ORISE

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

November 17, 2003

Mr. Thomas Dragoun
NRR/DRIP
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

SUBJECT: DOCUMENT REVIEW—FINAL STATUS SURVEY REPORT FOR SAXTON NUCLEAR EXPERIMENTAL CORPORATION CV INTERIOR ABOVE 774' EL. & EXTERIOR, SAXTON, PENNSYLVANIA (DOCKET NO. 50-146; TASK 1.5)

Dear Mr. Dragoun:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) has reviewed the Saxton Nuclear Experimental Corporation (SNEC) final status survey report for the containment vessel (CV) interior above the 774-foot elevation and exterior for Task 1.5.

Comments identified are enclosed for your consideration. If you have any questions please contact me at (865) 576-3356 or Timothy J. Vitkus at (865) 576-5073.

Sincerely,

Timothy J. Bauer
Health Physicist
Environmental Survey and
Site Assessment Program

TJB:ar

Enclosure

cc: S. Adams, NRC/NRR/OWFN O-12E5
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Process Per
A. Adams

Comments on the
Final Status Survey Report
for Saxton Nuclear Experimental Corporation
CV Interior Above 774' El. & Exterior
Saxton, Pennsylvania

November 2003

General Comments

At the request of the Nuclear Regulatory Commission's (NRC) Office of Nuclear Reactor Regulation (NRR), the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) has reviewed the Saxton Nuclear Experimental Corporation (SNEC) final status survey report for the containment vessel (CV) interior above the 774-foot elevation and exterior (GPU 2003) for Task 1.5. The requirements of the License Termination Plan (LTP, GPU 2002) and recommendations provided in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM, NRC 2000) were considered during the review. A teleconference[1] was held between ESSAP, NRC, and GPU Nuclear (GPU) staff to discuss comments and request additional information. ESSAP concludes that the report adequately documents the radiological status of the specified remaining internal and external areas of the CV, the excavated area outside the CV, and the debris and soil piles. Specific comments are included below.

Specific Comments

1. Section 2.1.1, Page 4, Table 1—The column labeled "Msmt. Results (dpm/100 cm^2)" includes what appears to be a summary of surface activity measurements by including a value for each row such as "<1000." GPU indicated that the column appeared to be a summary of results from a previous report. ESSAP recommends rather than showing a "less-than" value that the column be edited to show the maximum result for each row and to include a reference to the original report.

2. Section 3.4.1, Page 17, Paragraph 2—The effective volumetric $DCGL_w$ for the debris and soil piles is given as 4.2 pCi/g. The radionuclide mix percentages used to calculate the $DCGL_w$ are provided, however, there is no indication if these were calculated using the mean plus 2-sigma values as was done on other calculations (see Appendix B, SNEC Calculation E900-03-021, Pages 26 and 27 of 38). These percentages are then used in Table 10 to show the 4.2 pCi/g calculation. ESSAP recommends the detailed calculations used to determine radionuclide mix percentages for the debris and soil piles be included, similar to what was done in Appendix B.

3. Appendix B, SNEC Calculation E-900-03-021, Section 4.8, Page 6 of 38—SNEC used the "2 sigma plus the mean" methodology presented in Section 5.2.3.2.3 of the LTP (GPU 2002) to calculate a gross activity $DCGL_w$. In summary, SNEC summed up the radionuclide concentrations across multiple samples for each radionuclide and

[1] Teleconference between T. Bauer (ESSAP), T. Dragoun (NRC), and A. Paynter (GPU Nuclear) held on November 6, 2003.

determined basic statistical quantities such as mean and sigma. For each radionuclide, the mean plus 2-sigma concentration value was calculated. These values were then used to calculate radionuclide fractions by dividing the mean plus 2-sigma concentration value for each radionuclide by the sum of the mean plus 2-sigma concentration values for all radionuclides.

While this methodology was presented in the LTP to provide "a conservative surrogate ratio," it in fact is neither conservative nor appropriate for a number of reasons. First, this methodology does not account for variability of radionuclide fractions as measured throughout the survey unit. See the Recommendations for Section 2.1 from the ORISE Site-Specific Decommissioning Inspection Report No. 2 (ORISE 2003). To properly account for the variability in the radionuclide fractions, the fraction would need to be calculated on a sample by sample basis, then basic statistical quantities determined for the population of fractions calculated. The mean plus 2-sigma fraction values can then be analyzed to calculate a conservative gross activity $DCGL_w$. As calculated by SNEC, the variability accounted for is variability in the amount, or magnitude, of contamination in the survey unit, not the ratios between contaminants. For example, on Page 26 of 38, the second table provides decay corrected radionuclide data for a number of contaminants. The results for Cs-137 for seven samples is a mean concentration of 172.98 [pCi/g] with a sigma of 443.31—this results in a mean plus 2-sigma concentration value of 1059.61. The value of 1059.61 does not represent variability of the radionuclide fraction within the survey unit, rather, represents the variability in the sample result values (the sample mean concentrations ranged from 0.17 to 1178.17).

Second, the "2 sigma plus the mean" methodology also perturbs the average fraction for each radionuclide by considering the variability in the radionuclide concentrations rather than the radionuclide fractions. At the least, the average values presented can be used to calculate aggregate radionuclide fractions. It is important to note that this methodology does not consider the variability in the radionuclide ratio and is presented to show that the "2 sigma plus the mean" does not provide a conservative approach as described in the LTP. If the average concentration values were used in the spreadsheet on page 27 of 38 in the "Sample Input (pCi/g, uCi, etc.)" column, the resultant "Maximum Permissible dpm/100 cm^2" would be 11,099 dpm/100 cm^2 compared to the presented 15,131 dpm/100 cm^2. If the mean concentration values as calculated on Page 26 of 38 are representative of the radionuclide mix average fractions without considering spatial variability, the 11,099 dpm/100 cm^2 value is more appropriate. In another way, this calculational approach allows SNEC to have roughly 34 mrem/y (roughly 36% increase) rather than 25 mrem/y [(1+(15,131-11,099)/11,099)*25]. The SNEC "2 sigma plus the mean" methodology for this survey design actually calculates a higher gross activity $DCGL_w$, which is not conservative.

4. Appendix C, SNEC Calculation E-900-03-022, Section 4.7, Page 5 of 32—SNEC used the "2 sigma plus the mean" methodology presented in Section 5.2.3.2.3 of the LTP (GPU 2002) to calculate a Cs-137 $DCGL_{mod}$ of 6 pCi/g. ESSAP calculated a Cs-137 $DCGL_{mod}$ of 5.18 pCi/g using the mean concentration values from Page 29 of 32. The SNEC calculated Cs-137 $DCGL_{mod}$ of 6 pCi/g is not conservative (see Comment 3).

5. Appendix C, SNEC Calculation E-900-03-022, Section 4.8, Page 6 of 32—This section refers to the modified Cs-137 $DCGL_w$ as a "gross activity $DCGL_w$." ESSAP recommends this section be corrected to replace "gross activity" with "modified Cs-137" or similar terminology.

6. Appendix D, SRA SMCM Final Report, Section 1, Page 1—The last paragraph on this page indicates the SMCM system was operated with an alarm set-point of 2.91 pCi/g for Cs-137 for SR-55. This is reasserted in many areas of the report (see Pages 2, 8, 19, 40, and 41). The second paragraph on page 2 indicates the alarm set-point for SR-62 was also 2.91 pCi/g. However, when ESSAP reviewed the Survey Release Records (SRR) referenced in Appendix A and included on the CD-ROM, for SR-55 the indicated alarm set-point was 2.2 pCi/g and for SR-62 the indicated alarm set-point was 4.2 pCi/g. What is the reason for the discrepancy?

7. Appendix D, SRA SMCM Final Report, Section 2.5.2, Page 14—This section discusses Exploratory Data Analysis (EDA) and the four-plot method is illustrated in Figure 2-10. However, the accompanying text describes that the y-axis on three of the four plots is in units of cps (counts per second) when Figure 2-10 shows pCi/g. ESSAP recommends that the text be corrected to indicate pCi/g as the SRRs in Appendix A show pCi/g in the four-plot figures.

8. Appendix D, SRA SMCM Final Report, Section 3, Page 19—Table 3-1 provides a summary of the radiological information for the SRA SMCM by batch. It is ESSAP's understanding that this data in conjunction with the scan results using the SMCM and supplemental laboratory analysis of grab samples are the supporting data for release of this material. Were these results corrected for moisture content reported per batch in Table 2-1? *In situ* measurements of soil should be corrected for moisture content before comparing to the release criteria because the criteria are provided as pCi per gram of dry soil.

9. Appendix D, SRA SMCM Final Report, Section 3.1, Page 23—ESSAP does not understand the mechanism where over reporting Bi-214 and Tl-208 and under reporting K-40 will result in over estimating the Cs-137 concentration in the soil and debris piles. GPU committed to review the results with SRA and to follow-up with ESSAP. Expanding the discussion in Appendix D of the SRA report may provide the technical basis for the conclusions reached in this section (see Comment 11 below).

10. Appendix D, SRA SMCM Final Report, Appendix D, Page D-2—The equation presented on this page appears to have an error. ESSAP believes the term shown as κTh_c should actually be κK_c. GPU committed to discussing with SRA to determine if it was in fact an error and correcting if necessary.

11. Appendix D, SRA SMCM Final Report, Appendix D, Page D-2—Table 2-D presents the final calculated stripping coefficients for κ, μ, and τ; however, no discussion is included on how these values were calculated. ESSAP recommends this section be expanded to better illustrate the calculations performed. GPU committed to discussing with SRA to determine if a change was warranted.

REFERENCES

GPU Nuclear, Inc. (GPU). Saxton Nuclear Experimental Corporation Facility, License Termination Plan, Rev. 2. Saxton, PA; December 16, 2002.

GPU Nuclear, Inc. Final Status Survey Report for Saxton Nuclear Experimental Corporation, CV Interior Above 774' El. & Exterior. Saxton, PA; October 2003.

Oak Ridge Institute for Science and Education. Final Site-Specific Decommissioning Inspection Report No. 2 for the Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146, Task 2). Oak Ridge, TN; May 15, 2003.

U.S. Nuclear Regulatory Commission (NRC). Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). Washington, DC; NUREG-1575; Revision 1, August 2000.