

APPENDIX

U.S. NUCLEAR REGULATORY COMMISSION
REGION V

Inspection Report No. 70-1257/94-03

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

Licensee: Siemens Power Corporation (SPC)
2101 Horn Rapids Road
Richland, Washington 99352-0130

Facility Name: Siemens Power Corporation

Inspection at: Richland, Washington

Inspection Conducted: March 21-25, 1994

Inspector: C. A. Hooker, Senior Fuel Facility Inspector

Approved by:

Frank A. Wenslawski
Frank A. Wenslawski, Chief
Materials Branch, Region IV Field Office

4/7/94
Date

Inspection Summary:

Areas Inspected: This was a routine unannounced inspection of criticality safety, operations review, followup on Confirmatory Action Letter (CAL) 94-001, and open items from previous inspections. Inspection procedures 30703, 80015, 88020, 92703, 92702, and 92701, were addressed.

Results:

- Within the scope of this inspection, one violation was identified involving the failure to assure that a liquid acid line was adequately jacketed to prevent leakage into a moderation controlled area (Section 1).
- The inspector confirmed that the licensee had completed the corrective actions and commitments as stated in CAL 94-001.
- The inspector verified that SPC had completed the corrective actions for previously identified violations.
- An Inspection Followup Item 70-1257/94-01-01 was identified regarding the review of final corrective actions for findings/observations identified in the licensee's biennial appraisal, EMF-93-220, Criticality Safety Management System Appraisal, " dated December 1993 (Section 1)
- A potential weakness was identified in the Licensee's Criticality Safety Analysis Update Program relative to maintenance of configuration

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drawings (Section 3.3).

Although proprietary information was reviewed during the inspection, such information is not described in this report.

Attachment:

- Persons contacted and Exit Briefing

DETAILS1 Criticality Safety (88015)

Previous inspection reports have described ongoing facility modifications involving a new two story analytical laboratory addition to the Uranium Dioxide (UO₂) Building, the relocation and upgrade of uranium hexafluoride (UF₆) cylinder storage and handling facility, and modifications associated with the licensee's preparation for constructing a new dry conversion building. During plant tours, the inspector noted that the new UF₆ cylinder handling and storage facility was nearly completed. The licensee will be utilizing this facility following certification of new cylinder weighing scales. The inspector observed that construction contractors were tarring the roof of the analytical laboratory addition and installing the exterior stairway entrance to the second floor level. Interior construction and installation of the exhaust stack remained. Also, the licensee was in the process of rerouting piping systems where this new facility will be constructed.

Regarding modifications requiring a new criticality safety analysis (CSA), the inspector reviewed CSA "Dry Conversion Modification Project F-339," dated November 22, 1993, and technical references, "Dry Conversion Hazards Evaluation," EMF-93-174(P), "UF₆ Dry Conversion Process Verification Tests," XN-NF-83-45," and the engineering startup/test/operating procedures related to the process. The inspector also discussed the system with cognizant process engineers and the Lead Criticality Safety Specialist (LCSS) while conducting a walk-down of the system. The dry conversion process was being operated under the direction of process engineering. The new CSA was performed to replace two CSAs that previously covered this process and inclusion of modifications to the process, which included the addition of a calciner and various filters and equipment in the off-gas system, and the removal of scrubber vessel. Although the dry conversion CSA was not performed in relation to the licensee's CSA update program, the format and detail of the analysis was consistent with those planned for new CSAs under this program (Section 3.3).

The dry conversion CSA included a description of the process and equipment, analytical methodology, component description and analysis, system interactions, evaluations of possible accident conditions, conclusions, references, and a quality assurance review. The inspector verified that the technical basis for limiting assumptions were either described in the analysis or available in the reference materials utilized by the analyst. The CSA appeared to be conservatively modeled in accordance with the licensee's procedures and requirements of the license. The second party review was performed by a qualified person in accordance with Part I, Section 4.1.1 of the license application. Process limits and controls were adequately described in the CSA and translated in a nine page Criticality Safety Specification (CSS) U-79, "Dry Conversion Process," provided to and accepted by operations personnel by signature of the Manager, Plant Operations. The inspector also verified that the limits and controls described in the CSA and

CSS were adequately incorporated into the operating/test procedures. The inspector also noted no concerns during a walk-down of the dry conversion system and could not conceive of an upset condition that had not been considered in the analysis. The inspector also verified that the controls listed in the CSS were installed in the process.

The licensee's biennial appraisal, EMF-93-220, "Criticality Safety Management System Appraisal," dated December 1993 was reviewed and discussed with cognizant licensee personnel. This appraisal was conducted in December 1993 consistent with the requirements of Section 9.4, "Criticality Safety Appraisal, Chapter 3, Nuclear Criticality Safety Standards," of the licensee's Safety Manual EMF-30. The appraisal committee consisted of six knowledgeable individuals from departments that either process, handle, or store special nuclear material (SNM). The appraisal was focused on areas of the criticality safety program that are not major elements of the CSA update program: (1) training, (2) audits and inspections, (3) labeling and posting, (4) incidents and emergencies, (5) shipping, and (6) records. The appraisal identified 8 findings and made 19 observations. The findings appeared to be administrative in nature and did not represent a safety problem. The observations primarily involved items concerning program improvements. Following previous appraisals, the licensee had not been timely in resolving identified deficiencies/observations nor maintained an adequate tracking system for their closure. This matter was also discussed at the exit briefing. The licensee's final corrective actions for the appraisal findings/observations will be reviewed in a future inspection and is identified as an Inspection Followup Item (IFI 70-1257/94-03-01).

Monthly criticality safety audits conducted by the Criticality Safety Component (CSC), and quarterly operating group shift supervisor criticality safety inspections from October 1993 through February 1994 were reviewed. Identified infractions were documented on a Criticality Safety Corrective Action Report (CSCAR). The CSCARs described immediate actions taken, who performed these actions, recommended long term corrective actions to prevent recurrence, person assigned these actions, and the date the actions were to be completed. In addition to the routine licensee audits/inspections, infractions identified by operators or other personnel during the course of their routine duties are reported to the responsible supervisor and documented on CSCARs for review and corrective actions. The inspector noted that some of the quarterly operating group inspections were either not timely or documented. This matter was also identified by the licensee during their December 1993 criticality safety management appraisal.

The CSC maintained a tracking system of all infractions and had divided them into specific categories such as spacing, labeling, large spills, volume, geometry, improper storage, mass, moderation, exceeding slab limits, and other. The inspector noted that a majority of the infractions involved improper storage, mass control, and moderation control. According to the licensee's data about 78% of all infractions were identified by operators and about 20% by the CSC. At the time of this inspection, the licensee had about 38 outstanding CSCARs and one that was overdue. Based on the review of the licensee's data, it appeared that a majority of the infractions involved the lack of attention to detail and equipment problems. Although individual

CSCARs were adequately evaluated for safety significance and corrective actions appeared appropriate and it was commendable for operations personnel to identify and report infractions, it appeared that common causes were not fully addressed. This matter was also discussed with the licensee during the exit briefing.

During facility tours, the inspector observed that criticality control limits appeared to be appropriately posted where special nuclear material was being processed, handled and stored. The inspector noted that storage containers were labeled with the enrichment and quantity of material. Leakage from wet operations appeared to be minimal. The inspector made the following observations relative to moderation controlled areas:

- Safety Condition No. S-1 of SNM License No. 1227 authorizes the use of licensed materials in accordance with the statements, representations, and conditions contained in Part I of the licensee's application dated July 1987, and supplements dated November 12, 1987, and supplements thereto.

Section 2.5, Part I of the license application states, in part, that the licensee is committed to controlling activities in accordance with Standard Operating Procedures, Company Standards and Policy Guides.

Section 3.2, "Criticality Safety Specifications (CSS)," Chapter 3.0, "Nuclear Criticality Safety Standards," of the licensee's Safety Manual (EMF-30) states, in part, that CSS are used to translate the controls for criticality safety.

Item 2.c, Section A, "General Requirements on the Control of Moderators," of CSS U-92, "Moderation Control Areas," Revision 7, dated March 7, 1994, states that:

"All overhead water or liquid-bearing lines shall be removed or shielded/jacketed to prevent liquids getting into the material requiring controls on moderation."

- During a plant tour with the Lead Criticality Safety Specialist (LCSS) on March 22, 1994, in Room 101A (uranium dissolver room) of the UO₂ Building, the inspector observed that a concentrated liquid nitric acid line above a moderation control area was not completely jacketed to prevent leakage into the moderation controlled area. This moderation controlled area is used as a staging area for a single sealed low enriched uranium 45-gallon poisoned drum. The inspector noted that a section of the acid line entering the ceiling of the room and over the edge of the moderation control area was not jacketed, and the jacket over the remaining section of the line was not adequate to prevent back leakage into the moderation controlled area should a line leak occur. The LCSS acknowledged the inspectors observation.
- The licensee took immediate actions to correct the problem: (1) a 45-gallon drum containing low enriched uranium was moved to an alternate

location, (2) the storage location was posted out of service, (3) Plant Engineering was contacted to initiate an Engineering Change Notice (ECN) to encase the line, and (4) the LCSS initiated a CSCAR that included corrective actions to prevent recurrence. The corrective actions to prevent recurrence involved (1) completely encasing the line above the moderation control area, (2) complete a joint walk-down of all moderation control areas by Operations and the CSC, and (3) correct any noted deficiencies.

Inspection reports during the past two years have described licensee identified problems and NRC identified concerns relative to moderation control at SPC. As a result of these concerns and as part of the licensee's CSA update program, the licensee has made several evaluations and walked down systems to identify and remedy similar moderation control problems. Although the observation concerning the acid line in the UNH facility did not appear to represent an immediate significant safety problem and immediate actions were taken to correct the problem, the condition was identified as a violation of License Condition No. S-1 and will be cited because the criteria specified in Section VII.B of the NRC's Enforcement Policy were not satisfied (70-1257/94-03-02).

The licensee's overall performance in this area appeared adequate and their program appeared capable of accomplishing its safety objectives. The apparent violation did not represent a significant safety problem. However, it was an indication of a need for a ongoing rigorous formal program to preclude similar occurrences in the future. One violation was identified.

2. Operations Review (88020)

In addition to the observations made in Section 1 above, during facility tours the inspector observed that structural integrity of SNM storage racks and storage of SNM materials were in accordance with the licensee's criticality safety analyses and license conditions. Sealed SNM storage containers were adequately labeled with the uranium content and enrichment. As applicable, inventory records at work stations were up-to-date and indicated that no over batching had occurred. Spacing of SNM within and between other SNM storage arrays was consistent with the licensee's CSSs. The integrity of chemical processing systems appeared good and there was no free standing SNM bearing liquids. The handling of UF₆ cylinders appeared consistent with the licensee's operating procedures and industry practices. The inspector also observed that the exhaust ventilation systems appeared to be fully functional. Pressure drops across the main filters were within the limits specified in the license.

On March 23, 1994, the inspector observed on-the-floor training of operators for startup of the licensee's mega blender. This system has been shut down since July 1992 due to potential moisture problems that initiated the issuance of a Confirmatory Action Letter dated July 17, 1992. The CAL was closed by letter dated January 21, 1994. The training was being provided by the Manager, Process Engineering who detailed each piece of equipment with emphasis on modifications, operating procedures, criticality safety devices and criticality safety requirements. The operators were occasionally asked to

recite the instructions provided which were repeated as necessary. Such training was to be completed for all operations personnel and engineers involved with this system prior to restart of the blender which will be under engineering control.

Regarding house keeping practices, the inspector observed a general overall improvement in the appearance of the licensee's facilities. The licensee had initiated a campaign of improved housekeeping and painting of fuel processing and handling areas. On March 25, 1994, the inspector toured selected areas of the UO₂ Building with the Manager, Plant Operations and the LCSS. While the general work area appearances were good, the inspector pointed out areas where there was room for improvement such as storage of cleaning equipment and tools and/or leftover bits of metal located in discrete locations from previous maintenance activities. The inspector also pointed out some process vessels that were clearly marked with either their tank number or name of tank, while some process vessels showed no identification. Unlabeled equipment can be prone to operator error, especially in emergency situations. The inspector's observations during this tour were acknowledged by the accompanying manager.

The licensee appeared to be maintaining their previous level of performance in this area and their overall program appeared capable of accomplishing its safety objectives. No violations or deviations were identified.

3 Followup

3.1 Confirmatory Action Letter (CAL) 5-94-001 - (Closed) - (92703)

This CAL dated March 9, 1994, detailed the agreement between the SPC and the NRC resulting from an event on March 7, 1994, involving the licensee's discovery of an invalid limiting assumption in the CSAs associated with the ammonium diuranate (ADU) processing systems. This discovery was made as part of the licensee's on-going CSA update program. The CSC requested ADU samples to be taken from certain locations of the ADU process to confirm the original assumption. The analysis of the samples yielded results greater than the original assumption (0.85 gU/cc) for the ADU the Line 1 process off-gas (POG) duct (about 1.1 gU/cc), Line 2 POG duct (about 1.1 gU/cc), and Line 1 dryer discharge (about 1.3 gU/cc). The analysis of the centrifuge discharge to the Line 2 dryer indicated a uranium density of about 0.67 gU/cc which was in the bounds of the original assumption. The Line 1 ADU system was shut down for scheduled maintenance and enrichment clean-out and the Line 2 ADU system was operating at the time of the discovery. In the CAL, the NRC confirmed SPC's commitments that (1) the affected Line 1 and Line 2 ADU systems had been shut down, (2) SPC would perform new CSAs for affected processes and equipment and confirm all limiting assumptions, (3) SPC would not restart the Line 1 and Line 2 ADU process systems until management was satisfied that the new CSAs have been completed in conformance with license conditions, and (4) Siemens would inform the NRC Region V office prior to restart.

By telephone and facsimile on March 11, 1994, SPC informed the NRC Region V office (1) of the findings and conclusions of the circumstances related to the event, (2) that the affected CSAs had been revised using a new conservative limiting assumption for the uranium density in ADU, resulting in new

criticality safety specifications, and (3) of Siemens intent to restart the ADU process systems.

Based on discussions with cognizant licensee personnel, a walk-down of the ADU systems, and a review of licensee procedures and CSA amendments, "Line 1 and Line 2 ADU Dryers," and "Line 1 and Line 2 POG Ducts," dated March 10, 1994, the inspector verified that the corrective actions planned had been implemented prior to restart of the ADU systems. Regarding the original assumption of 0.85 grams U per cubic centimeter (gU/cc), the inspector noted that the licensee maintained several documents of tests and evaluations from 1971 through 1981 that provided the technical basis for the licensee's assumption. The licensee's finalized investigation report (TCP:94:039, "IIB for ADU Conversion Process," dated March 22) determined that the original studies concluded that the density of ADU centrifuged above that for normal operations to be the limiting condition for ADU and that only ADU would be picked up in the POG duct system. The original studies did not take into account the potential density increase which occurs when ADU is compacted (dryer feed screws) and/or dried. Also, previous process changes could potentially result in U material (UO_2 from the off-gas of the calciner recycle system) other than ADU entering the POG system.

The inspector noted that the amended CSA for the dryers was conservatively based on the theoretical density of dry ADU (6.27 g/cc) and optimum moderation and full water reflection. The corresponding uranium theoretical density for U is about 4.8 gU/cc before water is added. The CSA determined that the Line 1 dryer was geometrically safe. However, the lid of the Line 2 dryer had to be lowered two inches to assure the maximum allowed height of ADU could not be exceeded. During plant tours, the inspector verified that the Line 2 dryer lid had been modified. Keno Va was used to model the dryers and calculate the K_{eff} values for various amounts of uranium at various densities and water content. The CSA showed that the maximum K_{eff} , including uncertainties and bias was less than 0.95 for normal conditions, and less than 0.97 for abnormal conditions which was justified by a sensitivity analysis in accordance with Section 4.2, Part I of the license application. The basic limit of the dryers for ADU was determined to be enrichment (≤ 5.0 wt.% U-235), based on the design features and configuration of the system.

The CSA for the dryer POG ducts determined that fully reflected ADU at 0.85 gU/cc is critical at about 13.2 inches diameter and moderated UO_2 compounds with the density of the material sampled can be critical in 12 inch diameter ducts. The major portion of the ducting is 10 to 12 inches in diameter, except for a Y section of the Line 1 system which exceeds 13 inches in diameter. To compensate for the unfavorable POG ducting, the CSA specified new limits and controls to prevent unsafe accumulations of ADU in the ducts: (1) Inspection of the POG system every 5 days for unusual accumulations of U bearing compounds, (2) cleaning of the POG system every 10 days of operation, (3) supervision shall verify the adequacy of every clean-out before placing the system back in service, and (4) if the buildup of material in the ducts exceeds 2 inches, the CSC shall be notified immediately to evaluate the need to increase the required clean out frequency. The inspector noted that operating procedure P66,917, "Process Vessel Vent Systems," Revision 5, had been revised to reflect the new requirements for cleaning out the POG system.

As a long term solution, the licensee will be modifying the POG system to a favorable geometry system and install a device to reduce the buildup of uranium bearing materials in the ducts.

The licensee also performed a generic implication review and evaluation of the tankage system associated with the process using the maximum theoretical density of ADU. No problems were identified from the licensee's review. The inspector verified the licensee conducted a startup Council review of the evaluations and the Line 2 dryer lid modification prior to restart of the system, which was approved by the Plant Manager.

The inspector did not identify any safety concerns with the licensee's evaluations and approval for restart of the ADU process systems. The inspector also verified that the required inspections and clean out of the ducts were being conducted in accordance with the requirements of the CSS and operating procedure. The assumptions in the CSAs appeared conservative and second party reviews had been performed. The inspector concluded that the licensee had completed the commitments delineated in the CAL and had no further questions regarding this matter.

3.2 Corrective Actions for Previous Violations (92702)

Based on the review of selected licensee procedures, training records, and discussions with licensee personnel, the inspector verified the corrective actions taken to correct the violation and those to prevent recurrence of the following violations as stated in the licensee's timely response dated March 4, 1994.

70-1257/94-01-01 (Closed): Failure to inform workers of the new occupational dose limits as specified in 10 CFR 20.1201(a)(2).

70-1257/94-01-02 (Closed): Failure to develop and implement a program to ensure compliance with 10 CFR 20.1208(a) and (b), "Dose to an embryo/fetus," and 20.2106(e).

The inspector had no further questions relative to these violations and they are considered closed.

3.3 Inspector Followup Items (92701)

70-1257/93-03-06 (Open) - Review of the Licensee's Criticality Safety Analysis (CSA) Update Program

This long term action item has been described in previous inspection reports and licensee correspondence to the NRC. Although none of the 32 identified system CSAs had been completed under this program, the licensee appeared to be within its planned Phase III schedule. Two systems, Line 1 Vaporization and Line 1 UO₂ Powder, were undergoing second party review and would be completed in the near future. The licensee's schedule to complete all 32 system CSAs remains at January 31, 1995. The inspector noted that the CSA update as-built verification/update program was about 50% completed and several of the major systems were 90-99% completed. During a discussion with the Manager,

Mechanical/Chemical Engineering, the inspector was informed that procedures for maintaining as-builts current were only in the conceptual stage. The inspector questioned the licensee representative as to the method to assure that verified and updated as-builts are maintained current for subsequent plant modifications. The inspector was informed that when these procedures are developed, Engineering Change Notices, for plant modifications completed after an as-built has been verified, will have to be re-reviewed for the affected system and as-builts up dated accordingly. The inspector viewed the absence of procedures to assure as-builts are maintained current as modifications take place as a weakness in the licensee's CSA update program. It is important to maintain configuration drawings current because they are used by the CSC in the performance of CSAs, including support in accident scenarios. This weakness was also discussed at the exit briefing.

The licensee's CSA update program will continue to be reviewed in future inspections and remains open.

ATTACHMENT

1 Persons Contacted

1.1 Licensee Personnel

- *B. N. Femreite, Plant Manager,
- *R. E. Vaughan, Manager, Safety, Security and Licensing
- *M. K. Valentine, Manager, Manufacturing Engineering
- *L. J. Maas, Manager, Regulatory Compliance
- *J. B. Edgar, Staff Engineer, Licensing
- *B. F. Bentley, Manager, Plant Operations
- *R. L. Feuerbacher, Manager, Materials and Scheduling
- *T. C. Prcbasco, Supervisor, Safety
- *C. D. Manning, Criticality Safety Specialist
- *R. K. Burklin, Health Physicist
- *E. L. Foster, Supervisor, Radiological Safety
- *J. J. Payne, Shift Supervisor, Chemical Operations

In addition to the personnel listed above, the inspector contacted other personnel during this inspection.

* Denotes personnel present at the exit briefing conducted on March 25, 1994.

2 Exit Meeting (30703)

On March 25, 1994, the inspector met with the licensee representatives to discuss the findings of the onsite inspection. The observations described in the report were discussed with the licensee representatives. The licensee was informed of the IFI and the violation identified in Section 1 of the report.

APR 7 1994

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

Siemens Power Corporation
2101 Horn Rapids Road
P. O. Box 130
Richland, Washington 99352-0130

Attention: Mr. B. N. Femreite, Plant Manager

SUBJECT: NRC INSPECTION REPORT NO. 70-1257/94-03 (NOTICE OF VIOLATION)

This refers to the routine inspection conducted by Mr. C. A. Hooker of this office on March 21-25, 1994. The inspection included a review of activities authorized for your Siemens Power Corporation facility in Richland, Washington. At the conclusion of the inspection, the findings were discussed with you and those members of your staff identified in the enclosed report during an exit briefing conducted on March 25, 1994.

Areas examined during this inspection are described in the enclosed inspection report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observation of activities in progress.

Based on the results of this inspection, certain licensed activities appeared to be in violation of NRC requirements, as specified in the enclosed Notice of Violation (Notice). The violation is of concern because the involved equipment had already been re-evaluated by your Criticality Safety Analysis (CSA) Update Program and the problem identified by the NRC inspector was not recognized by your staff. A related concern identified during this inspection involves your program for maintaining up-to-date plant configuration drawings. Both of these issues relate to the quality of your CSA Update Program.

The last routine NRC/Siemens management meeting was in December 1993. The findings of this inspection, the NRC regional organizational changes, and the necessity for frequent information exchange warrant another management meeting. We will be contacting you in the near future to establish a mutually agreeable date and agenda. We propose having this meeting at your Richland facility.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. In your response, you should document the specific actions taken and any additional actions you plan to prevent recurrence. After reviewing your response to this Notice, including your proposed corrective actions and the results of future inspections, the NRC will determine whether future NRC enforcement action is necessary to ensure compliance with NRC regulatory requirements.

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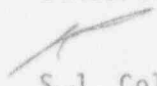
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In accordance with 10 CFR 2.790 of the Commission's regulations, a copy of this letter and the enclosed inspection report will be placed in the NRC's Public Document Room.

The responses directed by this letter and the enclosed Notice are not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, Pub. L. No. 96-511.

Should you have any questions concerning this inspection, we will be glad to discuss them with you.

Sincerely,



S.J. Collins, Director
Division of Radiation Safety
and Safeguards

Enclosures:

- 1. Notice of Violation
- 2. Inspection Report No. 70-1257/94-03

cc w/enclosures:

State of Washington
L. J. Maas, Manager, Regulatory Compliance

bcc w/enclosures:

- PDR
- Inspection File
- J. Callan
- K. Perkins
- S. Collins
- F. Wenslawski
- C. Cain
- G. Sanborn
- C. Hooker
- G. Cook
- R. Pierson, NMSS/FCLB
- M. Adams, NMSS/FCLB
- J. Roth, NMSS/FCOB
- R. Bellamy, RI
- D. Collins, RII
- J. Grobe, RIII

RIV:WCFO	RIV:WCFO/MB	RIV:DRSS
CHooker	FWenslawski	SCollins
04/6/94	04/7/94	04/7/94