ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

May 15, 2003

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

SUBJECT: FINAL SITE-SPECIFIC DECOMMISSIONING INSPECTION REPORT NO. 1 FOR THE SAXTON NUCLEAR EXPERIMENTAL CORPORATION, SAXTON, PENNSYLVANIA (DOCKET NO. 50-146; TASK 2)

Dear Mr. Dragoun:

Enclosed is the final Site-Specific Decommissioning Inspection Report for the Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania, for Task 2 activities performed on-site during the period March 26 through 28, 2003 with your comments incorporated.

Please contact me at (865) 576-3356 or Timothy J. Vitkus at (865) 576-5073 should you require any additional information.

Sincerely,

Timothy J. Bauer
Health Physicist
Environmental Survey and
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TJB:ar

Enclosure

cc: A. Adams, NRC/NRR/OWFN 12G13
E. Abelquist, ORISE/ESSAP
T. Vitkus, ORISE/ESSAP
File/0968

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FINAL
SITE-SPECIFIC DECOMMISSIONING INSPECTION REPORT NO. 1
FOR THE SAXTON NUCLEAR EXPERIMENTAL CORPORATION
SAXTON, PENNSYLVANIA

At the request of the Nuclear Regulatory Commission's Office of Nuclear Reactor Regulation, the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed site-specific decommissioning inspection activities at the Saxton Nuclear Experimental Corporation (SNEC) in Saxton, Pennsylvania. This report describes the in-process inspection and confirmatory activities for the lower bowl of the containment vessel (CV) and split-sample results for the Saxton Steam Generating Station debris performed on-site during the period March 26 through 28, 2003, as requested for Task 2.

The following applicable checklist items were taken from the Site-Specific Decommissioning Inspection Plan (ORISE 2003a). Bulleted observations and recommendations are noted under each checklist item. Additional comments from the review of the final status survey report (GPU 2003) not specifically addressed in the Inspection Plan are included in Attachment A.

2.0 IDENTIFICATION OF CONTAMINANTS AND DCGLS

2.3 Evaluate how the DCGLs [derived concentration guideline levels] will be implemented—e.g., use of surrogate measurements and modified DCGLs, gross activity DCGLs, $DCGL_{EMC}$s—to determine how samples/measurements will be compared, implementation of the unity rule, and how radionuclide variabilities—specifically modification of σ—will be integrated in DCGL implementation.

- **Recommendations:** SNEC calculations E900-03-003 (Appendix A, GPU 2003) and 6900-02-024 (Appendix B, GPU 2003) were reviewed. To address the concern stated in Appendix A, Section 4.11, that "Compass (version 1.0) does not perform well when using the gross activity option" and to make the section calculations more straightforward, ESSAP recommends the following changes to the document text and COMPASS data entry.

  Create a table that shows the contaminants of concern and associated radionuclide mixture fractions (see example table below). Each row would also include the instrument, surface, and subtotal total efficiencies. The summation of the subtotal total efficiency column will be the desired total efficiency value. Note that the fraction column must sum to one, and in the COMPASS software the gross activity $DCGL_w$ conversion from dpm/100 cm^2 to cpm cannot be performed unless this condition exists. With this format, the reviewer can easily determine the parameters used to calculate the total efficiency. This change would have no impact on the final result, but should make the process easier to implement for future calculations when more than one radionuclide is detectable for a gross activity measurement.

Contaminant	Fraction	Instrument Efficiency	Surface Efficiency	Subtotal Total Eff.
Cs-137	0.62	0.47	0.50	0.15
Ni-63	0.XX	0.00	0.25	0.00
H-3	0.XX	0.00	0.25	0.00
Totals:	1.00	N/A	N/A	0.15

4.0 FINAL STATUS SURVEY PROCEDURES AND INSTRUMENTATION

4.2 Building Surface Survey Instrumentation

4.2.1 Review the calibration and performance check procedures. Ensure calibrations will account for any environmental or other factors that could potentially impact performance. Evaluate the appropriateness of the calibration source energies in determining instrument efficiencies and any applied weighting factors relative to the radionuclides of concern. Evaluate the licensee's selection of surface efficiency value(s). Review the survey instrumentation operational checkout procedures and acceptance parameters.

- **Observations:** SNEC calculations E900-03-003 and 6900-02-024 and procedure E900-QAP-4220.01 (SNEC 2001) were reviewed. The calibration source used to determine efficiency was Cs-137, which was considered the only detectable radionuclide of the mix. A correction factor of 0.62, applied with instrument and surface efficiencies, was used to convert the gross activity $DCGL_w$ to net counts per minute. ESSAP recommends the calculation presentation be modified (see Section 2.3 observations). Surface efficiency selection was consistent with guidance—0.5 for Cs-137. Survey instrumentation operational checkout procedures and acceptance parameters were consistent with industry standards (ANSI 1997).

4.2.2 Review both the scanning and static measurement MDC determinations.

- **Recommendations:** SNEC calculations E900-03-003 and 6900-02-024 were reviewed. Scan and static MDC determinations were consistent with guidance and were calculated to be less than 50% of the $DCGL_w$. However, for calculation E900-03-003, sections 4.15 and 4.16, the incorrect background value was used in the MDC calculations. The correct value to use would be the unshielded (or open window) background average from the survey unit because the scan survey was performed with an unshielded detector. These errors would not affect the conclusions of the final status survey.

4.2.3 Review the procedures for field use of instrumentation and evaluate that any *a priori* factors that may impact use in the field have been accounted

for, such as scan speed and background variability. Review training records of personnel who will operate survey instrumentation.

- **Observations:** SNEC calculations E900-03-003 and 6900-02-024 and procedure E900-IMP-4520.04 (SNEC 2003b) were reviewed. Scan speed was conservatively set at 2.2 centimeters per second or one detector width per four seconds. Ambient background variability was accounted for on a daily basis by determining an average background count rate (ABCR). The sigma value chosen for the sample size determination calculation correctly used the largest value between the survey unit and background reference area. The background reference area data appeared to be corrected by the difference between the ambient gamma backgrounds in the survey units and background reference area (see calculation E900-03-003, section 4.14). Training records were not reviewed during this inspection.

4.3 Final Status Survey Procedures

Review final status survey procedures and planning documents for the following:

4.3.1 Verify the adequacy of reference areas selected by the licensee for assessing background contributions to surface activity levels and radionuclides in soils or other volumetric media.

- **Recommendations:** SNEC calculations E900-03-003 and 6900-02-024 were reviewed. No concerns were identified with the selection of the background reference area. Background contributions were accounted for during survey planning, but not during data assessment. Because survey unit gross activity levels were less than the $DCGL_w$, use of the background reference area data in the application of the WRS Test was not required (see Comment 4, Attachment A).

4.3.2 Review procedures for establishing survey unit boundaries. Review maps showing preliminary survey unit designations.

- **Observations:** SNEC calculations E900-03-003 and 6900-02-024 were reviewed. Survey units were bounded by physical features in the CV, such as weld joints. No concerns were identified.

4.3.3 Review available radionuclide variability (σ) data that will be used for calculating required sample size. Additionally, determine whether the analytical methods and instrumentation used for the initial σ calculations are comparable to those that will be used during final status surveys.

- **Observations:** SNEC calculations E900-03-003 and 6900-02-024 were reviewed. Sample size calculations correctly accounted for survey unit and reference area variability. Similar instruments were

used during variability measurements as were used during the final status survey.

4.3.4 Review procedures for required scan coverage based on survey unit classification.

- **Observations:** SNEC calculations E900-03-003 and 6900-02-024 and License Termination Plan (LTP) (GPU 2002) were reviewed. All survey units were considered Class 1 and scanned 100% per the LTP.

4.3.5 Review methods for determining area factors that will be used for evaluating areas of elevated activity detected during scans.

- **Observations:** SNEC calculations E900-03-003 and 6900-02-024 were reviewed. No elevated areas of activity were noted during the final status survey; however, the calculations noted that area factors for Co-60 would be used should the elevated measurement comparison be required. Instead of using Cs-137 area factors, the smaller Co-60 area factors were used to be conservative.

4.3.7 Review selection process for sample locations in survey units.

- **Observations:** SNEC calculations E900-03-003 and 6900-02-024 were reviewed. Sample locations were determined using a triangular systematic spacing pattern with a random start-point. For the weld ring survey units, which were irregularly shaped such that triangular grid spacing was impractical, sample locations were selected randomly.

5.0 ANALYTICAL PROCEDURES

5.3 Analyze split-samples of media such as soil, building debris, and water for comparison with SNEC's on-site laboratory results.

- **Observations:** Four split samples of Saxton Steam Generating Station debris were collected. Comparison of results of SNEC's on-site laboratory and ESSAP's laboratory are shown in Table 1. SNEC's analytical results for Cs-137 compared within statistical uncertainty with ESSAP's. Neither laboratory identified concentrations of Co-60 exceeding detection limits. Analytical activities were conducted in accordance with procedures from the ESSAP Laboratory Procedures and Quality Assurance Manuals (ORISE 2003b and c).

6.0 IN-PROCESS AUDIT OF RADIOLOGICAL SURVEY TECHNICIANS

Review the licensee's radiological survey technician's implementation of the final status survey. Specifically:

6.1 Understanding of the concepts of the License Termination Plan (LTP) and associated documents and procedures as outlined in the Final Status Survey Training Manual.

- **Observations:** SNEC Radiological Technicians performing final status surveys of the remaining B-plates (B10 and B11) in the lower bowl of the CV had a thorough understanding of the LTP and Final Status Survey Training Manual. It was noted they carried controlled copies of the Survey Request (SR) SR-0058 (SNEC 2003a) and procedure E900-IMP-4520.04.

6.2 Adherence to the specification of the Survey Requests (SR) generated by the licensee for final status survey field implementation.

- **Observations:** SNEC Radiological Technicians carried a controlled copy of SR-0058 which was applicable to final status surveys of B-plates B1 through B16. The Radiological Technicians had a thorough understanding of the goals of the SR, which included scan speed, survey coverage, and action levels. It was verified that the Ludlum 2350 instruments were programmed with the appropriate alarm level per SR-0058 and procedure E900-IMP-4520.04. B. Brownsberger demonstrated the procedure for setting the Ludlum 2350 alarm set point for surface scanning by determining an average background count rate (ABCR) calculated from three shielded measurements then adding the scan action level of 200 cpm from SR-0058.

6.3 Performance of surface scans using the audible output—in particular, that the radiological survey technician passing the detector over the surface being measured is the individual listening to the audible output.

- **Observations:** During the inspection, ESSAP noted that the SNEC Radiological Technicians listened to audible output from the Ludlum 2350 through headphones while performing surface scans. The technicians used long cables (25-foot) while scanning and were not in the immediate vicinity of the instrument during scanning. When asked if the alarm from the Ludlum 2350 could be heard, especially during noisy conditions such as crane operation, ESSAP was informed that the alarm sound was transmitted through to the headphones.

7.0 CONFIRMATORY SURVEY MEASUREMENTS

7.2 Building Surface Surveys

Perform alpha+beta surface scans using gas proportional detectors coupled to ratemeter-scalers with audible indicators. Scans should be performed over 50 to 100% of selected survey units. Areas of elevated radiation will be marked for further investigation. Direct measurements will be performed in each survey unit—the number performed will be dependent on the licensee's modified guideline levels and surface scan results. Direct measurements will also be

performed at locations corresponding to licensee measurements for direct data comparison.

- **Observations:** ESSAP performed alpha+beta surface scans using gas proportional detectors coupled to ratemeter-scalers with audible indicators over approximately 10% of A-plates A1 and A2, 100% of B-plates B8 and B9, 50% of B-plates B3 and B15, and 25% of B-plate B11. No elevated areas of radiation were detected. Scan coverage was reduced from the inspection plan percentages due to results as the survey progressed. Direct measurements were performed at 11 locations corresponding to SNEC direct measurement locations. Table 2 shows ESSAP and SNEC direct measurement results. ESSAP results varied from -23 to 35 net counts per minute (cpm) while SNEC results varied from -9 to 23 net cpm. The ORISE action level corresponding to the $DCGL_w$ of 2100 dpm/100 cm^2 was 410 net cpm while SNEC's was 400 net cpm. The direct measurement comparison indicates SNEC has adequately and appropriately documented the radiological conditions for the lower bowl of the CV. Survey activities were conducted in accordance with procedures from the ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2003d and c).

8.0 QA/QC AND DATA MANAGEMENT PROCEDURES

ESSAP performed an inspection of the SNEC QA/QC and data management procedures during the period March 27 through 29, 2001. The following items will be reviewed for additions and/or modifications that have been incorporated since the 2001 inspection.

8.2 Review the licensee's data management system that will be used to track field and analytical results.

- **Recommendations:** R. Marquette demonstrated the data management process used for field survey results. All survey data are maintained electronically until the final controlled copy is filed. The electronic data are then to be saved after the final controlled copy is filed for QA verification of data transcription. One concern was identified that a routine data backup of electronic data was not being performed. R. Marquette indicated that SNEC was investigating a backup system to implement and that one would be operational in the near future. ESSAP recommends this system be implemented as soon as practical to avoid any electronic data loss and to ensure the QA verification can be performed.

ORISE TABLE 1

SPLIT SAMPLE COMPARISON
GAMMA SPECTROSCOPY RESULTS FOR
SAXTON STEAM GENERATING STATION DEBRIS
SAXTON NUCLEAR EXPERIMENTAL CORPORATION
SAXTON, PENNSYLVANIA

ORISE Sample Number	ORISE Radionuclide Concentrations (pCi/g)		SNEC[a] Sample Number	SNEC Radionuclide Concentrations (pCi/g)	
	Cs-137[b]	Co-60[b]		Cs-137	Co-60
0968M001	0.05 ± 0.03[c]	-0.01 ± 0.02	SX-SD-3401	0.081 ± 0.031[d]	<0.046
0968M002	0.05 ± 0.02	0.00[e] ± 0.02	SX-SD-3403	0.072 ± 0.03	<0.042
0968M003	0.05 ± 0.04	-0.01 ± 0.02	SX-SD-3404	0.101 ± 0.03	<0.05
0968M004	0.07 ± 0.02	0.02 ± 0.02	SX-SD-3405	0.081 ± 0.03	<0.047

[a]Saxton Nuclear Experimental Corporation.
[b]Minimum detectable concentrations (MDC) for the analyses averaged 0.03 pCi/g.
[c]ORISE uncertainties are total propagated uncertainties at the 95% confidence level.
[d]SNEC reported 2σ uncertainty.
[e]Zero value is due to rounding.

ORISE TABLE 2

DIRECT MEASUREMENT COMPARISON
CONTAINMENT VESSEL INTERIOR
774' ELEVATION AND BELOW
SAXTON NUCLEAR EXPERIMENTAL CORPORATION
SAXTON, PENNSYLVANIA

Location	ORISE Measurements (net cpm)[a,b]	SNEC Measurements (net cpm)[a,c]
Panel A1, Loc. 8	-2	-3
Panel A2, Loc. 5	-23	6
Panel B2, Loc. 12	6	7
Panel B5, Loc. 13	-21	-9
Panel B7, Loc. 5	4	12
Panel B8, Loc. 6	12	23
Panel B9, Loc. 7	35	8
Panel B9, Loc. 15	1	-8
Panel B10, Loc. 16	14	0
Panel B13, Loc. 17	-2	20
Panel B16, Loc. 11	-12	6

[a]Net cpm (counts per minute) calculated by subtracting shielded from unshielded measurement.
[b]Action level corresponding to the $DCGL_w$ of 2100 dpm/100 cm^2 was 410 net cpm.
[c]Action level corresponding to the $DCGL_w$ of 2100 dpm/100 cm^2 was 400 net cpm.

REFERENCES

American National Standards Institute (ANSI). Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments. ANSI N323A-1997. New York, New York; 1997.

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, 774' El. And Below. Saxton, PA; April 2003.

Oak Ridge Institute for Science and Education (ORISE). Final Site-Specific Decommissioning Inspection Plan for the Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146, Task 1). Oak Ridge, TN; March 13, 2003a.

Oak Ridge Institute for Science and Education. Laboratory Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, TN; February 2003b.

Oak Ridge Institute for Science and Education. Quality Assurance Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, TN; April 2003c.

Oak Ridge Institute for Science and Education. Survey Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, TN; February 2003d.

Saxton Nuclear Experimental Corporation (SNEC). Procedure E900-QAP-4420.01, Quality Assurance Program for Radiological Instruments. Saxton, PA; July 30, 2001.

Saxton Nuclear Experimental Corporation. Survey Request SR-0058. Saxton, PA; March 20, 2003a.

Saxton Nuclear Experimental Corporation. Procedure E900-IMP-4520.04, Survey Methodology to Support SNEC License Termination. Saxton, PA; February 24, 2003b.

ATTACHMENT A

ADDITIONAL COMMENTS ON THE FINAL STATUS SURVEY REPORT FOR THE SAXTON NUCLEAR EXPERIMENTAL CORPORATION CV INTERIOR, 774' ELEVATION AND BELOW APRIL 2003

1) Executive Summary, Page 1, Paragraph 2: ESSAP recommends defining the purpose of the removable activity supplemental data. See MARSSIM section 8.5.3.

2) Executive Summary, Page 1, Paragraph 2: ESSAP recommends that the exposure rate measurements performed be mentioned in this section as also being "supplemental" in nature.

3) Section 3.1.1.2: This section states that all static measurement results were less than 250 net cpm—the action level for scanning per calculation 6900-02-024. First, the action level should be changed to 580 net cpm for direct measurement comparison to the $DCGL_w$. This change should also occur in sections 3.1.2.2, 3.1.3.2, and 3.1.4.2.

4) Section 3.1.1.2: The table included in this section shows data for shielded and unshielded measurements with the net cpm difference calculated. As written, the data assessment appears to compare the net difference column to the $DCGL_w$, which is not consistent with MARSSIM guidance for data assessment when using the WRS Test. The last sentence in the section should be rewritten to discuss only the unshielded (gross) measurement results and how they compare to the $DCGL_w$. The shielded and net difference columns should be removed from the table. These suggestions also apply to the remaining sections titled "Static Measurements." Per calculation E900-03-003, section 4.14, shielded measurements were performed to correct background reference area ambient values to be consistent with the survey unit. Once the reference area measurements are corrected for the difference in the survey unit and reference area ambient backgrounds, additional shielded measurements are not required and including additional shielded measurement data could be confusing to the reader.

5) Sections 3.1.1.2 and 3.1.1.3: ESSAP recommends that the discussions in these sections should be reversed in order because QC smears are discussed before the smear survey results are discussed. This recommendation would apply to many sections throughout the document.

6) Section 3.1.5: ESSAP recommends adding a discussion of how the gamma spectroscopy data from the smears should be interpreted.

7) Section 3.5, Table: ESSAP recommends reporting the actual value of each gamma spectroscopy measurement, with the minimum detectable concentration (MDC) reported using a standard background for the process or individually for each measurement.

8) Section 5.0, Paragraph 5: ESSAP suggests rewording the summary written as "be backfilled to at least the 774' elevation" to clarify that the containment vessel (CV) will be backfilled no higher than the 774' elevation.