November 26, 2013

Mr. Teo Grochowski, Chief Executive Officer
Robatel Technologies, LLC
5115 Bernard Drive
Suite 304
Roanoke, VA 24018

SUBJECT: APPLICATION FOR CERTIFICATE OF COMPLIANCE NO. 9365 FOR THE MODEL NO. RT-100 PACKAGE – SECOND REQUEST FOR ADDITIONAL INFORMATION

Dear Mr. Grochowski:

On October 9, 2012, Robatel Technologies, LLC, submitted an application for approval of the Model No. RT-100 package as a Type B(U)-96 package. On December 6, 2012, the staff accepted your application for detailed technical review. On September 18, 2013, you responded to our first request for additional information letter dated March 28, 2013.

In connection with our detailed technical review, we need the information identified in the enclosure to this letter. We request that you provide this information by December 31, 2013. If you are unable to meet this deadline, you must notify us in writing no later than December 20, 2013, of your submittal date and the reasons for the delay.

Please reference Docket No. 71-9365 and TAC No. L24686 in future correspondence related to this request. The staff is available to meet with you to discuss your proposed responses. If you have any questions regarding this matter, I may be contacted at (301) 287-0759.

Sincerely,

/RA/

Pierre Saverot, Project Manager
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Docket No. 71-9365
TAC No. L24686

Enclosure: Request for Additional Information

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REQUEST FOR ADDITIONAL INFORMATION
FOR THE
MODEL NO. RT-100 PACKAGE

DOCKET NO. 71-9365

On October 9, 2012, Robatel Technologies, LLC, submitted an application for approval of the Model No. RT-100 package as a Type B(U)-96 package. The NRC staff completed an acceptance review of this application on November 15, 2013. On December 6, 2013, the staff accepted your application for detailed technical review. On September 18, 2013, you responded to our first request for additional information (RAI) letter dated March 28, 2013.

This second RAI letter identifies information needed by the staff in connection with its review of the Model No. RT-100 package application. The requested information is listed by chapter number and title in the application. The staff reviewed the application using the guidance in NUREG 1609, “Standard Review Plan for Transportation Packages for Radioactive Material."

Each individual RAI section describes information needed by the staff to complete its review of the application and to determine whether the applicant has demonstrated compliance with the regulatory requirements.

Chapter 1 General information

Licensing Drawings

1.1 Correct the error in the licensing drawing RT100 PE 1001-1.

There are two places on the licensing drawing RT100 PE 1001-1 that reference “DETAIL 3.” From the drawing, it is apparent that these two references are related to two very different parts of the packaging design. The applicant needs to correct this error.

This information is required by the staff to determine compliance with 10 CFR 71.43.

Chapter 3 Thermal Evaluation

3.1 Clarify the potential combustion of paper, within the package, under an HAC fire.

Following the staff’s review of Figures 24 and 36 of Calculation No. RTL-001-CALC-TH-0201, provided as part of an RAI response, the applicant showed the HAC inner shell surface temperatures of about 275°C for pin damages on the top impact limiter (Figure 24) and on the cask body side (Figure 36). Such temperatures are above the auto-ignition point of 232°C for paper, one of the package content materials.

The applicant is required to demonstrate that the auto-ignition of the paper will not occur or that its reaction is not significant for the package; otherwise, the paper should not be allowed as part of the content materials.

This information is required by the staff to determine compliance with 10 CFR 71.51, 71.71, and 71.73.

3.2 Provide the maximum temperatures of the cover plate EPDM O-rings during NCT and HAC.

Page 3-6 of the application includes the maximum temperatures of the primary lid and secondary lid O-rings. The cover plate O-ring temperatures should also be provided in order to verify their acceptable operation during NCT and HAC.

This information is required by the staff to determine compliance with 10 CFR 71.71 and 71.73.

Editorial Changes

3.3 Change “ambient” with “package surface” in Section 3.4.1.2, Section 3.4.2.2, and Calculation Package RTL-001-CALC-TH-0201.

The applicant should modify the sentences (a) “heat transfer to the ambient by forced convection” with “heat transfer to the package surface by forced convection” and (b) “heat transfer to the ambient by radiation, emissivity = 0.9” with “heat transfer to the package surface by radiation, emissivity = 0.9” on page 3-31(Section 3.4.1.2), page 3-43 (Section 3.4.2.2) and page 20 of Calc. No. RTL-001-CALC-TH-0201 (Rev. 3). This modification will clarify the heat transfer direction during the fire transient.

This editorial change is required to determine compliance with 10 CFR 71.35 and 71.73.

Chapter 4 Containment Evaluation

4.1 Confirm whether alpha emitters in the contents would contribute to the flammable gas generation analysis.

The flammable gas generation analysis relies on G values for water subject to gamma radiation, per Table 4.4-1. However, Table 5.5.2-1 indicates a number of alpha emitters, including Po-210, Cm-244, Cf-252, etc., which could result in increased G values for water, as noted in Table D.1 of NUREG/CR-6673.

A list of alpha emitters in the loaded contents, and decay products of the loaded contents, should be provided.

This information is required by the staff to determine compliance with 10 CFR 71.43.

4.2 Clarify the limitations of water allowed in the content and specify, within the Chapter 7 Package Operations, the need to determine the amount of water in the content.

Page 4-20 of the application states both that the resin is dewatered and that resin beads could have moisture content up to 55% by weight. In addition, the response to RAI 4-7 indicates there is no restriction on moisture content, although page 4-21 indicates a

limitation by assuming a ($0.99*0.25*V_{waste} + 0.01*V_{waste}$) water volume in the calculations. The ambiguity should be clarified since the amount of water has an effect on the quantity of flammable gas generated. In addition, confirm the 55% by weight moisture content is numerically compatible with the assumed ($0.99*0.25*V_{waste} + 0.01*V_{waste}$) water volume.

This information is required by the staff to determine compliance with 10 CFR 71.43.

4.3 Clarify that the flammable gas generation calculation methodology, presented in Section 4.4, bounds the materials that are permitted within the package cavity.

Chapter 1 indicates that content and shoring can contain wood and thermoplastics, including polyethylene and polypropylene. However, Table 4.4-1, which is used to determine flammable gas generation, does not include wood and polypropylene.

This information is required by the staff to determine compliance with 10 CFR 71.43.

4.4 Provide the G values, used in Section 4.4 and Figure 7.5-1, that reflect the conditions inside the package.

There is a temperature dependency on radiolysis, as discussed in NUREG/CR-6673. Sections 3.3.2.2 and 3.4.3.2.2 of the application indicate cavity temperatures greater than 298°K, which is the temperature basis for the G values reported in Table 4.4-1. Depending on the activation energy of the materials, the higher temperatures during transport could result in a radiolytic gas generation that is twice the gas generation at 298°K.

This information is required by the staff to determine compliance with 10 CFR 71.43.

Editorial Changes

4.5 Correct typographical errors associated with leakage rates and flammable gas generation, including Section 4.3, Section 4.4, and Table 8.3-2. The tables and equations in these sections are especially important, as they form the basis of calculations performed by package users if content is not within the range set forth in Figure 7.5-1.

- The equation on the bottom of page 4-9 is missing a pair of parenthesis around the (Fc+Fm) term.
- It appears that equation 4.4 should define the hydrogen mole fraction as: $X_H = n_H/n_o+n_{\text{total gas}}$.
- In the top equation of equation 4.5, the third term in the denominator should be (D_w G_{TW} (2t))/(100 A_N) rather than (D_c G_{TW}(2t))/(100 A_N).
- Per Section 3.3.2, the radiolysis of water generates hydrogen and oxygen. Confirm that not including oxygen as part of the net gas generated is conservative in the flammable gas generation calculations and make note of that in Table 4.4-1. In addition, provide water's G (net gas), G_T value in Table 4.4-1.

- It appears that the footnote for Table 8.3-2 refers to leak rates from Table 4.3.1-2 rather than Table 4.3-3. If so, this notation should be corrected in order to aid leakage test personnel.

This information is required to determine compliance with 10 CFR 71.43.

Chapter 5 Shielding Evaluation

5.1 Provide clarifications for (1) the distribution (homogenous or heterogeneous) of the sources inside the contents, and (2) the criteria used to define what constitutes or not a "significant variation." Justify why the pre-shipment measurement could assure the homogeneity of the source distribution. Delete statements on "reasonable assurance."

In the staff's first RAI letter, dated March 28, 2013, RAI 5-2 requested the applicant to confirm if the packaging is used to transport only sources that are uniformly distributed inside the contents, as assumed in the shielding analyses. In its response to this RAI 5-2, the applicant stated the following: "The contents of the RT-100 will consist of dewatered resins and filters. The material is not intended to be shipped as a "point source." Waste Generators are required to perform sampling prior to shipment. This sampling verifies the homogeneity of the material." Such a statement did not answer staff's question.

Also, as part of its response to this RAI 5-2, the applicant further stated: "Prior to shipment, the waste generators are required to provide the complete waste stream characteristics and characterization in the form of a waste profile. This waste profile ensures that the material is in compliance with the receiving facilities Waste Acceptance Plan and includes any analytical data process knowledge, radiological activities, *anticipated* dose rates of the material, and the chemical/physical make-up of the waste. The maximum isotopic unit activity of any waste samples is used in the Loading Table for the entire contents of a package. This provides *reasonable assurance* that the RT-100, when loaded, *will not have significant variation* in the homogeneity of its contents, that could result in a dose rate at the package surface or one meter from the vehicle boundary that exceeds the dose limits in 10 CFR 71.47 b(2)." An applicant cannot claim "reasonable assurance," i.e., a term used by regulators, to establish the licensing basis for the package design. Also, the applicant did not define what constitutes a "significant variation" in the homogeneity of the contents.

In addition, in its response to RAI 5-2, the applicant stated: "The dose rate measurements required by NRC and DOT before shipment are used to indirectly verify (not to make the primary determination) that there are no significant variations in package contents." It is not clear how the pre-shipment dose rate measurements can be used to determine the uniformity of the source in the contents, as pre-shipment measurement is not a means to demonstrate compliance with the regulations (see Regulatory Issue Summary RIS 13-04, "Content Specification and Shielding Evaluations for Type B Transportation Packages," for further clarification).

The applicant needs to provide (1) the nature of the contents with regard to source distributions (homogenous or heterogeneous), and the criteria used to define what constitutes a "significant variation." The applicant needs to justify how a pre-shipment

measurement can assure the homogeneity of the source distribution. The applicant needs to delete all references to "reasonable assurance."

This information is required by the staff to determine compliance with 10 CFR 71.47 and 71.51.

5.2 Explain the three range approach used in the shielding analyses and justify why it is reliable and produce conservative results.

In its response to RAI 5-6, the applicant changed its method for shielding analysis of low energy particle emitter contents. A new method named "Three Range Approach" is introduced. In its response to the RAI, the applicant indicated that the new approach is explained in Section 5.4.2 of the application, but the staff was unable to find any explanation on how this new approach works and why it can produce reliable results. The only information provided in Section 5.4.2 of the application appears to be a list of three groups of energy ranges. The application does not elaborate on why the energy range was split into three groups and what problem this regrouping may attempt to resolve. The applicant needs to provide detailed information on this new approach, including details on how it works, its technical basis, and all appropriate justifications for its reliability and accuracy.

This information is required by the staff to determine compliance with 10 CFR 71.47 and 71.51.

5.3 Correct the following error in Table 5.1.2-1 and explain why incorrect regulatory requirements were cited.

Table 5.1.2-1 cited 0.1 mSv/hr at 2 meters from the projected plane of the edge of a flatbed as the regulatory requirement of 10 CFR 71.47(b)(2). However, the regulatory requirement for this dose rate limit is prescribed in 10 CFR 71.47(b)(3). A similar error occurred in the initial application in which some sections indicated that the package design meets the requirements of 10 CFR 71.47(a) and other sections of the application indicated the package was designed to meet the 10 CFR 71.47(b) requirements. The applicant needs to correct this error and explain why this type of error repeated from the initial submittal to the revised SAR.

This information is required by the staff to determine compliance with 10 CFR 71.43.

5.4 Demonstrate that the response method used is accurate and reliable with focus on mid- and low-energy particles and prove that all MCNP shielding calculations have converged properly.

In the previous letter requesting additional information, RAI 5-6 requested the applicant to demonstrate that the approach it used in determining the maximum allowable content is reliable and accurate. The applicant's response, however, did not answer the question. In its response, the applicant did not address the fundamental question on the interdependency of the dose rate to particle/energy response relation and the media through which the particles traverse, i.e., whether the dose rate/particle/energy response

is still valid if the assumed content changes. The applicant needs to provide the technical bases for the approach used in the shielding analysis and demonstrate that this approach is accurate and reliable for the package shielding analyses.

In addition, the staff's confirmatory calculations using the applicant's models indicated that most of the low mid-to-low energy particle MCNP calculations do not converge with the time specified in the models and the applicant confirmed this during a meeting. Hence, the results presented to the NRC in the application might have been erroneous and misleading. The applicant needs to provide results that are accurate and reliable.

This information is required by the staff to determine compliance with 10 CFR 71.47 and 71.51.

5.5 Justify the code benchmarking results with respect to:

1. the efficiency and uncertainty of the detector(s) that was used in measuring the package surface dose rates;
2. calibration of the detector for this measurement purpose;
3. the conclusion that the calculated dose rate is greater than the measured ones except one case; and
4. the applicability of benchmark analysis results to other major gamma emitting.

The applicant stated that it used the ^{60}Co gamma scan results of the acceptance test for the first fabricated cask and used the results as a way for code benchmarking. For neutron shielding, the applicant used the well known Ueki experiment. However, it is not clear if the results of these benchmarks are applicable to the RT-100 package.

Typically, code benchmarking requires carefully designed set up of experiments, carefully selected detector, well calibrated detector, accurately measured dimensions of the experiment and the detector positions, and well understood efficiency of the measurements. In order to demonstrate the suitability of these measurement data for code benchmarking for the RT-100 package design, the applicant needs to provide information on: (1) the efficiency and the accuracy of the detector for the measurements; (2) information regarding the calibration of the detector for this measurement purpose; (3) justification of the validity of the benchmark analyses for both gamma and neutron; (4) justification for the conclusion that the calculated dose rate is greater than the measured ones except one case; and (5) the applicability of benchmark analysis results to other major gamma emitting radionuclides (beside ^{60}Co) that have significant presence in the contents to be shipped.

This information is required by the staff to determine compliance with 10 CFR 71.43.

Chapter 7 Operating Procedures

7.1 Clarify the limitations of Figure 7.5-1 in determining appropriate waste volume and content decay heat.

a) It is expected that Figure 7.5-1 will be used by shippers to determine waste volume and decay heats within the package. Therefore, the limitations associated with the figure should be specified, such as secondary container volume, relative fractions of water in waste volume, ionic resin in waste volume, shipping time limitation, etc. A warning against extrapolating the curve should also be provided. These limitations should be specified in the text and within the figure.

b) Section 7.5 states "If the waste volume and decay heat values for a cask are above the curve illustrated in Figure 7.5-1, the user must perform a more detailed calculation of hydrogen generation for their specific contents and expected shipping time using the information provided in Section 4.4." However, according to Figure 7.5-1, it is "NOT ACCEPTABLE" to ship if waste volume and decay heats are above the curve. Is the need to perform a more detailed calculation dependent on whether the waste volume and decay heat falls outside the range of the curve (e.g., decay heats larger than 13 W or waste volumes greater than 100 ft^3) or above the curve?

c) What does the superscript "1" represent in the Figure 7.5-1 description?

This information is required by the staff to determine compliance with 10 CFR 71.43.

7.2 Revise the operating procedures to point the users to Section 7.6, "Appendix," for determining the allowable quantity of the contents.

Section 7.6 of the application provides instructions for determining the allowable quantity of the contents with a specific chemical/physical make-up. However, there is no "pointer" in the step-by-step operating procedures that points the users to Section 7.6.

The applicant needs to revise the Operating Procedures to point the users to Section 7.6, "Appendix," of the application for determining the allowable quantity of the contents.

This information is required by the staff to determine compliance with 10 CFR 71.111.

7.3 Incorporate into Chapter 7 the information presented in Section 4.4. of the application

The procedures indicate that Figure 7.5-1 should be used to determine the appropriate contents for loading. However, the figure is valid only for specific conditions. The necessary procedures described in Section 4.4. of the application must be included in Chapter 7 for those conditions in which Figure 7.5-1 is not appropriate.

This information is required by the staff to determine compliance with 10 CFR 71.43 and 71.87.

Chapter 8 Acceptance Tests and Maintenance Procedures

8.1 Clarify the quick disconnect valve and quick disconnect valve cover plate leakage test procedures.

It is not clear how the quick disconnect valve (Section 8.1.4.3) and cover plate (Section 8.1.4.4) will be helium leak tested. For example, why should the secondary lid not be

attached to the primary lid, as indicated in the testing procedure "Note"? It would appear that helium would leak out of the system if the secondary lid was not attached.

This information is required by the staff to determine compliance with 10 CFR 71.43.

8.2 Provide a note in Section 8.2.2.2 to remind the user to verify if the cover plate and/or the lids were removed or loosened during a preceding shipment of Type A material.

Users of Type B packages should be aware that containment boundary components (e.g., seals and valves) could have been opened during a prior shipment of Type A contents, Low Specific Activity (LSA) material, or Surface Contaminated Objects (SCO), but a pre-shipment leakage rate test might not have been performed. If any containment boundary component is not opened during loading of a Type B package, consideration should be given if the containment boundary component might have been opened during a prior shipment and not have undergone a pre-shipment leakage rate test.

This information is required by the staff to determine compliance with 10 CFR 71.51, and 71.87.

8.3 Clarify that the primary lid, secondary lid, and cover plate are leakage tested as part of the cask body containment boundary.

Section 8.1.4.1 describes leakage testing for the inner shell, cask bottom, and upper flange as part of the fabrication testing. However, per ANSI N14.5, the primary lid, secondary lid, and cover plate, which form the containment boundary, must also be tested as part of fabrication leakage testing.

This information is required by the staff to determine compliance with 10 CFR 71.43, and 71.51.

8.4 Confirm that detailed procedures, that would provide guidance to convert pressure rise test data to leakage rates, are available to package users.

Section 8.2.2.2 does not provide guidance for determining the leakage rate from pressure rise data. It is the leakage rate, however, that must be compared to the acceptance criteria in Table 8.3-1. The equation to determine the leakage rate from pressure rise data should be provided in Chapter 8 or in detailed procedures that are available to package users.

This information is required by the staff to determine compliance with 10 CFR 71.87.

8.5 Identify and summarize the differences between COFREND and ASNT-NDT certifications.

The applicant states that personnel shall be either ASNT-NDT or COFREND certified for leak testing but does not identify if and how those certifications are equivalent. The staff understands that each standard is a set of consistent rules and that a line by line comparison may lead to an incorrect conclusion. However, the main differences between ASNT-NDT and COFREND should be identified and summarized.

This information is required by the staff to determine compliance with 10 CFR 71.43.

8.6 Clarify the standards used for the EPDM O-rings.

Page 2-8 of the application mentions that the EPDM O-rings follow ASTM D1418. Page 8-10 does not list this standard.

This information is required by the staff to determine compliance with 10 CFR 71.43.