Washington
TRU Solutions LLC

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October 17, 2006

Mr. M. Rahimi, Senior Project Manager
Licensing Section, Spent Fuel Project Office
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
One White Flint North
1555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: SECOND REQUEST FOR ADDITIONAL INFORMATION ON ARROW-PAK EXEMPTION REQUEST (DOCKET NO. 71-9218, TAC No. L23811)

REFERENCES:
1. Letter from P. C. Gregory to M. Rahimi, dated January 31, 2005, subject: Application for Revision of the TRUPACT-II Certificate of Compliance, NRC Docket No. 71-9218
2. Letter from M. Rahimi to P. C. Gregory, dated July 8, 2005: subject: Request for Additional Information on ARROW-PAK Exemption Request
3. Letter from P. C. Gregory to M. Rahimi, dated February 17, 2006, subject: Response to NRC Request for Additional Information on ARROW0PAK Exemption Request (Docket No. 71-9218, TAC No. L23811)
4. Letter from M. Rahimi to P. C. Gregory, dated July 14, 2006, subject: Second Request for Additional Information on ARROW-PAK Exemption Request

Dear Mr. Rahimi:

This letter is in response to the second request for additional information (RAI) regarding the application for ARROW-PAK exemption. After careful evaluation of the information needed for your staff to complete its review, we have arrived at the following top level plan to address each of the requests by a combination of drawing revision, analysis, material bench testing, and/or full-scale testing. As identified below, we intend to rely rather heavily on material bench tests and/or full-scale free drop and deflagration testing, whereas additional analytic studies are expected to be rather limited. We also anticipate changing to an alternate engineering grade of HDPE material, which exhibits improved performance at low temperature (see response to RAI 2-1).

P.O. Box 2078 • Carlsbad, New Mexico USA 88221-2078
Phone: (505) 234-7200 • Fax: (505) 234-7083

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Chapter 1 – Introduction

1-1 "Revise Drawing 163-007, Rev. 1, to specify the type and capacity of the corrugated plastic spacers used to roughly center the 55-gallon drum along the length of the ARROW-PAK."

Response: Drawing 163-007 will be revised as requested to include the size (length and diameter), type, and capacity of the corrugated plastic spacers. Of note, Section D-D of drawing sheet 3 does not currently depict the spacers at their correct, as-tested length of 10.5 inches each. That view will be redrawn to scale and dimensions provided. In addition, as a part of our response to this RAI, a representative spacer will be axially crushed solid, and the resultant force deflection curve provided.

1-2 "Explain how the 55-gallon drum will remain in its position at the center during the transport and handling, when the plastic spacers are not restrained at the other end. Also, verify that the configurations for Hypothetical Accident Conditions tests are consistent with the configurations shown on the drawings."

Response: A discussion of the location of the 55-gallon drum during Normal Conditions of Transport and Hypothetical Accident Conditions will be provided as requested. The maximum amount of axial free play between drums, spacers, and the ARROW-PAK heads will be quantified and the significance of that free play on normal and accident conditions will be discussed. Given the response to RAI 1-1, it will become clear that the maximum possible axial offset of a drum from being centered in an ARROW-PAK is approximately 3.5 inches, which will have a negligible affect on package response.

1-3 "Revise Drawing No. 163-007 to provide Codes for design and inspection of the ARROW-PAK container, and provide the calculations referenced in the response to RAI 1-3 dated February 17, 2006, for the localized stresses in the ARROW-PAK container."

Response: The drawing will be revised to include applicable design and inspection codes. NDE inspection techniques capable of detecting the largest allowable flaw in the fusion joint will be identified and added to the drawing as/if appropriate (see response to RAI 2-1 below). Previously referenced calculations will be provided. With reference to the various full-scale free drop and deflagration tests now planned, the discussion of localized stresses at higher strain rates will be expanded. The properties of the fused joint compared to the parent material will be discussed as requested.

Chapter 2 – Structural

2-1 "Provide data to demonstrate that the EHMW-HDPE material has sufficient fracture toughness to preclude brittle fracture at all ranges of temperatures required by 10 CFR Part 71. Specify the size of the largest flaws in the EHMW-HDPE material including any that may be present in weldments (base material and material near the

fused zone). Include data on fracture toughness measurements as a function of temperature of this material. Include your understanding of the highest local stress-intensity factors that you used to compute the likelihood of propagation of flaws."

Response: In consideration of this RAI, Washington TRU Solutions LLC (WTS) now expects to change from TR480 to an alternate engineering grade of HDPE, which exhibits improved low-temperature performance. Fracture toughness data for the full range of temperatures will be presented for the final material selected. In addition, full-scale deflagration testing at cold (-40 °F) temperature will be conducted to demonstrate the ability of ARROW-PAK to adequately withstand a deflagration at regulatory defined, normal condition of transport cold temperatures. If the HDPE material grade selected for final design does not clearly exhibit a ductile-to-brittle transition temperature below -40 °F, the deflagration testing will be performed with worst-case detectable flaws induced in the ARROW-PAK.

2-2 "Provide the basis for testing the ARROW-PAK containers with ambient internal pressure and temperature (73 °F and 93 °F) instead of the Maximum Normal Operating Pressure of 100 psig and the temperatures most unfavorable between -20 °F and 100 °F."

Response: Full-scale HAC free drop testing will be reperformed in light of this RAI. Considering material properties at temperature extremes and the effects of internal pressure and drop orientation on free drop response, WTS will identify what it considers to be a set of worst-case free drop tests. Dependent on the final response to RAI 2-1, cold temperature (-20 °F) free drop tests utilizing ARROW-PAK containers with induced flaws will be considered. The final set of recommended tests will be presented and the basis for initial conditions will be discussed in detail at the next meeting with the NRC.

2-3 "Provide the basis for the assumption that the horizontal and vertical drop tests performed to meet 10 CFR71.73(c)(1) Hypothetical Accident Conditions (HAC) *Free Drop* requirements represent the orientations for which maximum damage is expected."

Response: The basis for the drop test orientation(s) will be expanded to provide improved justification for which orientations will result in maximum expected damage. WTS continues to believe for ARROW-PAKs contained within a TRUPACT-II that flat end and flat side drops are the governing cases. We intend to provide a more thorough explanation of this and are prepared to perform drop tests in other orientations if NRC concerns cannot be analytically addressed.

Chapter 3 – Thermal

3-1 "Demonstrate the integrity of ARROW-PAK container by full scale test using hydrogen deflagration at MNOP conditions and with its high-density polyethylene walls at the maximum temperature estimated in Section 3.5 of the SAR. In addition, provide Reference 16 [i.e. K. L. Kosanke and B. J. Kosanke, Repeat Firing of 10.2 cm (4 in.), SDR-17, HDPE Mortars, Proceedings of the First International Fireworks Symposium (1992)]."

Response: Full-scale deflagration tests will be conducted at stoichiometric conditions with the ARROW-PAK at the maximum normal operating pressure and wall temperature expected during the thermal event described in Section 3.5 of the SAR as requested. Reference 16 will be provided as requested.

We are currently conducting the above discussed bench-scale material tests and further refining the above response approaches. If you see anything in the above planned path forward that appears to fall short of addressing your concerns, we would appreciate some near-term feedback. We would then like to meet with you in early January to present the bench test results and provide you with details of the above response approaches. We hereby request a meeting to discuss our proposed responses and to present a test plan intended to answer portions of the RAI related to Chapter 2 and Chapter 3. Please confirm a meeting date and time that is convenient for you and your staff.

If you have any questions, please feel free to call me at 505-234-7469 (office) or 505-302-1158 (cell), or you may send e-mail to phil.gregory@wipp.ws.

Yours truly,

Brad Day for

P. C. Gregory, Manager
Packaging

PCG:clm

cc: M. A. Italiano, CBFO