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**Initial Entries**

**Scientific Note Book:** # 1335E

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**Project Title:** Technical Support for Developing an Environmental Impact Statement for the Proposed Interim Storage Partners (ISP) Centralized Interim Storage Facility (CISF)

**Project Number:** 23700.06

**Participants:** Patrick LaPlante (PL)

This electronic notebook is maintained in accordance with CNWRA QA procedure QAP-001, Rev 16 Ch 0. The intent of this notebook is to document calculations from P. LaPlante supporting the EIS development.

**Overall Objectives of the Task**

The overall task is to develop an Environmental Impact Statement as part of the NRC licensing review of the license application for the proposed CISF. The EIS under development includes an analysis of potential impacts of the proposed transportation of spent-nuclear-fuel (SNF) from existing reactor sites to the proposed CISF and from the proposed CISF to a repository for final disposal of the SNF after storage. That analysis of proposed SNF transportation involves detailed calculations that are documented in this scientific notebook.

**Calculations of the Potential Radiological Impacts to Workers and the Public from the Transportation of SNF to and from the Proposed ISP CISF**

**Objective:**

Develop, execute, and supplement the documentation of the radiological impact calculations for the proposed SNF transportation in a series of Excel spreadsheets.

**Technical Approach:**

The technical approach to implementing the SNF transportation impact calculations scales prior NRC SNF transportation risk assessment results (for single shipments of SNF along representative routes) that are documented in NUREG-2125 by the number of proposed shipments to calculate dose-risks (impacts) to workers and the public that are expected to reasonably bound the impacts from the proposed transportation. The transportation risk assessment calculations in NUREG-2125 utilize the RADTRAN 6.0 code. RADTRAN transportation risk calculations are acceptable for use in the current impact analysis because the

model was developed for the purpose of assessing risks to workers and public from the transportation of SNF to support analysis under NEPA and the code has been the established model for conducting such calculations for decades. Regarding the RADTRAN code NUREG-2125 states the following:

*The RADTRAN computer code (Taylor and Daniel, 1977) is used in this chapter to estimate risks from routine transportation of SNF. Sandia National Laboratories initially developed RADTRAN for the NRC's NUREG-0170 risk assessment. During the past several decades, the calculation method and RADTRAN code have improved to stay current with computer technology and supporting input data have been collected and organized. The basic RADTRAN analysis approach has not changed since the original development of the code, and the risk assessment method used in the RADTRAN code is accepted worldwide; about 25 percent of the 500 RADTRAN users are international. RADTRAN 6.0, integrated with the input file generator RADCAT (Neuhauser et al., 2000, Weiner et al., 2009) is the version used in this study. The incident-free module of RADTRAN, the model used for the analysis in this chapter, was validated by measurement (Steinman et al., 2002), and verification and validation of RADTRAN 6.0 are documented in Dennis et al., 2008.*

The NUREG-2125 calculations are particularly applicable for the impact analysis calculations because they are the most recent NRC technical analysis of national SNF transportation risks and the results are presented in sufficient detail and in “modular” form that allows scaling to match project-specific characteristics. In fact, NUREG-2125 includes descriptions of how results can be scaled to support specific analyses (see Appendix B example calculations and the “unit risk” approach). Because the original calculations in NUREG-2125 are detailed and resource-intensive to complete, applying these documented results from NUREG-2125 to new analyses by scaling as is done in the calculations documented in this notebook is an efficient approach that produces results that are the same as they would be if the same scenario were run in the model.

#### Work Plan for Developing SNF Transportation Calculation Spreadsheets

1. Define conceptual models consistent with the scope of the SNF transportation radiological impact analysis. This includes impacts to workers and the public from the national transportation of SNF by rail.
2. Implement and document dose calculations in Excel spreadsheets
3. Document the calculations and results in the EIS.

#### **Documentation and Analysis of Results:**

The documentation and analysis of results is in the draft EIS milestone report. The included spreadsheet files provide supplemental details of the calculations described in the EIS milestone report and in this scientific notebook.

#### **File Archive:**

All files referenced in this scientific notebook have been archived on CNWRA computer drives and will be copied to appropriate media that will be associated with this scientific notebook. The file structure of the archive is as follows:

National\_SNF\_Transportation\_Risk\_Calculations\_ISP\_EIS\_Single\_Phase.xlsx

National\_SNF\_Transportation\_Risk\_Calculations\_ISP\_EIS\_Full\_Buildout.xlsx

**References:**

Dennis, M.L., et al., "Verification and Validation of RADTRAN 6.0," SAND2008-4556, Sandia National Laboratories, Albuquerque, NM, 2008.

Neuhauser, K.S., F.L. Kanipe, and R.F. Weiner, "RADTRAN 5 Technical Manual," SAND2000-1256, Sandia National Laboratories, Albuquerque, NM, May 2000.

Steinman, R.L., R.F. Weiner, and K.J. Kearfott, "A Comparison of Transient Dose Model Predictions and Experimental Measurements," Health Physics 83(4):504–11, 2002.

Taylor, J.M., and S.L. Daniel, "RADTRAN: A Computer Code to Analyze Transportation of Radioactive Material," SAND76-0243, Sandia National Laboratories, Albuquerque, NM, April 1977.

Weiner, R.F., et al., "RadCat 3.0 User Guide," SAND2009-5129P, Sandia National Laboratories, Albuquerque, NM, 2009.

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