October 31, 2005

Mr. J. J. Byrne
Program Director
Saxton Nuclear Experimental Corporation
Three Mile Island Nuclear Station
P.O. Box 480
Middletown, PA 17057-0480

SUBJECT: NRC INSPECTION REPORT NO. 50-146/2005-201

Dear Mr. Byrne:

This refers to the inspection conducted from May 16 to October 5, 2005, at your Saxton Nuclear Experimental Corporation Facility and frequent telephone conferences with your staff during the months of July through October 2005. The inspection included a review of 43 Final Status Survey Reports (FSSR) that, in conjunction with earlier reports, completes the NRC review of FSSRs for the site. The survey information in these reports confirmed that remediation was complete and that all residual radioactivity was quantified, documented and below the NRC limits.

The inspection included an in-depth review of each FSSR and an in-process review of soil sampling and laboratory analysis on May 23 - 25, 2005. The NRC was assisted in our reviews by the Oak Ridge Institute for Science and Education. The inspector determined that the FSSs were conducted in accordance with the recommendations in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) and requirements in the NRC-approved License Termination Plan (LTP). The FSSRs demonstrated that all survey units met the criteria in 10 CFR 20.1402 for unconditional release.

The inspector concluded that you have met the requirements for license termination given in 10 CFR 50.82(a)(11) by determining that 1) dismantlement has been performed in accordance with the approved LTP, and 2) the final radiation survey and associated documentation demonstrate that the facility and site have met the radiological criteria for decommissioning as specified in 10 CFR Part 20, Subpart E. The NRC will reply to your request of September 15, 2005, for license termination by separate letter in the near future.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) http://www.nrc.gov/NRC/ADAMS/index.html.

Should you have any questions concerning this inspection, please contact Mr. Thomas Dragoun at 610-337-5373.

Sincerely,

/RA/

Brian E. Thomas, Section Chief
Research and Test Reactors Section
New, Research and Test Reactors Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-146
License No. DPR-4

Enclosure: NRC Inspection Report No. 50-146/2005-201

cc w/enclosure: Please see next page

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Should you have any questions concerning this inspection, please contact Mr. Thomas Dragoun at 610-337-5373.

Sincerely,

/RA/

Brian E. Thomas, Section Chief
Research and Test Reactors Section
New, Research and Test Reactors Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-146
License No. DPR-4

Enclosure: NRC Inspection Report No. 50-146/2005-201

cc w/enclosure: Please see next page

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U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Docket No:	50-146
License No:	DPR-4
Report No:	2005-201
Licensees:	GPU Nuclear, Inc./FirstEnergy Corporation and Saxton Nuclear Experimental Corporation
Facility:	Saxton Nuclear Experimental Facility
Location:	Saxton, Pennsylvania
Dates:	May - September 2005
Inspector:	Thomas F. Dragoun
Approved by:	Brian E. Thomas, Section Chief Research and Test Reactors Section New, Research and Test Reactors Program Division of Regulatory Improvement Programs Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

Saxton Nuclear Experimental Facility
Report No: 50-146/2005-201

This inspection reviewed the Final Status Survey Reports (FSSRs) for the site areas not previously reported, which were primarily open land areas, and conducted an in-process review of the licensees' program for soil sampling and laboratory analysis. The inspector was assisted in the reviews by the Oak Ridge Institute for Science and Education (ORISE). NRC and ORISE comments on the recently issued 36 FSSRs were provided in telephone conferences with the licensees' staff. Letters from the licensees dated September 8, and 29, 2005, resolved the comments and included additions, deletions, and explanations for certain FSSRs. There were no further NRC comments and the FSSRs were accepted as amended. The inspector concluded that decommissioning was complete and the facility and site have met the criteria for unconditional release specified in 10 CFR Part 20, Subpart E.

REPORT DETAILS

Background Information

The Saxton Nuclear Experimental Corporation (SNEC) facility reactor was built from 1960 to 1962 on a 4645.8-square meter (m^2) (1.148-acre) site deeded to SNEC by the Pennsylvania Electric Company (PENELEC). The SNEC facility was built adjacent to the PENELEC owned Saxton Steam Generating Station (SSGS), a coal-fired station placed in operation in 1924. The single loop pressurized light water reactor was operated from 1962 to 1972 primarily as a research and training reactor. The SNEC facility was constructed without its own turbine-generator. From 1962 until 1972, when the SNEC facility produced usable steam, the steam was sent to the SSGS turbine-generator. The facility was shut down in 1972 and all fuel was removed from the containment vessel (CV) and shipped off-site to the Atomic Energy Commission (now Department of Energy) facility in Savannah River, South Carolina, during the same year. After fuel removal, equipment tanks and piping located outside the CV were removed and the control rod blades and the superheated steam test loop were shipped off-site. The building and structures that supported reactor operations were partially decontaminated during 1972 through 1974. In 1974, the SNEC facility was placed in a monitored storage condition similar to what now is called SAFSTOR. Quarterly surveillances and minor maintenance was performed as necessary. The SSGS was deactivated at the end of 1974 and was subsequently demolished between 1975 and 1977.

In 1987, 1988, and 1989, radiological decontamination of the reactor support structures and buildings including the Control and Auxiliary Building, the Radioactive Waste Disposal Facility, Yard Pipe Tunnel, Filled Drum Storage Bunker, and Refueling Water Storage Tank (including removal) was performed in preparation for demolition of these structures. These buildings and structures were demolished in 1992, after NRC accepted the final release survey, as incorporated in License Amendment No. 11 to Amended Facility License No. DPR-4.

In addition, License Amendment 11, which allowed removal of these buildings, deferred the final release of the portions of the site related to the reactor support structures and buildings until containment decommissioning and termination of the facility license. In 2000, these earlier final release survey results were reviewed by an independent contractor (Co-Physics), retained by GPU Nuclear, Inc., who found the projected dose to be well below the current criteria of 25 mrem per year. The report detailing this analysis was provided to the NRC via GPU Nuclear letter E910-00-010 dated June 23, 2000, (Accession No. ML03752196) and was summarized in the SNEC License Termination Plan (LTP).

In November 1994, the SNEC Soil Remediation Project was completed. This comprehensive project involving surface soil surveys, sampling, excavation, packaging, and shipment of slightly contaminated site soil. “Super sacks” were used to transport a large quantity of soil to a railhead where the sacks were loaded into large gondola cars. According to the licensees, this program reduced radioactive soil contamination levels over the majority of the site to levels less than the site cleanup criteria for unrestricted use. The project involved extensive surface [0-15 centimeters (cm) (0-5.9 inches)] and subsurface soil sampling in preparation for remediation of the open land areas. The report of this work, titled “1994 Saxton Soil Remediation Project Report,” was forwarded to NRC in July 1995.

In accordance with 10 CFR 50.82(a)(9)(ii)(A) and the guidance contained in NRC Regulatory Guide 1.179, “Standard Format and Content of License Termination Plans for Nuclear Power Reactors,” the radiological conditions of the site were provided in Chapter 2 of the LTP. Summaries of the most significant radiological events were described in Section 2.2.3 of the

LTP. With the exception of the Northeast area of the site, most scoping, characterization surveys, and sample collections were performed from May 1994 through 1997. The purpose of this effort was to estimate the extent of contamination on the SNEC site and on adjoining PENELEC property that would require remediation.

The licensees' characterization process for the site and adjacent areas focused on structures, systems, and the environs, considering radiological, hazardous, and State regulated-materials. Groundwater and subsurface soil contamination are included in the assessment of the site environs. Quality assurance (QA) and quality control (QC) measures included the appropriate training and qualifications, instrumentation, procedures, records, audits and surveillance, and data collection, for the site characterization program, to ensure data quality in accordance with the SNEC QA Program and compliance with the appropriate sections of 10 CFR Part 50, Appendix B.

The types of surveys and sampling that the licensees conducted for radiological characterization included: (1) surface activity measurements on interiors in the CV Line Shack (surface structures) and SSGS surfaces (including intake and discharge tunnels, seal chambers and SSGS remaining basement foundation); (2) extensive sampling and surveys to determine potential migration of radionuclide contamination in hard-to-reach or not readily accessible areas (e.g., cracks, crevices, areas beneath buildings, construction joints, etc.); (3) surface activity measurements on interior surfaces of embedded piping; (4) detailed surveys and sampling to supplement information developed during the initial site characterization (i.e., internal surfaces of secondary side systems, activated CV liner steel and concrete, direct radiation measurements, etc.); and (5) surveys and sampling of systems, structures, and the environment that were not conducted during the characterization [e.g., open land areas, subsurface soil, sediment, groundwater, and structural surfaces potentially contaminated with transuranic (TRU) and difficult-to-measure/hard-to-detect (HTD) radionuclides]. The licensees also used radiological environmental monitoring program data to complement the characterization information, to assess the classification of off-site areas, and to assess the possible need for any remediation.

A list of the site radionuclide inventory was provided in LTP Table 2-1. This table includes the following radionuclides: H-3; C-14; Fe-55; Ni-59; Co-60; Ni-63; Sr-90; Nb-94; Tc-99; Sb-125; Cs-134; Cs-137; Eu-152; Eu-154; Eu-156; U-234; U-235; U-238; Pu-238; Pu-239/240; Pu-241; Am-241; Pu-242; and Cm-243/244. These fission and activation products are typical of those found in pressurized-water reactor plants and are similar to those radionuclides described in NUREG/CR-0130, "Technology, Safety and Costs of Decommissioning a Reference Pressurized-Water Reactor Power Station." Additionally, over 30 years of radioactive decay and remediation, since shutdown, have reduced the inventory of radioactive material. The remaining inventory consisted mainly of contaminated and activated concrete in the CV and SSGS structures, low-level contaminated soil in and near the site, and infiltrated water and sediment in two SSGS tunnels.

Because of the use of mixed oxide fuel at the SNEC facility and the history of failed fuel experiments, the licensees placed special emphasis on the detection of TRU and HTD radionuclides during characterization. Over 200 samples were analyzed for TRU and/or HTD radionuclides. Samples were taken from the SNEC facility, adjacent PENELEC property, and off-site background locations. The licensees used these results to determine the nuclide ratios and mix for the appropriate surrogate derived concentration guideline levels (DCGLs) for remediation activities. The extensive analysis performed for TRU and HTD radionuclides

enabled the licensees to focus on those nuclides present as a result of licensed operations. Table 2-29 of the LTP provides the results of the TRU and HTD radionuclide analysis.

The results of the characterization project found that the SNEC facility site property, portions of the adjacent PENELEC property, and a section of the Raystown Branch of the Juniata River (hereinafter referred to as the "river") were radiologically impacted as a result of nuclear plant operations. All areas of the SNEC site and the adjacent PENELEC site were classified as impacted (i.e., Class 1, 2, or 3) in accordance with the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) guidance with the exception of the exterior section of the CV below elevation 243.11 meters (m) [797.6 feet (ft)] and the soil surrounding and below this elevation which was classified as non-impacted. Impacted portions of the PENELEC site property include the SSGS, segments of the SSGS intake tunnel, SSGS discharge tunnel, storm drain system, pavement, warehouse, garage, line shack and switchyard buildings, and various open land areas. The intake tunnel from the river intake to the second clean-out [about 133.8 m (440 ft)] and the trash rack and intake screen areas were classified as non-impacted. The river was characterized to assess possible impacts by SNEC facility operations. The river, including surface waters and sediment, was classified as non-impacted, with the exception of the weir outfall (Class 2) and the weir outfall buffer (Class 3).

Upon review of the LTP, the NRC staff found the site characterization process acceptable based on the information provided and the implementation of the guidance in MARSSIM, USNRC Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors," and NUREG-1727, "NMSS Decommissioning Standard Review Plan." The types of surveys and sampling described for characterization were acceptable. The licensees evaluated area classifications throughout the dismantlement and decommissioning process as radiological conditions changed and additional information and data were obtained.

From 1996 through 1997, the licensees made site preparations to support full-scale efforts for the remaining decommissioning operations. The Decommissioning Support Facility (DSF) was erected south of the CV and was physically connected to the CV. NRC approved the start of full-scale decommissioning in April 1998 and operations began in May 1998. Up to that time, the licensees removed selected loose material, spare components, asbestos insulation, and electrical components under specific license amendments. After approval in April 1998, the licensees' main effort was on the removal of the nuclear steam supply system components, namely the reactor pressure vessel, the single steam generator, the pressurizer, and the main coolant pump, collectively referred to as the Large Components. During high activity periods such as this, the NRC and licensees, including consultants, held biweekly telephone conferences and scheduled in-process inspections based on planned activities. Open and frequent communication involving the licensees, NRC, and consultants was encouraged. The licensees completed the SNEC Large Component Removal Project and shipped the components by rail in November 1998 to a licensed radiological waste burial site. This involved the preparation, removal, packaging, shipment, and disposal of the SNEC Facility pressurizer, steam generator, and reactor pressure vessel.

The remaining mechanical and electrical systems and components in the CV were removed and shipped off-site to a waste broker for processing/disposal, in accordance with all applicable regulations and the LTP. The remaining systems were small piping system sections that penetrate the CV steel liner and the structural concrete. Attempts to decontaminate the concrete using scabbling techniques in 1999 were unsuccessful. The licensees took many core bores to evaluate the extent of penetration of contaminants into porous concrete and to assess activation levels. The licensees found extensive penetration of waterborne contamination into

unaggregated zones and cracks in the structural concrete and decided to remove all the remaining interior CV concrete in 2000. The concrete was successfully removed and shipped off site for disposal in accordance with current DOT and NRC requirements. Concerns regarding the increased buoyancy of the CV due to the high water table and removal of all concrete were resolved by welding a steel belt to the CV outer surface and attaching over 40 steel bars drilled into the bedrock and grouted in place. On completion of the concrete removal, the interior of the CV was a hollow shell. The subsurface portion of the CV was surveyed for unconditional release, back filled, and capped with concrete (see NRC Inspection Report 50-146/2003-201 dated November 12, 2003, Accession No. ML033090608). The CV was filled with clean fill and material excavated on-site and surveyed for compliance with the DCGL for site soil. The anchor system was removed. The above ground portion of the CV was cut free at about 6 feet below grade, segmented, and shipped off site. As detailed in the LTP, the licensees had determined from extensive characterization that the exterior section of the CV below elevation 243.1 m (797.6 ft) is non-impacted. A FSS was performed on the entire excavated area which was then filled to grade level with clean soil and landscaped.

Following the recommendations of hydrology consultants during the earlier and more recent decommissioning activities, the licensees installed surface, shallow, and deep wells to monitor groundwater. There were 8 overburden wells installed in 1992, 2 angular wells and 2 vertical bedrock wells in 1994. To support the site characterization activities, 11 additional wells were added in 2000 and 2001, and 1 angular well in 2002. The routine radioanalysis of well water and surface water samples from the Raystown Branch of the Juniata River and Shoup's Run creek indicated that site activities had an insignificant impact on the ground water. In addition, the licensees committed to the Citizen's Task Force to a dose goal of 4 mr/yr from groundwater. This limit were developed from site-specific dose modeling and is more restrictive than NRC limits.

The FSS is the radiation survey performed after an area has been characterized, remediation has been completed, and the licensees believe that the area is ready to be released for unrestricted use. The limit on residual radioactivity necessary for unconditional release of building surfaces, including the CV, was based on screening values published by the NRC in the Federal Register. NRC guidance on use of these values states that further reductions from ALARA analysis are not required. The licensees made downward adjustments to these limits to account for HTD and delisted radionuclides, as well as providing for a wider margin below regulatory dose limits for unrestricted release. The DCGL for unconditional release of soil and open land areas were calculated by SNEC staff using the open land areas for the resident farmer scenario. Both surface and sub-surface models were run and the details submitted to the NRC in GPU Nuclear Letter E910-02-039, dated August 20, 2002 (Accession Nos. ML022410195 and ML022520007). Both models were developed using the RESRAD Version 6.1 computer code using the deterministic and probabilitistic options. The most conservative values between the two models were selected as the SNEC Facility DCGL (Table 6-2 of the LTP). The contaminated zone description in the model was based on site-specific conditions and was set at one meter thick. Therefore, soil samples taken during the FSSs consisted of a one-meter long column of soil that was homogenized, processed, and counted. Use of these conservatively derived DCGL values and a policy for remediation of contamination well beyond the minimum, resulted in mostly non-detectable radiation levels during the FSSs. Attached Table 1 provides the DCGL values for residential soil contamination and the site-specific 4 mr/yr groundwater dose goal. The licensees continued the off-site monitoring programs to detect any impact from site remediation. The "Annual Radioactive Effluent Releases Report" and "Radiological Environmental Monitoring Report" filed each year indicated no increased dose to the public from the site activities.

The licensees followed the Data Quality Objective (DQO) Process from MARSSIM and the SNEC Facility Decommissioning QA Plan during the characterization survey work and the FSSRs. Additionally, the FSSRs described changes in initial survey unit assumptions relative to the extent of residual radioactivity. The FSSs were designed, using guidance in MARSSIM, to demonstrate compliance with the site specific criteria for unrestricted release of the SNEC site in accordance with 10 CFR Part 20, Subpart E. The licensees discussed the planned final survey activities with the NRC, sufficiently in advance, to allow the scheduling of in-process inspections. NRC and the NRC contractor (ORISE) reviewed the licensees' FSSRs and performed independent radiation surveys to ensure that the basis for the survey design and implementation and supporting data were adequate for the licensees to ultimately demonstrate compliance with the requirements of 10 CFR Part 20, Subpart E.

The licensees designed and conducted FSSs using MARSSIM guidance and NRC recommendations for the selection of appropriate values for input parameters. The LTP acceptably described the selection of statistical tests, limits on decision errors, calculating sample size, the DCGL, the Lower Bound of the Gray Region (LBGR), and an estimate of the radionuclide variability. The COMPASS computer program was frequently used to calculate the number of static measurements required for the survey. Essentially all FSSs reported that the mean concentration of residual radioactivity in the survey unit was less than the administrative limit or the DCGL, therefore, no statistical test of the survey data was required.

MARSSIM allows for the use of advanced survey technologies as long as these techniques meet the applicable requirements for data quality and quantity. Use of these technologies and methods necessitates that they meet the DQOs specific to the FSS design. Consequently, when such was used, the licensees included, in each survey design package, a description of the instrument calibration, operational checks, sensitivity, and sampling methods, with a demonstration that the instruments and methods have adequate sensitivity. Several surveys were conducted using a large area probe to perform surface scans in the tunnels and open land areas. The equipment had higher sensitivity and provided more data than the customarily used detectors. However, the equipment routinely used for FSSs consisted of well-known and recognizable hardware.

The NRC staff determined that the licensees conformed to 10 CFR 50.82(a)(9)(ii)(D) in that the final radiation survey plan was conducted in accordance with the NRC-approved LTP and provides assurance that residual radioactive contamination levels meet the criteria specified in 10 CFR 20.1402, for unrestricted use. In a letter dated September 15, 2005, titled "Records Required to be Forwarded to Nuclear Regulatory Commission (NRC) Region 1 Office Prior to Termination of the Saxton Nuclear Experimental Corporation Plant License" (Accession No. ML 052840147) from the licensees described the record keeping and reporting requirements specified in 10 CFR Part 30 and the method used to satisfy each requirement. The inspector determined that the 10 CFR Part 30 regulatory requirements were met.

Table 1

SNEC DCGLs for Volumetric Sources (Table taken from LTP)

Radionuclide	DCGL (pCi/g)	Radionuclide	DCGL (pCi/g)
Am-241	9.9E+00	Ni-63	7.5E+02
C-14	2.0E+00	Pu-238	1.8E+00
Co-60	3.5E+00	Pu-239	1.6E+00
Cs-137	6.6E+00	Pu-241	8.6E+01
Eu-152	1.0E+01	Sr-90	1.2E+00
H-3	1.3E+02		

SNEC Facility DCGL Values (a)

Radionuclide	25 mrem/y Limit Surface Area ($dpm/100cm^2$)	25 mrem/y Limit (All Pathways) Open Land Areas (Surface & Subsurface) (pCi/g)	4 mrem/y Goal (Drinking Water) Open Land Areas [(b)] (Surface & Subsurface) (pCi/g)
Am-241	2.7E+01	9.9	2.3
C-14	3.7E+06	2	5.4
Co-60	7.1E+03	3.5	67
Cs-137	2.8E+04	6.6	397
Eu-152	1.3E+04	10.1	1440
H-3	1.2E+08	132	31.1
Ni-63	1.8E+06	747	1.9E+04
Pu-238	3.0E+01	1.8	0.41
Pu-239	2.8E+01	1.6	0.37
Pu-241	8.8E+02	86	19.8
Sr-90	8.7E+03	1.2	0.61

NOTES:

(a) Only the DCGL values that constitute the 25 mrem/y regulatory limit were controlled under the LTP and the NRC's approving license amendment.

(b) Listed values are from the subsurface model. These values are the most conservative values between the two models (i.e., surface & subsurface).

1. Surface Soil Surveys

a. Inspection Scope (IP 69013)

The inspector, assisted by ORISE personnel, conducted an in-process review of the surface soil Final Status Surveys to determine if the procedural requirements and policies were adhered to:

- Saxton Nuclear Experimental Corporation Facility License Termination Plan, revision 3, dated February 2004
- Procedure No. E900-ADM-4500.39, "Chain of Custody for Samples", revision 8, dated January 6, 2005
- Procedure No. E900-IMP-4520.06, "Survey Unit Inspection in Support of FSS Design", revision 0, dated January 29, 2003
- Procedure No. E900-QAP-4220.01, "Quality Assurance Program for Radiological Instruments", revision 4, dated July 30, 2001
- NUREG-1575 "Multi-Agency Radiation Survey and Site Investigation Manual" revision 1, dated August 2000

b. Observations and Findings

The radiation survey meters used to scan open land areas employed a sodium iodide crystal detector with the supporting electronic circuitry "windowed" to respond only to the gamma ray emissions characteristic of Cs-137. This technique results in improved sensitivity and reduction of background thus lowering the minimum detectable count rate (MDC). Cesium-137 was selected as the surrogate for all soil survey units which therefore benefitted from the enhanced sensitivity. One meter long soil samples were taken in the vicinity of elevated scan readings and at random and biased locations determined by application of MARSSIM and Data Quality Objectives. Technicians performing surveys stated that they were trained to perform scanning or sampling but not both.

In-field interviews with survey technicians indicated that they were trained and qualified and demonstrated a good understanding of the procedures and an awareness of the survey design parameters. Technicians carried a hard copy of the Survey Request (SR) and indicated that the expectation was that the SR was to be followed exactly. The inspector reviewed selected SRs and noted that the LTP and procedural requirements were properly implemented.

c. Conclusions

The Final Status Survey program for open land areas was conducted in accordance with regulatory guidance and requirements specified in the NRC-approved LTP.

2. Analytical Laboratory Performance

a. Inspection Scope (IP 69013)

The accuracy and reproducibility of analysis performed by the on-site radiological laboratory was reviewed by in-process inspection and duplicate sample analysis. ORISE and NRC review including the following:

- Procedure E900-OPS-4524.33 "Operation of the SNEC Gamma Spectroscopy System" revision 3, dated February 25, 2004
- Procedure E900-IMP-4520.02 "Preparation of Sample Materials for Analysis" revision 5, dated June 16, 2003
- Procedure E900-ADM-4500.39 "Chain of Custody for Samples" revision 6, dated October 1, 2003
- Letter, T.J. Bauer, ORISE to T.F. Dragoun NRC, "Subject: Final Site - Specific Decommissioning Inspection Report No. 4 for the Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146; Task 1)."

b. Observations and Findings

Selected elements of the on-site laboratory program were reviewed in March 2001, March 2003, and August 2004, and included some duplicate analysis. The entire inventory of laboratory equipment was purchased from the GPU Environmental Laboratory (E lab) when management decided to permanently close the lab. The equipment had been used for many years to support the Oyster Creek and Three Mile Island power plants. A QA program had been in effect to maintain the lab performance at a high level. Besides the equipment, the Saxton facility hired the terminated E Lab staff to set up and maintain the equipment at the Saxton site. The acquisition of state-of-the-art equipment and the knowledge base from the experienced staff resulted in a high level of performance on the Saxton site.

Four dirt samples were selected at random for split analysis by the licensees' on-site laboratory and the ORISE laboratory. There was good agreement of the analytical results between ORISE and the licensees' lab. No technical deficiencies were found during the program review. In September 2004, hurricane Jeane caused major flooding of the Juniata River and caused a power line surge that damaged all laboratory equipment normally "on" at all times. Repairs were prompt and effective.

c. Conclusions

The performance of the on-site analytical laboratory was satisfactory.

3. Final Status Surveys

a. Inspection Scope (IP 69013)

The inspector reviewed the 36 FSSRs submitted to the NRC during June and July 2005 with respect to the requirements and guidance in GPU/SNEC procedures listed in Attachment A, regulatory requirements and guidance documents listed in Attachment B, 10 CFR 50.82(a)(9)(ii)(D), and 10 CFR 20.1501(a) and (b). The FSSRs included in this review were as follows:

- Containment Vessel Excavation (Accession Nos. ML052140119, ML052140099, ML052140104)
- Open Land Area MA2 (Accession Nos. ML051950566, ML051950564)
- Open Land Area OL5 (Accession Nos. ML051950559, ML051950553, ML051950557)
- Open Land Area OL9 (Accession Nos. ML051950548, ML051950546)
- East Yard Excavation OL 1-7 (Accession Nos. ML051950534, ML051950531)
- Spray Pond Area SP1 (Accession Nos. ML051950525, ML051950523)
- Open Land Area OL4 (Accession Nos. ML051950074, ML051950066, ML051950072, ML051950059)
- Open Land Area MA9 (Accession Nos. ML051950089, ML051950087, ML051950086)
- Open Land Area OL13 (Accession Nos. ML051950135, ML051950132)
- Open Land Area OL11 (Accession Nos. ML051950122, ML051950498, ML051950120)
- Open Land Area OL8 (Accession Nos. ML051950488, ML051950486)
- PENELEC Switchyard (Accession Nos. ML051950501, ML051950503, ML051950491)
- Remediated Soils (Accession Nos. ML052010662, ML052010660, ML052010659)
- PENELEC Switchyard Control Building (Accession Nos. ML052010547, ML052010542, ML052010540)

- Open Land Area OL6 and OL10 (Accession Nos. ML052010671, ML052010668, ML052010667)
- Open Land Area OL7 (Accession No. ML052090269)
- SSGS Firing Aisle (Accession No. ML052090275)
- SSGS Basement (Accession Nos. ML052090286, ML052090272, ML052090271, ML052090281, ML052090273, ML052090274, ML052090279)
- SSGS Seal Chambers (Accession Nos. ML052140181, ML052090296, ML052090289)
- SSGS Discharge Tunnel Transition Area (Accession Nos. ML052090247, ML052090245)
- Open Land Area OL1 - Soils ((Accession Nos. ML052140051, ML052140053, ML052140121, ML052140104, ML052140049)
- Open Land Areas OL7 - Paved surfaces and concrete (Accession Nos. ML052140066, ML052140074, ML052140064)
- SSGS Structural Surfaces - Intake Tunnel (Accession Nos. ML05140163, ML052140075,ML052140071, ML052140167, ML052140158)
- SSGS Structural Surfaces - Discharge Tunnel (Accession Nos. ML052140059, ML052140077, ML052140065, ML052140054)
- SSGS Structural Surfaces - CV Steam Tunnel (Accession Nos. ML052140116, ML052140123, ML052140120, ML052140110)
- SSGS Spray Pump Area (Accession Nos. ML052140191, ML052090248, ML052140198, ML052140195, ML052140187)
- Seal Chamber Roofs (Accession Nos. ML052140134, ML052140117, ML052140136, ML052140132, ML052140144)
- Open Land Area OL3-Paved Surfaces and Concrete (Accession Nos. ML052140102, ML052140106, ML052140095)
- Open Land Area OL2 (Accession Nos. ML052140142, ML052140153, ML052140149, ML052140133)

- Residual Concrete in OL1 (Accession Nos. ML052140396, ML052140399, ML052140259, ML052140393)
- Residual Macadam in OL1 (Accession Nos. ML052140253, ML052140256, ML052140403, ML052140240)
- Open Land Area OL1-6 (Accession Nos. ML052140239, ML052140245, ML052140235)
- Site Areas MA3/MA4 Weir Discharge Area (Accession Nos. ML052140332, ML052140325)
- Small PENELEC Garage GA1-1 (Accession Nos. ML052140175, ML052140172)
- Embedded/Buried Piping (Accession Nos. ML052140180, ML052140176)
- Open Land Area OL3 (Accession Nos. ML052140241, ML052140247, ML052140229)

b. Observations and Findings

In addition to the above list of FSSRs, the licensees previously submitted 3 FSSRs in 2003 and 2004 of which 2 were for the CV Interior and 1 for the PENELEC Line Shack. The 3 had been accepted by NRC and these areas were placed in Post Remediation Isolation (PRI) status. The inspector had reviewed selected records during a previous inspection and concluded that the PRI controls were effective. The inspector reviewed the maps and detailed survey unit descriptions submitted with the latest FSSRs and concluded that all impacted areas have been included, were surveyed, and a FSSR was submitted to the NRC.

The inspector, assisted by ORISE technical staff, provided comments on each FSSR and discussed the findings with the licensees' staff during telephone conferences. The comments generally consisted of the need for clarification or additional information but did not change the conclusions regarding the releaseability of the survey unit. In letters to the NRC dated September 8 and 29, 2005, (licensees file numbers E910-05-066 and E910-05-068, Accession Nos. ML052590310 and ML052870387) the licensees submitted detailed changes to the FSSRs to address these comments. The FSSRs, as amended, were determined to be acceptable for demonstrating compliance with the radiological criteria for license termination.

c. Conclusions

The amended FSSRs provide the radiological data that indicates that the entire facility satisfies the criteria for unconditional release.

4. Exit Interview

The inspection scope and results were summarized on October 5, 2005, with the SNEC RSO (Arthur Paynter). The inspector described the areas inspected and discussed in detail the inspection findings. In addition, the inspector stated that the facility satisfies the criteria for unconditional release. No dissenting comments were received from the licensees.

PARTIAL LIST OF PERSONS CONTACTED

Licensees

G. Kuehn, Director, SNEC Facility
A. Paynter, SNEC Radiation Safety Officer
W. Stoner, SNEC Radiological Engineering
P. Donnachie, SNEC consultant
R.Holmes, SNEC consultant
B.Brosey, SNEC consultant

NRC Contractor

T. Bauer, Assistant Project Leader, ORISE
T. Vitkus, Project Leader, ORISE

INSPECTION PROCEDURES USED

IP 69013 Research and Test Reactor Decommissioning

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

LIST OF ACRONYMS USED

CFR	Code of Federal Regulations
DCGL	Derived Concentration Guideline
FSS	Final Status Survey
FSSR	Final Status Survey Report
GPU	General Public Utilities
LTP	License Termination Plan
ORISE	Oak Ridge Institute of Science and Education
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
NRC	Nuclear Regulatory Commission
SNEC	Saxton Nuclear Experimental Corporation
SSGS	Saxton Steam Generating Station

Attachment A

GPU SNEC Procedures and Policies References:

E900-IMP-4520.04, “Survey Methodology to Support SNEC License Termination” revision 11, dated May 24, 2005

1000-PLN-3000.05, “Saxton Nuclear Experimental Corporation Facility Decommissioning Quality Assurance Plan” revision 5 dated May 26, 2005

Saxton Nuclear Experimental Corporation Updated Safety Analysis Report for Decommissioning the SNEC Facility Revision 5, January 2004

Letter E910-03-002, “Revision 4 of the Saxton Nuclear Experimental Corporation Facility Quality Assurance Plan” dated January 20, 2003

Letter E910-03-016, “Saxton Nuclear Experimental Corporation (SNEC) Operating License No. DPR-4 Docket No. 50-146 Submittal of FSS Report for the CV Interior, 774' El and Below” dated April 24, 2003

Letter E910-03-018, “Optimize Window and Threshold Settings for detection of Cs-137 using the Ludlum 2350-1 and a 44/10 NaI Detector” revision 0, dated August 7, 2003

Letter E910-03-031, “Saxton Nuclear Experimental Corporation (SNEC) Operating License No. DPR-4 Docket No. 50-146 FSS Report for the CV Interior, 774' El and Below, Revision 1” dated September 4, 2003

Letter E910-03-035, “Saxton Nuclear Experimental Corporation (SNEC) Operating License No. DPR-4 Docket No. 50-146 FSS Report for the CV Interior, 774' Elev and Below, Revision 1, Erratum” dated September 17, 2003

Letter E910-03-041, “Saxton Nuclear Experimental Corporation (SNEC) Operating License No. DPR-4 Docket No. 50-146 Submittal of FSS Report for SNEC CV Interior Above 774' Elev and Exterior” dated October 29, 2003

E900-ADM-4500.44, “SNEC Facility Calculations” revision 4 dated June 20, 2005

E900-QAP-4220.01, “Quality Assurance Program for Radiological Instruments” revision 5 dated May 11, 2005

E900-ADM-4500.54, “Post Remediation Isolation” revision 3 dated March 14, 2005

E900-IMP-4520.06, “Survey Unit Inspection in Support of FSS Design” revision 0 dated January 29, 2003

E900-IMP-4520.05, “SNEC Site Calibration Check for the GFPC” revision 0, dated January 22, 2003

E900-IMP-4520.03, “Establishing a Reference Coordinate Grid System” revision 0, dated July 9, 1999

E900-ADM-4500.39, “Chain of Custody for Samples” revision 8, dated January 6, 2005

E900-OPS-4524.43, “Operation of the Portable Gamma Spectroscopy System” revision 0, dated May 23, 2001

E900-IMP-4520.02, “Preparation of Sample Materials for Analysis” revision 5, dated June 16, 2003

E900-OPS-4524.33, “Operation of the SNEC Gamma Spectroscopy System” revision 4, dated May 11, 2005

E900-OPS-4524.46, “Operation of the Packard Tri-Carb 2550 TR/AB Liquid Scintillation Analyzer” revision 2, dated May 20, 2002

E900-QAP-4220.02, “SNEC Count Room Quality Assurance Program” revision 3, dated February 6, 2002

E910-04-023, “Saxton Nuclear Experimental Corporation (SNEC) Operating License No. DPR-4 Docket No. 50-146 FSS Report for SNEC Penelec Line Shack”, dated August 18, 2004

E900-ADM-4500.58, “Treatment of Embedded Piping and Components” revision 0, dated October 9, 2001

E900-PLN-4542.08, “SNEC Facility Offsite Dose Calculation Manual” revision 5, dated March 26, 2001

E900-ADM-4500.52, “SNEC Facility Regulatory Review Process” revision 2, dated October 24, 2001

E900-ADM-4500.60, “Final Status Survey Report” revision 0, dated March 12, 2003

E900-ADM-4500.59, ”Final Status Survey Planning and DQA” revision 1, dated April 21, 2003

E900-OPS-4524.42, ”SNEC RadCon Instrument Operations Manual” revision 5, dated May 24, 2005

Attachment B

NRC and other government agency publications:

SECY-00-0041, “Use of Rubblized Concrete Dismantlement to Address 10 CFR 20, Subpart E, Radiological Criteria for License Termination” dated February 14, 2000

SECY-98-051, “Guidance in Support of Final Rule on Radiological Criteria for License Termination” dated March 16, 1998. Enclosure 2 is “Decision Methods for Dose Assessment to Comply with Radiological Criteria for Decommissioning” draft dated March 13, 1998.

SECY-03-0069, “Results of the License Termination Rule Analysis” dated November 17, 2003

SECY-04-0035, “Results of the License Termination Rule Analysis of the Use of Intentional Mixing of Contaminated Soil” dated May 11, 2004

NRC Regulatory Issue Summary 2002-02 Lessons Learned Related to Recently Submitted Decommissioning Plans and License Termination Plans dated January 16, 2002

Nuclear Regulatory Commission, “Supplemental information on the Final Rule on Radiological Criteria for License Termination, Section 4.Screening Values for Building Surface Contamination”, Federal Register Vol. 63, No.222, Wednesday, November 18, 1998

NUREG - 1575, “Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)” revision 1, dated August 2000

NRC Letter Mr. A. Adams NRC, to Mr. G. A. Kuehn GPU, “Saxton Nuclear Experimental Corporation - Amendment Re: Approval of the Saxton License Termination Plan”, dated March 28, 2003 (ML030580260)

Regulatory Guide 1.179, “Standard Format and Content of License Termination Plans for Nuclear Power Reactors” January 1999

Regulatory Guide 1.86, “Termination of Operating Licenses for Nuclear Reactors”, June 1974

NUREG/CR-3473, “Long Lived Activation Products in Reactor Materials”, August 1984

NUREG/CR-5849, “Manual for Conducting Radiological Surveys in Support of License Termination” draft June 1992

Code of Federal Regulations Title 10 Part 50.82, Application for Termination of License

NUREG/CR-2082, “Monitoring for Compliance with Decommissioning Termination Survey Criteria”, June 1981

NUREG/CR-5512, “Residual Radioactive Contamination from Decommissioning”, October 1992

NUREG-1506, “Measurement Methods for Radiological Surveys in Support of New Decommissioning Criteria” Draft Report for Comment, August 1995

NUREG/CR-0130, “Technology, Safety, and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station” June 1978

NUREG-1507, “Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions” Draft Report for Comments August 1995

NUREG-1505, “A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys” Draft Report for Comment August 1995

NUREG/CR-6062, “Performance of Portable Radiation Survey Instruments” December 1993

Argonne National Laboratory, “Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD, Version 6.1” dated April 1998

NRC screening computer code “DandD” Version 3.1 dated August 20, 1998

NUREG-1727, “NMSS Decommissioning Standard Review Plan” September 2000

NRC Draft Regulatory Guide DG4006, “Demonstrating Compliance with the Radiological Criteria for License Termination” Federal Register August 4, 1998 (63 FR 41604)

NUREG-1757, “Consolidated NMSS Decommissioning Guidances, Vol. 1, revision 1, and Vol. 2, September 2003

International Standards Organization (ISO) standard 7503-1, “Evaluation of Surface Contamination-Part 1 Beta-emitters and Alpha emitters” dated August 11, 1988

ISO standard 7503-3, “Evaluation of Surface Contamination-Part 3, Isomeric Transitional and Electron Capture Emitters, Low Energy Beta-emitters” dated November 14, 1996

NRC on-site inspections - Saxton (month and year): August 1994, June 1995, November 1996, January 1997, February, May, September and October 1998, February and August 1999, June and November 2000, March 2001, October 2002, March and August 2003, July 2004, and May to September 2005.

Attachment C

ORISE Communication with NRC

ORISE Letter, "Subject: Site-Specific Decommissioning Inspection Plan for the Saxton Nuclear Experimental Corporation (SNEC), Saxton, Pennsylvania (Docket No. 50-146; RFTA No. 01-003)" dated March 16, 2001 (Accession No. ML052870034)

ORISE Letter, "Subject: Final Site-Specific Decommissioning Inspection Plan for the Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146;Task1)" dated March 13, 2003 (Accession No. ML052870046)

ORISE Letter, "Subject: Site-Specific Decommissioning Inspection Report No. 1 for the Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146 Task 2) dated May 15, 2003 (Accession No. ML052870029)

ORISE Letter, "Subject: Final Site-Specific Decommissioning Inspection Report No. 2 for the Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146 Task 3) dated September 25, 2003 (Accession No. ML052870037)

ORISE Letter, "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)" dated November 17, 2003 (Accession No. ML 052860223)

ORISE Letter, "Subject: Final Confirmatory Survey Plan for the PENELEC Line Shack Building, Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No.50-146; Task 1)" dated June 30, 2004 (Accession No. ML052860222)

ORISE Letter, "Subject: Final Site-Specific Decommissioning Inspection Report No. 3 for the Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146; Task 1)" dated September 29, 2004 (Accession No. ML050320270)

ORISE Letter, "Subject: Final Report—Confirmatory Survey of the PENELEC Line Shack, Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146; Task 1)" dated October 7, 2004 (Accession No. ML052860220)

ORISE Letter, "Subject: Document Review - Final Status Survey Reports, Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146; Task 1)" dated June 22, 2005 (Accession No. ML052860157)

ORISE Letter, "Subject: Document Review - Final Status Survey Reports, Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146; Task 1)" dated July 20, 2005 (Accession No. ML052860158)

ORISE Letter, "Subject: Document Review - Final Status Survey Reports, Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146; Task 1)" dated August 10, 2005 (Accession No. ML052860214)

ORISE Letter, "Subject: Document Review - Final Status Survey Reports, Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146; Task 1)" dated August 11, 2005 (Accession No. ML052860216)

ORISE Letter, "Subject: Document Review - Final Status Survey Reports, Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146; Task 1)" dated August 15, 2005 (Accession No. ML052860217)

ORISE Letter, "Subject: Document Review - Final Status Survey Reports, Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146; Task 1)" dated August 17, 2005 (Accession No. ML052860218)

ORISE Letter, "Subject: Final Site-Specific Decommissioning Inspection Report No. 4 for Final Confirmatory Survey Plan for the Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146; Task 1)" dated August 17, 2005 (Accession No. ML052870026)

ORISE Letter, "Subject: Document Review - Final Status Survey Reports, Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146; Task 1)" dated August 19, 2005 (Accession No. ML052860221)

ORISE Letter, "Subject: Document Review - Final Status Survey Report for Embedded/Buried Piping, Saxton Nuclear Experimental Corporation, Saxton, Pennsylvania (Docket No. 50-146; Task 1)" dated August 23, 2005 (Accession No. ML052860219)