May 1, 2002

Mr. G. A. Kuehn, Jr.
Vice President SNEC and
Program Director SNEC Facility
GPU Nuclear, Inc.
Route 441 South
P.O. Box 480
Middletown, PA 17057-0480

SUBJECT: SAXTON NUCLEAR EXPERIMENTAL FACILITY - DISCUSSION TOPICS FOR MAY 8, 2002, MEETING (TAC NO. MA8076)

Dear Mr. Kuehn:

We are continuing our review of your amendment request for Amended Facility License No. DPR-4 for the Saxton Nuclear Experimental Corporation (SNEC) Facility which you submitted on February 2, 2000, as supplemented. As part of our review, we have arranged a meeting with you that is open to public observation on May 8, 2002, to discuss details of our review of your application related to pathways analysis. The details of the meeting were sent to you under separate cover. This is a follow up to our meeting of April 8, 2002.

To facilitate our discussions on May 8, 2002, please find enclosed comments and issues that were identified during our review of your License Termination Plan, response to requests for additional information and information given to us during the April 8, 2002, meeting. The enclosure is not a request for additional information and may not contain all technical issues identified by the staff. Following our meeting, we may issue a request for additional information based on the outcome of the meeting.

If you have any questions regarding this review, please contact me at (301) 415-1127.

Sincerely,

/RA/

Alexander Adams, Jr., Senior Project Manager
Research and Test Reactors Section
Operating Reactor Improvements Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket No. 50-146

Enclosure: As stated

cc w/enclosure: Please see next page

Saxton Nuclear
Experimental Corporation

Docket No. 50-146

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Alexander Adams, Jr., Senior Project Manager
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DISCUSSION ISSUES FOR MEETING BETWEEN THE NRC AND SNEC STAFFS
MAY 8, 2002

The following comments are based on the NRC staff review of SNEC's response to NRC's request for additional information (RAI2), dated November 8, 2000.

1. Response to RAI2 Question #3

SNEC's response states that embedded piping and other components will be removed to the extent practical. However, Table 5-2 indicates that building surface DCGL values will be used for any remaining embedded piping. Given that screening DCGL values will be used for building surfaces and these screening DCGL values were not developed for this purpose, the licensee needs to justify extending the application of screening DCGL values for this purpose. Table 5-2 also indicates that surface and volumetric concrete DCGL values will be applied in some survey units (e.g., the containment vessel). SNEC needs to clearly identify which set of DCGL values will be used. Because exposure from the concrete can occur from both surface and volumetric contamination, the more restrictive of the two sets of DCGL values should be used. It should be also noted that no DCGL values are provided for volumetric concrete.

Staff was unable to derive the area factors (specifically for Cs-137, Co-60, and Am-241) included in *SNEC Calculation Report # E900-01-005*. The area factors derived by staff are lower, and thus, more restrictive than those indicated in the SNEC calculation.

2. Response to RAI2 Question #4

Not all parameters are addressed in Section II of the write-up. For example, distribution coefficients (K_d) for some isotopes and the outdoor time fraction are not included. It is important that an appropriate justification is provided for all selected values used in the analysis for key parameters. A sensitivity analysis should be used to identify the key parameters.

Given that the statistical distribution and range of parameter values used in a stochastic analysis can affect the results of the analysis, the treatment of parameters stochastically for developing DCGL values necessitates demonstrating that the statistical distribution and range of parameter values are appropriate for the SNEC site. As an alternative, the stochastic analysis can be used in identifying the key parameters affecting the calculated DCGL values; however, the specific value assigned to these key parameters will still need to be justified either in the context of what is known about the site or based upon the range of possible values. Any stochastic analysis used for either sensitivity analyses or for actually developing DCGL values, should consider potential correlation among parameters (e.g., total porosity, effective porosity, and bulk density), and should involve an evaluation of each radionuclide individually (i.e., as oppose to collectively). It should be noted that staff does not consider simply listing the parameter value used in the analysis as adequate justification for its use. Also, use of the central tendency of a range of values based on national data is generally not considered to be conservative when applied in a site-specific analysis. Such values may be appropriate for parameters for which the results are shown to be insensitive. SNEC's justification for the contaminated zone thickness may be also inadequate (see staff comment, below).

Staff does not have confident that the 20 parameters listed in Table 4 (22 parameters are listed in the table, but several are listed twice) are indeed the key parameters. Based on the radionuclide mix, several parameters such as plant, meat, and milk transfer factors, saturated zone hydraulic conductivity, depth of soil mixing, and wind velocity are expected to be important, but are not included in the list in Table 4. Staff also does not agree that it is appropriate to assume that the most sensitive parameters affecting Am-241 or Cs-137 are representative or bounding of the most sensitive parameters affecting other radionuclides. Given that a separate DCGL value is derived for each radionuclide, the most sensitive parameters affecting each radionuclide should be identified, for each radionuclide separately. Staff also does not understand the cutoff used for establishing the list of parameters in Table 4. Based upon the list of the most sensitive parameters affecting the dose for Am-241, several additional parameters (e.g., outdoor time fraction, soil ingestion, and density of the unsaturated zone) should have been included in Table 4.

In addition to these general concerns, staff has the following specific concerns with the analysis conducted in response to RAI2 Question #4:

- SNEC needs to show that use of the lowest K_d values will provide a conservative assessment of the dose. It is not certain that use of the lowest K_d value will be conservative for radionuclides where the ground-water pathway is not important. In fact, use of the lowest K_d value could be non-conservative for radionuclides where the surface exposure pathways are important. In general, K_d should be treated as a stochastic parameter in the sensitivity analysis to determine what effect it has on the calculated dose. For isotopes where K_d is shown to be sensitive, and negatively correlated with the dose, it would be appropriate to assume that use of the minimum derived K_d value is conservative. On the other hand, where K_d is shown to be sensitive, and positively correlated with the dose, use of the minimum derived K_d value would be non-conservative.

- If the slope of the ground-water ranges between 10 and 15 feet over a distance of 600 to 800 feet, the hydraulic gradient should range between 0.0125 and 0.025, instead of 0.017 to 0.019.

- SNEC needs to justify the assumption that 75% of the livestock and irrigation water is derived from on-site sources. SNEC needs to explain why this is considered to be either a conservative or acceptable assumption.

- SNEC needs to explain why (how) the contaminated fraction of plant food and meat parameters are identified as sensitive parameters (in Table 4); however, Table 1 indicates that these parameters were not included in the probabilistic analysis.

- It is not clear why SNEC chose to use a range of values for some behavioral parameters and then elected to go with the DandD default for the “basic” set. Given that the DandD default is usually at the lower end of the range, this approach gives the appearance that a non-conservative value is being used, especially if the results are sensitive to the parameter (e.g., leafy vegetable consumption). If the DandD default values are considered acceptable, they should be assigned as a constant in the probabilistic analysis. On the other hand, if the assigned range and statistical distributions are

considered appropriate, the selected value should be based upon that range and distribution, in which case, selection of a value at the lower end of the range cannot be considered as conservative.

- SNEC needs to justify the use of a contaminated zone area of 10,000 m^2; i.e., SNEC needs to indicate that this bounds the area of contamination at the site and is consistent with the assumptions made in developing survey units.

3. Response to RAI2 Question #8

The approach taken by SNEC for developing DCGL values in response to Question #8 is different from that used in developing DCGL values in response to Question #4; therefore, it is inappropriate to combine the different sets of DCGL values in coming up with a single set of values for the site. In developing DCGL values for the subsurface material (i.e., in response to Q8), all radionuclides are evaluated together in a single analysis. This approach would tend to provide less conservative, and therefore, a less defensible set of DCGL values given that the calculated DCGL value for each radionuclide may be affected by the time when the peak dose occurs; this peak will tend to be driven by the radionuclides that have the largest contribution to the dose. This approach is acceptable only when all radionuclides included in the analysis are present. For a radionuclide that has a peak dose at a different time, occurring by itself, this approach would not be acceptable.

The approach of analyzing the radionuclides together is also not appropriate for conducting sensitivity analyses. As previously stated, the sensitivity analysis should be conducted for each radionuclide individually and not collectively. It is not clear how the three most sensitive parameters for each radionuclide, listed in Table 4-2, were derived given that the analysis included all radionuclides collectively.

SNEC needs to explain how their analysis of subsurface material appropriately represents the material being located in the saturated zone. To model this material under saturated conditions, no ground-water dilution should be assumed and all contaminants should be assumed to be available for withdrawal from the hypothetical well. Accordingly, it seems that the mass balance (MB) approach should have been used in the RESRAD analysis instead of the non-dispersion (ND) approach.

In addition to these general concerns, staff has the following specific concerns with the analysis conducted in response to RAI2 Question #8:

- SNEC needs to show that use of the lowest K_d values will provide a conservative assessment of the dose (see previous comment, above). In addition, SNEC needs to justify the use of RESRAD default K_d values for Ac, Pa, Po, Ra, and Th. Further, SNEC needs to justify the use of an upper-end K_d value of five for C and H given that a recommended K_d value of one is listed in Table 3.

- No basis is provided for assuming a dilution factor of 1/5 for contaminants in overburden material assumed to be brought to the surface.

- The assumption that irrigation water will be derived from the shallow zone, where the contaminants are assumed to be diluted, as opposed to the deeper zone where the drinking water is assumed to be derived is not conservative and needs to be justified.

- SNEC needs to provide information that was suppose to be included in Attachment A of the URS Corp. report.

- As previously stated, staff does not believe that SNEC's sensitivity analysis has correctly identified the appropriate list of key parameters for the site. The sensitivity analysis should consider each radionuclide individually as oppose to collectively. In addition, the fact that the external gamma shielding factor is not identified as a key parameter for Co-60, Cs-137, Eu-152, Eu-154, Eu-155, and Nb-94 in Table 4-2 raises concerns about the validity of the sensitivity results. It is also not clear why a table similar to Table 4-2 was not included for the sensitivity analyses conducted for bedrock and sediment exposures.