SIEMENS

70-1257

January 28, 1997
JBE:97:010

U.S. Nuclear Regulatory Commission
Attn: Mr. Michael F. Weber
Licensing Branch
Division of Fuel Cycle Safety and Safeguards, NMSS
Washington, DC 20555

Dear Mr. Weber:

License No. SNM-1227
Docket No. 70-1257

Ref.: Letter. K.J. Hardin to L.J. Maas, "Request for Additional Information, Lagoon Uranium Recovery/Solids Processing Facility (LUR/SPF) (TAC No. L30893), dated December 23, 1996.

Enclosed are Siemens Power Corporation's (SPC's) responses to the staff's request for additional information in the referenced letter.

If you have any questions or require further information, please call me at (509) 375-8663.

Very truly yours,

James B. Edgar
Staff Engineer, Licensing

/pg

Enclosures

cc: C.A. Hooker, Region IV

NF04

Siemens Power Corporation

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TAC No. 30893, dated December 23, 1996

1. The description of the lagoon uranium recovery/solids processing facility (LUR/SPF) ventilation system does not include any liquid scrubbers for removal of off-gases from various chemical process tanks. Please explain why scrubbers are considered unnecessary.

SPC Response

In past LUR operations the only part of the process which resulted in the generation of offgases which could possibly require scrubbing was the dissolution of solids precipitated from lagoon liquids. That step will no longer be carried out at LUR, rather at the ELO Building. Consequently, no significant gaseous evolutions are foreseen for LUR operations.

The SPF process currently planned is a mild process involving low temperature heating and addition of a mild oxidant to the lagoon liquid slurry. Water vapor is expected from the tanks but the ventilation system has been designed to handle it. No evolution of gases has been observed during past lagoon sludge processing tests, or in tests currently underway, that indicates a scrubber is needed.

The LUR/SPF HVAC system has been approved by the Benton County Clean Air Authority.

2. In Section 10.2.12.1, a limit of "8 MPC-hr" is established to activate the alpha air monitor alarm. These units should be converted to reflect the new 10 CFR Part 20 terminology (e.g., some fraction/multiple of the DAC).

SPC Response

The units in Section 10.3.12.1 have been changed from 8 MPC-hr to 40 DAC-hr making it consistent with Section 3.2 of the license. Two copies of revised page 10-49 are enclosed to accomplish this change.

3. Provide a detailed process description, including details of items important to safety (i.e., describe the controls used to ensure criticality safety).

SPC Response

LUR process information provided herein is in addition to that in SPC's license and the SPF process description provided in the July 30, 1996 application is unchanged and is restated.

In the LUR process, approximately 5000 gallons of high uranium content (<1 gU/l) liquid waste filtrates are pumped into each of two precipitators. The uranium is precipitated from solution by addition of sodium hydrosulfite and allowed to settle. The low uranium content liquid is then decanted and pumped to lagoon storage and the solids filtered out. The uranium precipitate is transferred to plastic 55-gallon drums, and removed to the ELO Building where the uranium is recovered by solvent extraction.

In the SPF process a small dredge will be used to retrieve solids and liquids from the bottom of the lagoons as a slurry which will be pumped to the SPF. The slurry will be screened to remove rocks and large debris, processed through an in-line grinder to shred the remaining solid debris, and stored in a 12,000 gallon slurry feed tank at the SPF. The slurry will be homogenized in the feed tank with a mixer and heated with steam from a recirculation loop. Chemical additives (mild oxidizing agents such as sodium hypochlorite or sodium nitrite) will be pumped into the slurry as needed to assist in the dissolution of uranium. A filter aid will also be added to prepare the slurry for dewatering. The slurry will be pumped to the filter press and dewatered, resulting in a solid filter cake and separate liquid filtrates. The filter cake will consist of insoluble sands, filter aid, fine materials, salts, debris, residual moisture meeting burial requirements, and residual uranium. The ~~required~~ filter cake will be packaged into 55-gallon drums for disposal as LLRW. The filtrates will be pumped through a polishing filter and collected in the filtrate tank. The filtrates will be processed at LUR for uranium recovery.

A revised LUR/SPF process flow diagram with vessel dimensions is included for your information.

The uranium bearing solutions and solids currently stored in the SPC lagoons are closely monitored for uranium content. As this material is brought into the LUR/SPF process area a second analysis will be performed to establish the uranium concentration of the material being processed. The LUR process is controlled based on mass, concentration and enrichment. These controls are discussed in sections 4.2.3.1 and 4.2.5 of the SPC operating license.

The handling of solids in the SPF will be based primarily on concentration control. Under the postulated worst case solids process conditions a uranium concentration of 7 gU/l at 3.4 wt.% ^{235}U could be possible in a 12,000 gallon slurry feed tank. The maximum U concentration possible in the solids during processing will be 45 g U/l in the filter cake. The controls used for this process are no different than those currently used for other mass and concentration controlled workstations used at SPC.

Because criticality safety of the filter press in the SPF process is based on concentration control, limiting material holdup between processing batches is not required.

4. Provide a summary of the criticality safety analysis, including parameter safety limits and margins of safety and how they were derived.

SPC Response

As stated during recent discussions, the Criticality Safety Analysis is not expected to be completed until construction is complete, thus allowing for confirmation that the as-built facility matches the design. Below is a discussion of the assumptions to be used in the CSA. The revised process flow diagram provides vessel sizes.

The parameters controlled at LUR/SPF are mass, concentration and enrichment. The SPF is limited to an enrichment of 5 wt.% ^{235}U. Section 4.2.3.1 of the operating license establishes a minimum safety margin when using mass control of 45 percent of the minimum critical mass being processed. This section also details the controls that must be used. The safety limit on concentration allowed by Section 4.2.5 of the operating license is 140 g U/l. This is 50 percent of the minimum critical concentration for enrichments of 5 wt.% ^{235}U.

The U concentration in the liquid fed to LUR is measured and the amount of U in solution controlled such that the amount of uranium precipitating out of solution each of two approximately 5000 gallon precipitation tanks and transferred to 55 gallon plastic drums is less than the 790 g^{235}U safe mass for 5 percent enriched uranium. Vessels containing safe mass are spaced at least 1 foot apart.

The actual enrichment of the U in the lagoon solids is about 3.4 wt.% ^{235}U. The minimum critical U concentration for uranium bearing solutions enriched to 5 wt.%^{235}U is about 280 g U/l. Therefore the safety factor for this process in terms of concentration is over 6.2 (280/45). This safety factor does not include the fact that in pilot tests the Gd content in Lagoons 3, 4, and 5A solids processed through a filter press is high enough that a criticality in these solids is not possible.

Lagoons 1 and 2 are used for surge capacity as feed for the ammonia recovery process and only contain trace amounts of U (2-3 ppm) in the liquid. Significant solids do not exist in these lagoons. Lagoon 5B contains the salts and residual liquids that were previously processed through LUR to remove the uranium from the solution. Solids from these three lagoons do not contain gadolinia but have a significantly lower U content than the three discussed in the previous paragraph.

Although not specifically requested in this RAI, per our discussions on January 9 in your offices, all vessels in the LUR/SPF are covered in Table I-4.1 under "Cylindrical tanks, filters, and other equipment" either by diameter or as "other unfavorable geometry solution tanks."

10.3.11.4 HEPA Filter Bank

The final HEPA filters are enclosed in a sheet metal housing that, in turn, is mounted on structural steel legs fastened to a concrete slab. The HEPA filters are rated at 1000 ft^3/min at one-inch water gauge pressure drop and are mounted in welded steel frames. Continuous air samplers are installed downstream of the filter bank. Visual indicators for reading the pressure drop across the filters are permanently installed, and means are provided for in-place DOS testing.

The HEPA filter medium is 100% moisture-resistant fiberglass, pleated over corrugated separators and sealed in fire-resistant plywood frames. The individual filters are certified to remove 99.97% of 0.3 micron particles and meet or exceed Military Specification MIL-F-51079.

10.3.12 LUR/SPF HVAC System

The general features of the LUR/SPF HVAC system include a combination of a once-through airflow and recirculation supply system (K64) and a double HEPA filtered exhaust system (K65). A simplified schematic diagram of the HVAC system is shown in Figure II-10.27b.

10.3.12.1 K64 Air Supply and Recirculation System

The K64 air supply and recirculation system supplies approximately 1500 ft^3/min. of outside air and also recirculates approximately 8800 ft^3/min. of building air. Recirculated air is passed through a roughing filter and a single HEPA filter with an installed efficiency of 99.95% for 0.8 micron DOS cold-generated aerosol. Provision is made in the K64 recirculation system for continuous alpha radiation monitoring of recirculated air upstream of the HEPA filter bank. The alpha air monitor is set to alarm and annunciate when alpha activity exceeds 40 DAC-hr. 1

10.3.12.2 K65 Air Exhaust System

Air supplied to the LUR/SPF, plus infiltration, is exhausted through the K65 exhaust system. The double HEPA filter arrangement in this system consists of the final HEPA filter bank and upstream primary HEPA filter bank plus individual prefilters located in the exhaust ducts of the two areas serviced.

The K65 system exhaust air (approximately 2000 ft^3/min.) passes from the two stage HEPA filter bank through the main exhaust fan, past a duct air monitor (measuring airflow quantities) and is discharged from a stack extending 50 ft above ground on the south side of the building. The K65 exhaust system has one fan which is connected to normal power. All final HEPA filters are in-place tested to be 99.95% minimum efficient for 0.8 micron DOS cold aerosol.

10.3.12.3 System Controls

The HVAC systems are controlled with temperature, pressure and flow sensor actuating valving and damper positions to hold temperatures, pressures, and pressure differentials constant in the various building areas. The K64 supply air system is interlocked with the K65 exhaust system to prevent operation of the K64 supply air system without the K65 exhaust system operating. Pressure sensors are provided to maintain a minimum negative differential pressure of 0.05 inch water gauge in the building relative to the atmosphere.

The K64 supply fan is interlocked so that a loss of exhaust duct flow (exhaust fan failure) or a signal from the exhaust duct heat detector will shut down the K64 air supply system.

An automatic visual alarm is activated when the recirculation system is inoperable.

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LAGOON URANIUM RECOVERY (LUR)
SOLIDS PROCESSING FACILITY (SPF)

GENERAL PROCESS FLOW DIAGRAM WITH NOMINAL TANK VOLUMES AND DIMENSIONS