

Application for Certificate of Compliance for the Traveller PWR Fuel Shipping Package

**NRC Certificate of Compliance
USA/9297/AF-96
Docket 71-9297**

Safety Analysis Report, Revision 12



RECORD OF REVISIONS

Rev. No.	Date	Description of Revision
0	March 2004	Original application. (Ref: NMS-NRC-04-004)
1	November 2004	Response to NRC request for additional information. (Ref: NMS-NRC-04-009, NMS-NRC-04-011)
2	February 2005	Response to NRC request for additional information. (Ref: NMS-NRC-05-002)
3	March 2005	Response to NRC request for additional information. Correct one error, revise certain tables to make the SAR parameter tables consistent with those that will be published in the CoC, clarify the results of the rod container analysis, and clarify the maintenance requirements for the shock mounts. (Ref: NMS-NRC-05-003)
4	March 2005	Response to NRC request for additional information. Correct entries in various tables that list the Traveller design weights. Clarify in Sections 2 and 3 that the shock mounts were intact following the drop and fire tests. Provide justification in Section 2 for establishing payload weights that are higher than fuel assembly weights used in actual testing. (Ref: NMS-NRC-05-004)
5	March 2006	Information about loose rod pipe packaging in license drawings and revision to Safety Analysis Report to describe this new loose rod pipe packaging. (Ref: UAM-NRC-06-005)
6	September 2006	A packaging component used to secure these non-Westinghouse fuel assembly types in the Traveller was designed after approval of the Traveller. Information about packaging components used to secure the contents. (Ref: UAM-NRC-06-011)
7	October 2007	Response to NRC request for additional information. Added sketch of package in Chapter 1 and revised Section 1.1 Revised Sections 2.6.3 and 2.6.4 to delete reference to calculations because the package is not sealed against pressure. Revised Section 2.7.1.2 regarding test sequence justification. Revised Section 8.2.3.3 to clarify shock mount inspection frequency. Revised Section 8.2.5 to clarify BORAL plate inspection frequency. Administrative change to Table 6-21, showing the correct number of fuel and non-fuel rods in a 15x15 STD/OFA fuel assembly. (Ref: LCPT-10-6)
8	May 2010	Add CE16NGF and CE16VA fuel assemblies to criticality safety evaluation. (Ref: LCPT-10-14)

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<u>Rev. No.</u>	<u>Date</u>	<u>Description of Revision</u>
9	November 2010	<p><u>Style and Composition</u> An appendix is added to each section of the application as recommended in Regulatory Guide 7.9 to provide a list of documents that are referenced in the text of that section. The addition of this first appendix may result in renumbering of headings and pages where other appendices already existed for that section. Typographical changes have also been made.</p> <p><u>Section 1 – General Information</u> 1.2.1.2 Outerpack Added description of vibration and shock dampening system. 1.2.1.3 Clamshell Revised to provide more detailed description of clamshell features, including a design change for an alternate top end plate. Figures were revised to show typical configurations for the axial restraint and axial spacer. 1.2.1.4 Rod Container Removed rod box as an option. 1.2.3 Contents Revised description to add more detailed description of fuel assembly and components that may be transported in the fuel assembly. Added a Figure 1-8 showing a typical PWR fuel assembly. Added wording to describe the number of rods per pipe and how the rods are loaded. 1.4 Appendices Added Appendix 1.4.1, References. Renamed Appendix 1.4.2, Engineering Drawings for Packaging The engineering drawings for packaging Drawing No. 10004E58 Safety Related Items, Traveller XL and STD was revised to show modifications to the clamshell top end plate and changes to the outer pack such as silicone rubber weather gasket, tie down chain tray gussets, new swing bolts, and clamshell cam lock wave washer.</p> <p><u>Section 2 – Structural Evaluation</u> 2.12.3.2.4.1 Internal/External Pressure Added silicone foam rubber seal and removed description of seal function as providing thermal protection. 2.12 Appendices Added Appendix 2.12.1, References Added Appendix 2.12.6, Supplement to Drop Analysis for the Traveller XL Shipping Package – Clamshell Axial Spacer Structural Evaluation. Added Appendix 2.12.7, Supplement to Drop Analysis for the Traveller XL Shipping Package – Clamshell Removable Top Plate Structural Evaluation.</p>

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<u>Rev. No.</u>	<u>Date</u>	<u>Description of Revision</u>
9 (cont.)		<p><u>Section 3 – Thermal Evaluation</u> Revised introduction to clarify that there is no heat generating material. Tables 3-2 and 3-3 and bullets in the text were revised to be consistent with ASME Code</p> <p>3.1.3 Description of maximum temperatures Added silicone rubber gasket to Table 3-1, Summary Table of Temperatures for Traveller Materials</p> <p>3.1.4 Description of maximum pressures Added silicone rubber gasket.</p> <p>3.4 Thermal Evaluation Under Normal Conditions of Transport Revised to clarify that there is no heat generating material.</p> <p>3.5.3 Maximum Temperatures and Pressures Revised description of the purpose for seals used around the Outerpack door. Added silicone foam rubber as an acceptable seal material. Added Figure 3-8A to show location of weather seal gaskets.</p> <p><u>Section 4 – Containment</u> Added Section 4.3, Appendices, and 4.3.1 References. No references are cited.</p> <p><u>Section 5 – Shielding Evaluation</u> Added Section 5.1, Appendices, and 5.1.1 References. No references are cited.</p> <p><u>Section 6 – Criticality Evaluation</u> Section 6.2, Fissile Material Contents Added statement that reactor control cluster (RCC) assemblies, secondary source assemblies, and solid stainless steel rods that may be placed in the PWR fuel assembly are non-fissile material.</p> <p>6.2.1 PWR Fuel Assemblies Added justification for allowing RCC, secondary source rods, or stainless steel rods in fuel assembly contents.</p> <p>6.2.2 PWR and BWR Rods Revise limit for wrapping or sleeving in Table 6-5 Fuel Rod Parameters</p> <p>6.3.1.1 Contents Models Removed rod box as an option.</p> <p>6.10.2 PWR Fuel Assembly Parameters Revised dimensions for guide tube and pellet in Table 6-22 Parameters for 16X16 Fuel Assemblies</p> <p>6.10 Appendices Added Appendix 6.10.1, References</p> <p><u>Section 7 – Package Operations</u> Revised all sections to incorporate operating experience and more accurately represent the current package operations. Added Section 7.4, Appendices, and 7.4.1 References. No references are cited.</p>

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<u>Rev. No.</u>	<u>Date</u>	<u>Description of Revision</u>
9 (cont.)		<p><u>Section 8 – Acceptance tests and Maintenance Program</u> Replace “poison plate” with term “neutron absorber plate”, and replace “neutronics testing” with term “neutron absorber testing” to standardize reference to BORAL neutron absorber material. Add criteria for visual inspection of neutron absorber plates to Section 8.2.5. 8.1.5.1.4 Thermal Properties Thermal properties is revised to show the thermal conductivity for FR-3706, FR-3610, and FR-3620.</p>
10	September 2013	<p><u>Style and Composition</u> A number of typographical errors throughout the entire document have been corrected in this revision. A side result of the typographical corrections has been the addition of several pages, in order to accommodate paragraphs or figures which no longer had room to fit on the pages they previously occupied. <u>Section 1 – General Information</u> 1.2.1.1 Package Types Revised weights of packages where required. 1.2.1.4 Rod Pipe Further corrections added to clarify that the Rod Pipe will be the only rod container moving forward. 1.4.2 Engineering Drawings for Packaging Included the most recent revisions to the licensing drawings <u>Section 2 – Structural Evaluation</u> Updated equations and weights throughout the Section. 2.11.1 Rod Pipe Further corrections added to clarify that the Rod Pipe will be the only rod container moving forward. 2.12 Appendices Revised the appendices to provide an updated structural analysis which accounts for the revised weight of the Traveller package. 2.12.3.2.2 Lifting Provided additional information on Traveller STD four-point lift. Tables 2-7, 2-8, and 2-9 Removed, as the information was either already present or was consolidated elsewhere. <u>Section 6 – Criticality</u> 6.1.2, and 6.1.3 Corrections added to clarify that the Rod Pipe will be the only rod container moving forward. Figure 6-17 Replaced with the correct figure.</p>

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<u>Rev. No.</u>	<u>Date</u>	<u>Description of Revision</u>
10 (cont.)		<p><u>Section 7 – Package Operations</u> 7.1.1.3 Clarification and consolidation of information. 7.1.2, 7.12.1, and 7.2.2 Added tolerances for Torque figures.</p> <p><u>Section 8 – Acceptance Tests and Maintenance Program</u> Clarification and consolidation of information.</p>
11	December 2013	<p><u>Section 1 – General Information</u> 1.2.1.3 Maximum Quantity of Material per Package Revised allowable weight for packing materials which are equivalent to polyethylene.</p>
12	March 2015	<p>Addition of the Traveller-VVER packaging with VVER fuel assembly contents in each chapter as required for design approval. Chapters 1, 2, 3 and 6 contain majority of the content addition (including Sections 1.2.1.1.3 and 1.2.1.3, Section 2.12.8, Section 3.3.1.1, and Section 6.10.11).</p> <p>Addition of tie-down detail calculations (Section 2.12.3.2.3). Revision of text to clarify acceptable seal materials, however no changes to materials made (Chapter 2 and Chapter 8).</p> <p>Minor style and composition, non-technical edits made throughout SAR to clarify text.</p>

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