10^{13}$
$6.0000*10^{-1}$	$6.2500*10^{-1}$	$1.042*10^{14}$
$6.2500*10^{-1}$	$6.5000*10^{-1}$	0.000
$6.5000*10^{-1}$	$6.7500*10^{-1}$	0.000
$6.7500*10^{-1}$	$7.0000*10^{-1}$	$6.864*10^{13}$
$7.0000*10^{-1}$	$7.2500*10^{-1}$	$6.620*10^{13}$
$7.2500*10^{-1}$	$7.5000*10^{-1}$	0.000
$7.5000*10^{-1}$	$7.7500*10^{-1}$	0.000
$7.7500*10^{-1}$	$8.0000*10^{-1}$	$4.448*10^{13}$
$8.0000*10^{-1}$	$8.2000*10^{-1}$	$5.405*10^{13}$
$8.2000*10^{-1}$	$8.4000*10^{-1}$	0.000
$8.4000*10^{-1}$	$8.6000*10^{-1}$	0.000
$8.6000*10^{-1}$	$8.8000*10^{-1}$	0.000
$8.8000*10^{-1}$	$9.0000*10^{-1}$	$3.648*10^{13}$
$9.0000*10^{-1}$	$9.2000*10^{-1}$	$3.567*10^{13}$
$9.2000*10^{-1}$	$9.4000*10^{-1}$	0.000
$9.4000*10^{-1}$	$9.6000*10^{-1}$	0.000
$9.6000*10^{-1}$	$9.8000*10^{-1}$	0.000
$9.8000*10^{-1}$	1.0000	$2.415*10^{13}$
1.0000	1.0500	$9.332*10^{12}$
1.0500	1.1000	$6.482*10^{12}$
1.1000	1.1500	$6.194*10^{12}$
1.1500	1.2000	$4.248*10^{12}$
1.2000	1.2500	$4.076*10^{12}$
1.2500	1.3000	2.744*1012

Energy group structure		Emission density (□s/MeV)
E_{low} (MeV)	E_{high} (MeV)	
1.3000	1.3500	$2.640*10^{12}$
1.3500	1.4000	$1.732*10^{12}$
1.4000	1.4500	$1.671*10^{12}$
1.4500	1.5000	$1.058*10^{12}$
1.5000	1.5500	$1.023*10^{12}$
1.5500	1.6000	$6.176*10^{11}$
1.6000	1.6500	$5.986*10^{11}$
1.6500	1.7000	$3.390*10^{11}$
1.7000	1.7750	$2.179*10^{11}$
1.7750	1.8500	$2.225*10^{11}$
1.8500	1.9250	$9.987*10^{10}$
1.9250	2.0000	$4.592*10^{10}$
2.0000	2.1000	$3.297*10^{10}$
2.1000	2.2000	$1.274*10^{8}$
2.2000	2.3000	0.000
2.3000	2.4000	$6.375*10^{7}$
2.4000	2.5000	$6.115*10^{7}$
2.5000	2.6000	0.000
2.6000	2.7000	0.000
2.7000	2.8000	0.000
2.8000	3.0000	0.000
3.0000	3.2500	0.000
3.2500	3.5000	0.000
3.5000	3.7500	0.000
3.7500	4.0000	0.000
4.0000	4.5000	0.000
4.5000	5.0000	0.000
5.0000	6.0000	0.000
6.0000	7.0000	0.000
7.0000	8.0000	0.000
8.0000	10.0000	0.000