SIEMENS

February 26, 1993

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Gentlemen:

Re: Follow-up to NRC Bulletin 91-01 Report No. 24955 - Overfilling of Sintering Boats

On January 27, 1993, Siemens Power Corporation (SPC) reported a criticality safety incident to the NRC Operations Office per NRC Bulletin 91-01. SPC internal procedures require a 30-day written follow-up report of the initial telephone report. This letter fulfills this requirement.

Background

SPC utilizes pellet presses to press uranium dioxide (UO_2) powder into "green" pellets which are subsequently processed through sintering furnaces. Specific pressing and sintering conditions are defined in a pelletizing parameter sheet. Pellets exiting the pellet presses are transported single file on a 3/4-inch wide metal conveyor and are loaded into a molybdenum sintering boat following the instructions on the pelletizing parameter sheet. The sintering boats are nominally 11 3/4 inches long by 8 3/8 inches wide by 3 1/2 inches deep. The first boat filled is inspected by the operator to determine if the boat loader is set up correctly; if necessary the loader is adjusted by the operator to achieve the desired fill. During production pelletizing this initial set-up usually results in uniform boat loading from that point on because all the pellets have essentially the same dimensions and density.

Filled boats are removed from the boat loading enclosure and queued at a storage table while awaiting processing through the sintering furnace. The system of storage tables consists of 36 north-south rows of boats, each holding up to six boats per row. The green pellet storage tables have two tiers separated by 12 inches. One of the criticality safety requirements for the storage tables limits the pellet depth in each boat to a maximum of 3.6 inches.

Description

At 0450 hours during graveyard shift on January 27, 1993, an operator and shift supervisor noticed that some sintering boats, which had been pressed and loaded on the previous shift, were filled with a portion of the pellets extending above the side of the boat. The shift supervisor measured the depth of the pellets inside the boat that appeared to have the most pellets and measured the approximate depth of the pellets in other boats based on outside

Siemens Power Corporation
Nuclear Division - Engineering and Manufacturing Facility
2101 Horn Rapids Road, PO Box 130 Richland, WA 99352-0130 Tel: (509) 375-8100 Fax: (509) 375-8402

IE12
1/0

measurements. The shift supervisor determined that the maximum pellet depth at the peak was 4.25 inches with about 4 inches being the most typical. The shift supervisor determined that 38 of 42 sintering boats loaded on the previous shift exceeded the maximum allowed slab height.

Immediate Corrective Actions

Upon discovery of the overloaded boats, the following immediate response/corrective actions were undertaken:

- Overfilled sintering boats were rearranged so that each row of boats was separated from the next by an empty row.
- The Criticality Safety Specialist was notified by the shift supervisor of the situation (0455 hours).
- Under the direction of the Criticality Safety Specialist, pellets in the overfilled boats were leveled off to meet the 3.6-inch maximum height requirement. In all cases the pellets could be accommodated within the boat without any of the pellets extending above the sides of the boat.
- The General Area Supervisor was contacted and apprised of the incident.
- A telephone report was made to the NRC Operations Center in accordance with NRC Bulletin 91-01 based on a substantial degradation in a controlled parameter. However, due to other controls in place, a criticality accident was not possible.

Cause

A four person team representing Operations, Engineering, and Safety, Security and Licensing was convened to investigate and determine root causes for this incident. Using the Tap Root™ methodology, the team identified the following root causes under the category of "Human Machine Interfaces:"

- Controls (in place to determine when sintering boats are overfilled) less than adequate.
- Complex system - technician monitoring more than three items at once.
- Pelletizing technician monitoring alertness (for pellet depth in the center of sintering boats) less than adequate.

The team also identified two other causes that may have contributed indirectly to the incident. These causes are associated with the fact that the powder lot involved in this incident was

being processed in the "Press-Sinter-Scrap" mode i.e. being pressed and sintered strictly to produce U_3O_8 addback material for blending into subsequent UO_2 powder lots. Press-Sinter-Scrap pelletizing parameters are usually prepared to maximize pelletizing rates and therefore permit relatively wide dimension and density variance compared to normal production material. Press operators had difficulty maintaining pellet density and dimension parameters. Under normal conditions for production lots, such difficulties would not have been accepted by the operator; shutdown of the press and contact of Process Engineering would have occurred. However, since this particular lot was being processed to be later scrapped, pelletizing was continued. The resultant pellets were longer than the pellets used to initially set the boat loading conditions, thereby resulting in more material being loaded into the boats. More specifically, contributory causes associated with the Press-Sinter-Scrap processing were:

- Pelletizing was continued without contacting Process Engineering even though pelletizing parameters could not be maintained, because Process Engineering routinely authorized continued operation since it was scrap material.

- Management systems feedback was not adequate to provide information on pelletizing problems associated with Press-Sinter-Scrap material to personnel involved in preparing and prepping the powder. If the powder was produced or prepped differently, the powder characteristics that led to the pelletizing problems may have been avoided.

Corrective Actions

The following corrective actions were identified to provide an engineered solution to the detection/automatic suspension of boat overloading as well as to address the contributory causes related to Press-Sinter-Scrap processing:

1. Provide a full boat gauge at the discharge of the boat loader to detect over-filled boats and to automatically suspend additional boat loading. This will provide an engineered back-up control measure to supplement the procedural/visual monitoring controls provided by the press operator.

2. Control conversion process parameters during Press-Sinter-Scarp production to produce powder that will feed well and minimize downstream pelletizing problems.

3. Impress on all Process Engineering/Operations personnel that all required parameters must be followed regardless of end product. Pelletizing operations must be stopped and corrective measures applied when parameters cannot be met.

February 26, 1993

4. Define only those pelletizing parameters for Press-Sinter-Scrap processing that really need to be controlled. This will help to reinforce the attitude that all called-out parameters need to be met.

Actions 2,3, and 4 have been addre· ia written communication and/or documented training provided within Process Eng...e..ng and Plant Operations. The equipment to detect overfilled boats and automatically suspend further boat loading has been installed on all five pellet presses in the plant.

Questions regarding SPC actions in response to this situation can be directed to me (509) 375-8537.

Very truly yours,

Loren Maas

Loren Maas, Manager
Regulatory Compliance

LJM:pm

cc: J. B. Martin, NRC
E. G. Adensam, NRC HQ