

# Safety Evaluation Report for the Consolidated Safety Analysis Report for Packaging, NAC-LWT, June 2011

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Prepared by:   
James M. Shuler  
Manager, DOE Packaging Certification Program  
Office of Packaging and Transportation

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Approved by:   
Stephen C. O'Connor  
Headquarters Certifying Official  
Director, Office of Packaging and Transportation

Date: 03/13/12

## OVERVIEW

This Safety Evaluation Report (SER) documents the review of the Safety Analysis Report for Packaging for the NAC-LWT Legal Weight Truck Cask System, Revision 2, June, 2011 <sup>[1]</sup>, for compliance with the requirements of 10 CFR 71 <sup>[2]</sup>. The Department of Energy (DOE) Packaging Certification Program (PCP) staff performed this review. The safety performance of the NAC-LWT with the intended payloads meets the requirements of 10 CFR 71.

## Background

The NAC International Legal Weight Truck Cask System (NAC-LWT) is designed in accordance with the requirements of 10 CFR 71 and 49 CFR 173 <sup>[3]</sup> to provide a safe means of transporting various fuel assemblies, fuel elements, and fuel rods. The Nuclear Regulatory Commission (NRC) Certificate of Compliance (CoC), USA/9225/B(U)F-96, has undergone fifty-four (54) revisions. The current DOE CoC, USA/9225/B(U)F-96(DOE), Revision 7, was issued in November 2010 <sup>[4]</sup> based on the Safety Analysis Report for Packaging (SARP) for the NAC-Legal Weight Truck Cask, Revision LVVT(DOE)-O6D, September 2006 and three supplement revisions dated from 2007 – 2010 <sup>[5,6,7, and 8]</sup>.

NAC prepared Rev 2 of the SARP to incorporate (consolidate) all the supplemental revisions listed in Revision 7 of the DOE CoC. There are no additional content or packaging design changes in Rev 2 of the SARP. This SER documents the DOE PCP staff review of the SARP, Rev 2.

DOE PCP has concluded the reviewed changes have no impact on the safety performance of the LWT-NAC and the performance with the intended contents meets the requirements of 10 CFR 71. Reviews of each SARP Chapter are documented below.

## Regulatory Changes

There is no change to the regulations driving the NAC-LWT consolidation from the “-96”, certified NAC-LWT packaging. No further discussion is necessary. The review was performed using the methods outlined in the Packaging Review Guide for Reviewing SARP <sup>[9]</sup>, as applicable.

## 1. GENERAL INFORMATION REVIEW

A review and evaluation of Chapter 1 of the SARP, Revision 2, dated June, 2011, was performed by DOE PCP staff with respect to the requirements in 10 CFR 71. The application is for the approval of a consolidated SARP.

### 1.1 Areas of Review

The areas of review were not limited.

## 1.2 Regulatory Requirements

The requirements of 10 CFR 71 applicable to the General Information review of the NAC-LWT are those cited in the Packaging Review Guide, as applicable.

## 1.3 Review Procedures

The purpose of the Applicant's submittal is clearly stated in the accompanying transmittal letter. The application is for the approval of the consolidated SARP. The SARP includes a complete list of engineered drawings for the NAC-LWT.

## 1.4 Findings

Based on review of the statements and drawings given in the application, DOE PCP concludes this revision has no impact on the safety performance of the NAC-LWT.

## 1.5 Conditions of Approval

The conditions of approval for the NAC-LWT shipping cask have not changed. The comments identified in *Consolidated SARP Review Questions/Responses, S-SARQ-G-00022, NAC LWT SARP, Rev 2*, must be incorporated in the next submittal.

# 2. STRUCTURAL REVIEW

A review and evaluation of Chapter 2 of the SARP, Revision 2, dated June, 2011, was performed by DOE PCP staff with respect to the requirements given in 10 CFR 71. The application is for the approval of a consolidated SARP.

## 2.1 Areas of Review

There were no new configurations.

## 2.2 Regulatory Requirements

The requirements of 10 CFR 71 applicable to the Chapter 2 review of the NAC-LWT are those cited in the Packaging Review Guide, as applicable.

## 2.3 Review Procedures

No structural changes were submitted.

## 2.4 Findings

Based on review of the statements and representations given in Chapter 2 of the NAC-LWT SARP, DOE PCP concludes the revision has no impact on the safety performance of NAC-LWT and that the requirements of 10 CFR 71 for normal conditions of transport (NCT) and hypothetical accident conditions (HAC) are satisfied.

#### 2.5 Conditions of Approval

The conditions of approval for the NAC-LWT have not changed.

### **3. THERMAL REVIEW**

A review and evaluation of Chapter 3 of the SARP, Revision 2, dated June, 2011, was performed by DOE PCP staff with respect to the requirements given in 10 CFR 71. The application is for the approval of a consolidated SARP.

#### 3.1 Areas of Review

There were no new configurations.

#### 3.2 Regulatory Requirements

The requirements of 10 CFR 71 applicable to the Chapter 3 review of the NAC-LWT are those cited in the Packaging Review Guide, as applicable.

#### 3.3 Review Procedure

There is no need to specify review procedures for the current review.

#### 3.4 Findings

Based on review of the statements and thermal models and results presented in Chapter 3 of the NAC-LWT SARP, DOE PCP concludes there is no impact on the safety performance of NAC-LWT and that the requirements of 10 CFR 71 for NCT and HAC are satisfied.

#### 3.5 Conditions of Approval

The conditions of approval for the NAC-LWT have not changed.

## **4. CONTAINMENT REVIEW**

A review and evaluation of Chapter 4 of the SARP, Revision 2, dated June, 2011, was performed by DOE PCP staff with respect to the requirements given in 10 CFR 71. The application is for the approval of a consolidated SARP.

### **4.1 Areas of Review**

The focus area of the DOE PCP staff review was the consolidation of Chapter 4.

### **4.2 Regulatory Requirements**

The requirements of 10 CFR 71 applicable to the Chapter 4 review of the NAC-LWT are those cited in the Packaging Review Guide, as applicable.

### **4.3 Review Procedures**

There is no need to specify review procedures for the current review.

### **4.4 Findings**

Based on review of the statements and representations given in Chapter 4 of the NAC-LWT SARP, PCP concludes the revision has no impact on the safety performance of NAC-LWT and that the requirements of 10 CFR 71 for NCT and HAC are satisfied.

### **4.5 Conditions of Approval**

The conditions of approval for the NAC-LWT have not changed.

## **5. SHIELDING REVIEW**

A review and evaluation of Chapter 5 of the SARP, Revision 2, dated June, 2011, was performed by DOE PCP staff with respect to the requirements given in 10 CFR 71. The application is for the approval of a consolidated SARP.

### **5.1 Areas of Review**

The focus area of the DOE PCP staff review was the consolidation of Chapter 5.

### **5.2 Regulatory Requirements**

The requirements of 10 CFR 71 applicable to the Chapter 5 review of the NAC-LWT are those cited in the Packaging Review Guide, as applicable.

### **5.3 Review Procedures**

There is no need to specify review procedures for the current review.

#### 5.4 Findings

Based on review of the statements and representations given in Chapter 5 of the NAC-LWT SARP, DOE PCP concludes the revision has no impact on the safety performance of NAC-LWT and that the requirements of 10 CFR 71 for NCT and HAC are satisfied.

#### 5.5 Conditions of Approval

The conditions of approval for the NAC-LWT have not changed.

### **6. CRITICALITY REVIEW**

A review and evaluation of Chapter 6 of the SARP, Revision 2, dated June, 2011, was performed by DOE PCP staff with respect to the requirements given in 10 CFR 71. The application is for the approval of a consolidated SARP.

#### 6.1 Areas of Review

The focus areas of the DOE PCP Staff review were the consolidation of Chapter 6.

#### 6.2 Regulatory Requirements

The requirements of 10 CFR 71 applicable to the Chapter 6 review of the NAC-LWT are those cited in the Packaging Review Guide, as applicable.

#### 6.3 Review Procedures

There is no need to specify review procedures for the current review.

#### 6.4 Findings

Based on review of the statements and evaluations presented in Chapter 6 of the application, DOE PCP concludes that the nuclear criticality safety design of the NAC-LWT packaging has been described and evaluated adequately, and that the NAC-LWT packaging meets the subcriticality requirements of 10 CFR 71 for an infinite array of NAC-LWT packages under both NCT and HAC conditions.

#### 6.5 Conditions of Approval

The conditions of approval for the NAC-LWT have not changed.

### **7. PACKAGE OPERATIONS REVIEW**

A review and evaluation of Chapter 7 of the SARP, Revision 2, dated June, 2011, was performed by DOE PCP staff with respect to the requirements given in 10 CFR 71. The application is for the approval of a consolidated SARP.

#### 7.1 Areas of Review

The focus areas of the staff review were the consolidation of Chapter 7.

#### 7.2 Regulatory Requirements

The requirements of 10 CFR 71 applicable to the Chapter 7 review of the NAC-LWT are those cited in the Packaging Review Guide, as applicable.

#### 7.3 Review Procedures

There is no need to specify review procedures for the current review.

#### 7.4 Findings

Based on the review of the statements and representations presented in the application, DOE PCP concludes that NAC-LWT operating procedures meet the requirements of 10 CFR 71 and the procedures are adequate to assure the package will be operated in a manner consistent with its evaluation for approval.

#### 7.5 Conditions of Approval

The conditions of approval for the NAC-LWT have not changed.

### **8. ACCEPTANCE TESTS AND MAINTENANCE PROGRAM REVIEW**

A review and evaluation of Chapter 8 of the SARP, Revision 2, dated June, 2011, was performed by DOE PCP staff with respect to the requirements given in 10 CFR 71. The application is for the approval of a consolidated SARP.

#### 8.1 Areas of Review

The focus areas of the staff review were the consolidation of Chapter 8.

#### 8.2 Regulatory Requirements

The requirements of 10 CFR 71 applicable to the Chapter 8 review of the NAC-LWT are those cited in the Packaging Review Guide, as applicable.

#### 8.3 Review Procedures

There is no need to specify review procedures for the current review.

#### 8.4 Findings

Based on the review of the statements and representations given in the application, PCP concludes that the Acceptance Tests for the NAC-LWT meet the requirements of 10 CFR 71, and that the Maintenance Program is adequate to assure regulatory-compliant packaging performance during its service life. PCP also concludes that the information provided for the Acceptance Tests and Maintenance Program is adequate.

#### 8.5 Conditions of Approval

The conditions of approval for the NAC-LWT have not changed.

### 9. REFERENCES

Section 9.0 of the SARP lists the documents, papers, and reports that are referenced in the SARP for the NAC-LWT cask.

### 10. QUALITY ASSURANCE REVIEW

The DOE PCP staff performed a review and evaluation of the revised Quality Assurance (QA) requirements in the SARP, Revision 2, dated June, 2011, for compliance with 10 CFR 71 Subpart H. The application is for the approval of a consolidated SARP.

#### 10.1 Area Reviewed

The focus areas of the staff review were the consolidation of Chapter 10.

#### 10.2 Regulatory Requirements

The regulatory requirements for QA are 10CFR 71, Subpart H. The Staff review was aided by consulting the US NRC Regulatory Guide 7.10 and the Packaging Review Guide.

#### 10.3 Review Procedures

The quality assurance program (QAP) responsibilities, documentation, and approvals were adequately identified and clearly delineated in the SARP.

## 10.4 Findings

Based on review of the statements and representations in the SARP, DOE PCP concludes NAC's QAP has been adequately described in the SARP and meets the QA requirements of 10 CFR 71 Subpart H.

## 10.5 Conditions of Approval

Any organization involved in the design, procurement, fabrication, handling, shipping, storage, cleaning, assembly, operation, inspection, testing, maintenance, repair, modification, and use of the NAC-LWT shall maintain and follow an appropriate QAP compliant with the requirements specified in 10 CFR 71, Subpart H.

## References

- [1] NAC International, Safety Analysis Report for Packaging for the NAC-LWT Legal Weight Truck Cask System, Revision 2, June, 2011.
- [2] Title 10, Code of Federal Regulations, Part 71 (10 CFR 71), Packaging and Transportation of Radioactive Materials.
- [3] Title 49, Code of Federal Regulations, Part 173 (49 CFR 173), Shippers General Requirements for Shipments and Packagings.
- [4] US Department of Energy, Certificate of Compliance, Certificate Number 9225, Revision 7, Date of Issuance November 15, 2010.
- [5] NAC International, Safety Analysis Report for Packaging for the NAC-Legal Weight Truck Cask, Revision LVVT(DOE)-O6D, September 2006
- [6] NAC International, Safety Analysis Report for Packaging for the NAC-Legal Weight Truck Cask, Revision LWTIDOE-07E, September 2007
- [7] NAC International, Safety Analysis Report for Packaging for the NAC-LWT Legal Weight Truck Cask System, Revision LWTIDOE-IOB, May 2010
- [8] NAC International, Safety Analysis Report for Packaging for the NAC-LWT Legal Weight Truck Cask System, Revision LWTIDOE-IOD, October 2010
- [9] A.A. DiSabatino, et al., Packaging Review Guide for Reviewing Safety Analysis Reports for Packagings, UCID-21218, Revision 3, Lawrence Livermore National Laboratory (February 2008).

## Review Questions/Answers/Implementation

Following are the Q1 questions generated from the SRNL regulatory review of the *NAC-LWT SARP, Revision 2*. The applicant was requested to review the question, provide a response, and if applicable, to propose an implementation to satisfy the question.

ID #	Reviewer Question/Comment	Applicant's Response	Applicant's Proposed Implementation
1	<p>Why does this version keep the "(NEW)" designation for places where the text and/or section is not "(NEW)" (e.g., section 1.2.3.9 states that the section is "SNL (NEW)" when the section was designated "SNL (NEW)" in Revision 1 of the SARP)?</p> <p>Page 1.5-2, and Page 1.5-23,24</p> <p>These documents included in the SARP have not been signed. Why are signed, approved documents not in the SARP?</p>	<p>The "(NEW)" and "(MODIFIED)" designations are part of the as-approved amendment request text for the Sandia and Argonne contents. Revision incorporated the approved text unmodified.</p>	<p>In the next submittal NAC will merge together the approved "(NEW)" and "(MODIFIED)" sections deleting these designators to eliminate any confusion.</p>
2		<p>These documents remained in the NAC-LWT SARP from the time when the DOE CoC covered TPBAR shipments prior to Revision 5 (1998 – 2007).</p> <p>Starting with Revision 5 of the DOE CoC, TPBARs were no longer an authorized content (they are now covered by the NAC-LWT SAR and the NRC CoC No. 9225). At the time when the TPBAR content was abandoned, a decision was made not to update any portion of the SARP that is not directly applicable to the current hardware configuration or the currently approved contents. Hence, these TPBAR-related documents were not updated.</p> <p>Signed versions of later revisions of these documents can be found in the NAC LWT SAR, Revision 41.</p>	<p>Since they are no longer applicable to DOE, NAC will remove the five (5) TPBAR-related documents from the NAC-LWT SARP deleting Section 1.5 in the next submittal.</p>
3	<p>Page 1.2-6, Limit #4, Last line</p> <p>Should the first instance of the word "and" be removed?</p>	<p>NAC will remove the first instance of the word "and" in the next amendment request.</p>	<p>NAC will remove the first instance of the word "and" in the next submittal.</p>

ID #	Reviewer Question/Comment	Applicant's Response	Applicant's Proposed Implementation
4	<p>Page 6.8-2</p> <p>It appears that the endnotes have been swapped. Are the endnotes correct as written?</p>	<p>The footnotes were inadvertently swapped on Page 6.8-2.</p>	<p>NAC will correct this error in the next submittal.</p>
5	<p>Pages 6.8-16 and 6.8-17</p> <p>The title of the Figure (Figure 6.8-7) is on Page 6.8-16 and should it be at the top of Page 6.8-17?</p>	<p>This error has been noted, and the title of Figure 6.8-7 will be moved to the top of Page 6.8-17 in the next amendment request</p>	<p>The title of Figure 6.8-7 will be moved to the top of Page 6.8-17 in the next submittal.</p>
6	<p>Page 6.8-21</p> <p>Shouldn't it be endnote #1 instead of #4?</p>	<p>The footnote on Page 6.8-21 should be #1 instead of #4 in both places.</p>	<p>This editorial error has been noted and will be corrected in the next submittal.</p>
7	<p>Page 7.1-6, Page 7.1-33, Page 7.2-10</p> <p>Why is there an extra space between Steps #8 and #9, Steps #9 and #10, and Steps #8 and #9, respectively?</p>	<p>The extra space between the noted steps is included to indicate that a step was removed when compared to the previous revision.</p>	<p>In the next submittal of the NAC-LWT SARP, the extra lines will be removed.</p>
8	<p>Page 7.3-2, Table 7.3-1, Row 6,</p> <p>Port Cover Test Port Plug - Why did the torque tolerance increase from (<math>\pm 5</math>) to (<math>\pm 6</math>) in this revision?</p>	<p>The tolerance for the torque for the closure lid test port plug and the port cover test port plug was modified to correct a typo that resulted in an inconsistency between the NRC approved NAC-LWT SAR and the NAC-LWT SARP.</p> <p>Correcting the above tolerance values brings the SARP into compliance with the SAR. This correction was made since it represents hardware configuration.</p>	<p>Implemented.</p>