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JUN 23 1993

Release Rtf.

MEMORANDUM FOR: Robert L. O'Connell, Allegation Coordinator, NMSS

FROM: John A. Grobe, Chief, Fuel Cycle and Decommissioning Branch, Region III

SUBJECT: REVIEW: ALLEGATION NUMBER: NMSS-93-A-0005 COMBUSTION ENGINEERING-HEMATITE SITE, FAILURE IN REPORTING LOSS OF CRITICALITY CONTROL UNDER BULLETIN 91-01

This is in response to your memorandum of April 21, 1993, requesting George M. France, III of my staff to provide assistance in resolving the subject allegation. Our review of licensed activities was conducted on April 26-30, 1993, and discussed in the attached copy of Inspection Report No. 70-0036/93001. Based on our findings, there is no bases to the "allegation" that the licensee fails to report the loss of a criticality control.

The inspector conducted interviews with cognizant staff and operator personnel, reviewed records of criticality safety audits, and corrective actions to audit findings, and did not identify any incidents that required reporting under the licensee's criteria developed for Bulletin 91-01.

The only significant degradation of a criticality control covering the January 1992 through April 1992 operating period involved the potential loss of boron in Raschig rings. The licensee reported this incident on April 1, 1993, under Bulletin 91-01. However, the report was withdrawn. A bias in the standard used by the licensee's vendor resulted in an analysis for boron that was less than the concentration allowed by the ANSI Standard, ANSI/ANS-8.5. The vendor corrected the error and the actual concentration of boron in the Raschig rings met the level required by ANSI standard ANSI/ANS-8.5.

If you have any questions concerning this inspection, please contact George M. France, III of my staff at (708)790-5786.

Original Signed by John A. Grobe

John A. Grobe, Chief
Fuel Cycle and Decommissioning Branch

Enclosure: Inspection Report
No. 70-0036/93001(DRSS)

cc w/o enclosure:
R. W. DeFayette, RIII
D. E. Funk, RIII
C. E. Norelius, RIII
J. T. Greeves, NMSS

RIII	RIII
France/jp	Grobe
06/23/93	6/23

Z-5

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

April 21, 1993

MEMORANDUM FOR: Don Funk
Allegation Coordinator, RIII

FROM: Robert L. O'Connell
Allegation Coordinator, NMSS

SUBJECT: ALLEGATION INFORMATION

During a telephone conversation today between John Greeves, NMSS, and George France, Region III, regarding allegation NMSS-93-A-0005, Combustion Engineering, Inc. (CE), it was agreed that Region III would provide assistance in looking into licensee reporting pursuant to NRC Bulletin 91-01 during the next inspection of CE. To assist in that regard, I am forwarding copies of some of the allegation information. We are not asking that you open a new allegation, but merely see that this information gets to George France.

Robert L. O'Connell

Robert L. O'Connell

Enclosure: As stated

A L L E G A T I O N M A N A G E M E N T S Y S T E M

ALLEGATION NUMBER - NMSS-93-A-0005 RUN DATE: 03/10/93

DOCKET/FACILITY/UNIT: 07001100 / COMBUSTION ENGINEERING, INC. /
DOCKET/FACILITY/UNIT: / /
DOCKET/FACILITY/UNIT: / /
DOCKET/FACILITY/UNIT: / /

ACTIVITY TYPES - MATERIALS OTHER
NMSS; FUEL FACILITY; CRITICALITY REPORTING

MATERIAL LICENSES - SNM-1067

FUNCTIONAL AREAS - OPERATIONS ONSITE HEALTH AND SAFETY

DESCRIPTION - NOT REPORTING INCIDENTS RELATED TO LOSS OF CRITICALITY CONTROLS.

CONCERNS -
1

SOURCE - FORMER LICENSEE EMPLOYEE CONFIDENT - NO

RECEIVED - 930219 BY - F WENSLAWSKI / RV

ACTION OFFICE CONTACT - S SOONG

RESPONSIBLE PGN OFFICE - M VIOLATION SECTION 210 ALLEGED - NO

STATUS - OPEN SCHED COMPLETION - 930930 DATE CLOSED -

ALLEGATION SUBSTANTIATED - ALLEGER NOTIFIED -

OI ACTION - OI REPORT NUMBER -
REMARKS - ARB REVIEWED 3/8/93. FCLB ASSIGNED LEAD - WILL CONTACT ALLEGER TO CLARIFY ALLEGATION AND WILL WRITE LETTER TO ENVELOPE ALLEGER'S CONCERNS. FCLB WILL CONDUCT REVIEW OF RESPONSES TO BULLETIN 91-01 SUBMITTED BY CE AND SIEMENS. FCLB WILL CONTACT RI RE POSSIBLE INSPECTION OF CE TO DETERMINE WHETHER CE IS REPORTING ALL INCIDENTS IT IS SUPPOSED TO.

ENTERED SYSTEM - 930305 CLOSED SYSTEM - RECORD CHANGED - 930309

From: Michael B. Blume (MBB)
To: FRH
Date: Friday, February 19, 1993 1:41 pm
Subject: 2/19/93 ARBs

Combustion Engineering (MO and CT facilities):

EX. 6

EX. 6

While at Siemens on the AIT, Ray Vaughan, a Siemens mgr. and a former plant mgr. at CE/Windsor, CT, said to Frank Wenslawski that the NRC is treating Siemens differently than other licensees, specifically CE, because Siemens reports events per Bulletin 91-01, whereas CE reports nothing. While Frank feels certain that Vaughan did not interpret this as an allegation, and Yuhas feels that it should be treated as an inspection finding instead, we (Frank and I) wonder whether it should be for tracking purposes. Frank said that he'd call RI and RIII today to alert them to the issue. NB, according to Hooker, that in the past 2-3 years, CE has made no such reports, GA made 1, Siemens 7, GE 6, NFS 4, and B&W 8.

Yuma Proving Ground, RV-93-A-0005:

3 concerns: 1) violation of 19.12 requirement to inform workers of hazards of radiation ..., 2) H&I (atmosphere that discourages workers from raising safety concerns; 3) no film badge contra RP requirements (need to modify concerns listing in AMS). ARB decided to send ltr to union president (the contact listed by the alleger) listing the concerns and stating that the only way to follow up on the concerns is to refer the concerns to the licensee, and that we intend to do so within 30 days of the letter unless he/they object.

LIMITED DISTRIBUTION

ALLEGATION REVIEW BOARD

SUMMARY

Allegation Number: NMSS-93-A-0005 Combustion Engineering

1. The NMSS Allegation Review Board met on March 8, 1993, at 3:10 p.m. in 6H4.

2. Present at the meeting were:

   J. Greeves, Deputy Dir. FCSS, Chairman
   E. Adensam, Chief, FCLB
   M. Klasky, FCLB
   R. O'Connell, OAC
   S. Soong, FCLB
   M. Adams, FCLB

3. Facilities involved: Siemens, Combustion Engineering, other fuel facilities

4. Description: CE not reporting incidents related to loss of criticality control

5. Allegation assigned to FCLB for resolution.

6. Safety significance: not yet determined.

7. Priority: normal.

8. A copy of the allegation will be provided to OI for review.
   A copy will also be referred to OIG pursuant to MD 7.4.

9. The following resolution plan & schedule was approved by the ARB:

   Mark Klasky & Sean Soong, FCLB, will talk to RI and RV, and then will talk to alleger to establish more clearly and precisely what his allegation or contention is. FCLB will then write an acknowledgement letter to alleger enveloping his concerns. FCLB will review Bulletin 91-01 responses submitted by Siemens and CE. FCLB will contact RI re possible inspection of CE to determine whether CE is reporting all that it is supposed to be reporting. Board will meet again in approximately two weeks to consider progress and further action.

Activity	Due Date
a. Acknowledgement letter	3/19/93
b. Review responses to 91-01	3/19/93
c. Inspection	TBD
d. Next ARB review	3/22/93
e. Closure letter	TBD

10. Prepared by: R. L. O'Connell, NMSS OAC — Date: 3/9/93

11. Approved by: J. T. Greeves, Chairman, ARB — Date: 3/9/93

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A M S

ALLEGATION MANAGEMENT SYSTEM

NOTICE

TO BE USED AS AN IDENTIFICATION SHEET
FOR ALLEGATION RELATED CORRESPONDENCE
FORWARDED TO EICS.

THE ATTACHED CORRESPONDENCE CONTAINS
ALLEGATION RELATED MATERIAL

AMS NO. NRSS-93 -A-0005
FACILITY: Combustion Engineering Hematite
PAGE NO. pages 14-16
PARAGRAPH NO. Inclusive

A M S

ALLEGATION MANAGEMENT SYSTEM

Paragraph 15: ALLEGATION ACTION PLAN (Cont'd)

ALLEGATION/PERIPHERAL ISSUE ACTION PLAN

Concerns and any peripheral issues associated with a concern should be documented on a separate page. Each concern and peripheral issue, if any, should be documented in the followup report as is stated in this plan. If there are several concerns in one area, one page can be used. Otherwise, a separate page should be used for each concern.

/____/ Concern No.

NMSS-93-A-0005

/____/ Peripheral Issues Associated with Concern No.

I. Action Evaluation: The following method of resolution is recommended (circle):

A. Send to Licensee Requesting Response in ___ Days with RIII Followup*
B. Priority RIII Followup
C. Followup During Routine Inspection Within 60 Days
D. Followup with Assistance from OI
E. No Action - Outside NRC's Charter (describe basis below)
F. No Action - Without Merit (describe basis below)
G. Refer to _____
H. Other (specify)

* If the proposal is to send to the licensee, the Action Plan should describe the general areas we expect the licensee to address.

II. Inspector's Actions: The following areas at a minimum will be reviewed during the inspection into the above mentioned concern and/or peripheral issue.

A. Objective To determine if the licensee had a loss in criticality safety control or barriers (parameters) that led to a reportable event under Bulletin 91-01, and to whether such events were documented, reported or not reported.

B. Methods

1. Persons to be contacted: Hal Eskridge, Mgr. Regulatory Compliance, Stan Borell, Manager Chemical Operations, Cliff Christopher, Engineering, Process, ~~other~~ operators, process.

2. Documents and/or activities to be reviewed: Criticality Safety Audits, Safety Meeting Minutes, Operations travelers, Foreman/operator logs, QA work sheets on moisture control.

3. Time period to be covered: January 1992 → Present

4. Locations/specific areas to visit:
Wet Scrap Recovery / Criticality Storage Arrays

5. Other areas (specify): Equipment involving moisture control. Storage of Pellets in shipping containers

Allegation No. RIII-____-A-_____

JUN 7 1993

Combustion Engineering, Inc.
ATTN: James A. Rode
Plant Manager
P. O. Box 107, Highway P
Hematite, MO 63047

License No. SNM-33
Docket No. 70-0036/93001

Dear Mr. Rode:

This refers to the routine announced inspection conducted by Mr. Kenneth Lambert and Mr. George M. France, III, of this office on March 15-16 and Mr. Raymant Glinski and Mr. France, of this office on April 26-30, 1993, of activities authorized by NRC Special Nuclear Material License No. SNM-33, and to the discussion of our findings with you and your staff after the inspection. The report also includes discussion on the material submitted by Mr. Eskridge of your staff on May 4, 1993, regarding the recycle blending of waste solutions, and the telephone discussion of May 26, 1993, with Mr. Eskridge regarding criticality safety in laboratory operations.

The enclosed copy of our inspection report identifies areas examined during the inspection. Within these areas, the inspection consisted of a selective examination of procedures and representative records, observations, and interviews with personnel.

No violations of NRC requirements were identified during this inspection. However, five concerns described in the enclosed inspection report need additional management attention. Your actions to correct these concerns will be reviewed during a future inspection.

According to 10 CFR 2.790 of the Commission's regulations, a copy of this letter, the enclosure, and your response to this letter will be placed in the NRC Public Document Room.

We will gladly discuss any questions you have concerning this inspection.

Sincerely,
Original Signed by John A. Grobe

John A. Grobe
Fuel Cycle and Decommissioning

Enclosure: Inspection Report
No. 70-0036/93001(DRSS)

See Attached Distribution:

RIII	RIII	RIII	RIII
GMF III (ES)	K.L (YES)	RG	
France/jp	Lambert	Glinski	Grobe
06/07/93	6/7	6/7	6/7

Combustion Engineering, Inc. 2 JUN 7 1993

Distribution

cc w/enclosure:
Dr. R. S. Siudek, President,
ABB CE Nuclear Fuel
Mr. S. B. Junkrans, Vice President,
Manufacturing Operations
Mr. A. E. Scherer, Vice President,
Regulatory Affairs
Mr. L. Grossman, Director, Manufacturing
Technology, Nuclear Fuel
Mr. C. B. Brinkman, Manager,
Washington Nuclear Operations
Mr. J. F. Conant, Manager,
Nuclear Materials Licensing
Mr. H. E. Eskridge, Manager,
Regulatory Compliance
Mrs. Martha Dodson,
Concerned Citizen
Crystal City, MO
M. Tokar, NMSS/FCSS

bcc: PUBLIC

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 70-0036/93001(DRSS)

Docket No. 070-00036 License No. SNM-33

Licensee: Combustion Engineering, Inc.
Nuclear Power Systems
Windsor, CT 06095

Facility Name: Hematite Facility

Inspection At: Hematite, Missouri

Inspection Conducted: March 15 through 16, April 26 through 30, and May 4 and 26, 1993

Inspectors: George M. France, III — 6-7-93 Date
George M. France, III
Fuel Facilities Inspector

for Kenneth Lambert, — 6-7-93 Date
Radiation Specialist

Raymant Glinski, — 6-7-93 Date
Radiation Specialist

Approved By: John A. Grobe — 6-7-93 Date
John A. Grobe
Fuel Cycle and Decommissioning

Inspection Summary

Inspection on March 15-16, April 26-30, and May 4 and 26, 1993 (Report No. 70-0036/93001 DRSS))

Areas Inspected: This was an announced inspection of facility requirements specified in NRC regulations, license and license conditions, including a review of the following activities: The licensee's reporting requirement under Bulletin 91-01; chemistry of the uranium wet scrap recovery operations and the generic concern of the near criticality incident that occurred in the industry in 1991; the configuration of shelves in the uranium pellet storage and retrieval system, Criticality Safety (IP 88015); Operator Training and Retraining (IP 88010); Maintenance and Surveillance Testing (IP 88025);

Transportation of Radioactive Material (IP 86740); testing of HEPA filters in the work place, Operations Review (IP 88020); and Radiation Protection (IP 83822).

Results: Within the scope of the inspection, no violations were identified. The licensee's wet recovery program is adequate for minimizing the degradation of a criticality barrier. The licensee's implementation of Bulletin 91-01 concerns is adequate for reporting the loss of a criticality barrier.

However, five (5) concerns that need management attention were identified. A format should be established to assure that independent audits of the transportation program are in compliance with 10 CFR Part 71.137. The checklist for the transportation manifest should differentiate between exclusive and nonexclusive use shipments. The forms used to monitor training should be revised to specify training for new hires, contractors, or for operators scheduled for retraining. The visual inspection checklist should be used in the HEPA filter test procedure. On April 19-23, 1993, Inspection Report No. 70-36/93-201 submitted by the Material Control and Accounting Safeguards inspection program, showed that the licensee has not implemented a program to determine whether the maximum quantity of SNM in the laboratory areas is less than 740 grams of U-235 for criticality safety limits.

DETAILS

1. Persons Contacted

*S. Borell, Manager, Chemical Operations
*E. Criddle, Supervisor, Health Physics
*M. Eastburn, Criticality Safety Specialist (Hematite)
*H. Eskridge, Manager, Regulatory Compliance
*R. Fromm, Director, Quality Operations
*A. Keklak, Health Physicist
R. Klotz, Criticality Safety Specialist (corporate)
R. Moore, Supervisor, Maintenance
*R. Miller, Manager, Administration and Production Control
A. Noack, Manager, Facilities
*J. Rode, Plant Manager
R. Sanders, Production Scheduler (Pellet Plant)
D. Underwood, Systems Engineer
P. Weaver, Production Scheduler (Fuel Fabrication)

*Indicates licensee attendance at the exit meeting on April 30, 1993.

The inspectors also interviewed other licensee safety and production personnel.

2. License Program

The Combustion engineering facility at Hematite, Missouri, produces uranium dioxide (UO_2) fuel for the commercial nuclear power industry. Low enriched uranium hexafluoride (UF_6) limited to a maximum enrichment of 5% uranium-235 is shipped from the Department of Energy (DOE) uranium enrichment/gaseous diffusion facilities in 2 1/2 ton, 30 inch diameter cylinders. UF_6 is passed through a series of reactors (R-1, R-2, and R-3) and chemically treated with steam and hydrogen to form UO_2 oxide. UO_2 powder is pelletized, shipped to a fuel fabricator and prepared for commercial fuel.

The licensee is expanding its Hematite operation to prepare fuel bundles on site for the nuclear power industry. The first fuel bundles should be produced in mid-June 1993, subsequent to the completion of performance tests.

3. Radiation Protection (IP 83822)

An inspector reviewed the licensee's exposure control programs including, the bioassay data, required records, reports and notifications.

a. Monthly bioassay samples are analyzed by the licensee's corporate laboratory. Bioassay samples are collected quarterly. Individual sample results for first quarter 1993 were less than 40 MPC-hours. The highest result, 34 micrograms of soluble uranium per liter, is significantly less than the derived NRC intake limit of 9.6 milligrams (9,600 μg) soluble uranium in a work-week. No problems were identified.

On April 7-9, 1993, the licensee's contractor performed *in vivo* measurements on union and non-union workers. The contractor reported one significant measurement above the detection limit (63 μg) of uranium. This reported measurement of 155 +/- 44 μg is in the range of the permanent level carried by one worker due to a previous exposure. Historically, *in vivo* measurements are compared to the permanent level carried by the one worker to differentiate between a significant detection and instrument noise.

b. External Exposure Control

A review of the licensee's film badge data show that the highest exposure accumulation to any worker was 210 millirems through March 1993. Hence, there was no sign that film badge results exceeded the quarterly occupational dose of 3 rems (10 CFR Part 20.101 Radiation dose standards).

Dosimetry reports are tracked for visitors, contractors, and employees through the monthly dosimetry program. The highest exposure accumulation by a contractor was 10 millirems. The licensee's plant escort service for visitors, radiation safety orientation to contractor personnel, and work areas are managed with minimum radiation exposure.

c. Contamination Surveillance

According to the plant census 140 workers, 12 temporary workers, and a contractor's crew frequent the worker's change areas, office corridors, and the office lobby. The inspector observed that persons trafficking these areas made the appropriate exchange in work clothing and performed individual contamination surveillance in accordance with the posted instructions. An examination of surveillance data compiled from radiation surveys disclosed that contamination in these areas was less than the licensed limit of 200 disintegrations per minute per 100 centimeters squared (200 dpm/100 cm^2). A Health Physics Technician stated that workers were performing adequate surveys and that porters frequently wet mopped the areas. The inspector concluded that the licensee's radiation surveillance and maintenance program prevents the spread of contamination. No problems were noted.

The inspector concluded that the licensee's program for radiation exposure control as reviewed during this inspection, appeared to meet license conditions and regulatory requirements.

No violations or deviations were identified.

4. Maintenance and Surveillance Testing (IP 88025)

On January 14, 1992, the licensee notified Region III that maintenance procedures would be formalized, updated, and consolidated into a single document. During this inspection, the inspector confirmed that the licensee had revised the procedures and that the revisions delineated a significant portion of the licensee's maintenance practices.

About maintaining equipment used in handling SNM material, the inspector reviewed the following procedures:

Operating Sheet No. 4003 Material Handling Equipment

This procedure provides a checklist for maintaining the seven cranes used at the Hematite plant. It also references the annual inspection to be performed by the licensee's contractor on the crane designated for handling UF_6 cylinders.

Operating Sheet No. 4008 Press Oil Recycling

While the press is operating, uranium oxide powder may become entrained in the press oil. The oil is filtered and reused as press oil. The procedure provides instructions to the mechanics on precautions to take when performing maintenance on the pellet presses.

The upgraded maintenance procedures provide information to the mechanics about radiation, criticality, and industrial safety concerns.

During a future inspection, the inspector will review procedures that describe calibration of instruments associated with criticality control and moderation control. No problems were identified.

5. Training and Selection of Maintenance Personnel

The maintenance department includes a Maintenance Supervisor, 13 mechanics, 5 utility operators, and 3 porters. Most workers selected for assignment in the maintenance department were previously trained as oxide production operators. This supports the maintenance staff in handling equipment that may have been exposed to hazardous chemicals, radioactive materials, or other industrial safety concerns. Additionally, when needed, training in welding and electrical maintenance is performed off-site through the company sponsored educational program. However, most training is performed as on-the-job training. The inspector concluded that the licensee's method for selecting and training candidates for the maintenance department with the improvement shown in maintenance procedures supports the licensee's efforts to maintain a staff of qualified maintenance workers.

No violations or deviations were identified.

6. Transportation of Radioactive Material (IP 86740)

The inspector examined the shipping manifests that covered radioactive waste and uranium oxide pellet shipments. The inspector identified a minor concern with the licensee's preparation of shipping manifests. The format should be clear on distinguishing exclusive use shipments from nonexclusive use shipments. The safety significance is minor in that the shipping foreman is very knowledgeable in the use of the form. However, an uninformed shipping clerk may have difficulty using the current format. The inspector will examine a clarification of this format during a future inspection (Open Item No. 07000036/93001-01).

The shipping manifests also document that radiation surveillance is performed on outgoing shipments. The radiation dose rate on the shipments examined was 0.1 millirem/hour. The contamination wipe levels were less than 100 dpm/cm^2 which is significantly less than the limits listed in Table V of 10 CFR Part 71.87, of the NRC regulations.

According to NRC regulation 10 CFR Part 71.137, the transportation program should be periodically audited by members of the staff who are not accountable to the Manager responsible for transportation activities. The last audit was performed in 1991. The 1992 corporate audit was not clear as to its distinction to Part 71. The auditor did not reference that the audit was being performed according to 10 CFR Part 71.137, or whether the transportation activities complied with the licensee's quality assurance program. A format should be established to ensure that independent audits of the transportation program are in compliance with the regulation. This matter will be reviewed during a future inspection (Open Item No. 70-0036/93001-02).

No violations or deviations were identified.

7. Operator Training and Retraining (IP 88010)

The licensee acknowledged that most improvement of worker quality through training is derived through the on-the-job training concept. The inspector reviewed training records, held discussions with a shift foreman, an oxide operator, and the Health Physics Supervisor, and determined the following:

The shift foreman and the oxide operator presented a thorough description of on-the-job training from their respective positions. The foreman also maintains an up to date training schedule for workers under his supervision.

The HP Supervisor completed a recent 5 week course in Health Physics at the Oak Ridge training center, and has also improved his understanding of the licensee's UO_2 conversion process. Based on this review, the inspector concluded that the licensee had developed a competent staff to perform training requirements.

The licensee follows NRC regulation 10 CFR Part 19.12, "Instructions to Workers," which requires the licensee to inform workers about the use of radioactive materials or of radiation in the restricted area.

Attendance records of personnel receiving generic training, such as radiation protection, chemical hazards/toxins in the work place, etc., should be modified to identify attendees as either contractors, new hires, or seasoned operators. Other than through the knowledge of the records clerk, the inspector was unable to distinguish attendees by job category or by contractor. Consequently, the inspector was unable to audit the records and distinguish the relevant aspects of initial qualification and requalification training. The inspector will review this modification during a future inspection (Open Item No. 07000036/93001-03).

No violations or deviations were identified.

8. Operations Review (IP 88020)

The inspector toured the facility to observe conduct of operations in the licensee's uranium hexafluoride (UF_6) cylinder receiving area, the oxide pellet plant including the new control room, and the testing of HEPA filters.

a. The oxide pellet plant

Thermally hot, dry UO_2 oxide granules formed in the UF_6 conversion process are routed through a water screw type cooler and finally collected in a cooler hopper. The major criticality barrier for UO_2 oxide is moderation control. The moisture content of UO_2 oxide must be maintained at less than 1%, usually around 0.05%, for adequate flow through the oxide pellet process. This moisture content level is also well below limits established for criticality safety.

The inspector examined moisture data on the oxide collected at the cooler hopper and determined that the moisture content was typically less than 0.05%. In Inspection Report No. 70-0036/92005 the inspector reviewed an incident where the moisture level of UO_2 increased to about 1% and caused a jam in the cooler transfer system. The nuclear safety analysis of UO_2 oxide is based on moderation control and allows moisture levels up to 1%. However, as shown during this incident, oxide with a moisture level of 1% may jam the transfer system.

The inspector interviewed the Laboratory Supervisory, and an off-shift Quality Control Technician and observed a demonstration for checking the moisture level of UO_2 (Operating Sheet O. S. 504.8 Moisture Data Sheet, Virgin Powder Sensortech), the calibration of the Sensortech moisture measuring device, and the preparation of the UO_2 moisture standards.

The inspector concluded that standards for monitoring moderation were in place and UO_2 oxide was processed within the moderation control limits required by the nuclear safety analysis.

b. Control Room Activities

The inspector interviewed the manager of chemical operations, an off-shift foreman, and an operator on the backshift about the training requirements for operators and the operational aspects of converting plant process systems from an existing control room panel to modern control room computer logic.

The licensee has convereted over 75% of the input/output items including, switches, thermocouples, and readouts from the old control panel to new control logic. The new control logic will mirror the previous control panel and enable the operator to do the job more efficiently. Another advantage is that the control logic will retain a history of process upsets, and monitor process parameters such as, temperature and pressure on the three conversion reactors, R-1, R-2, and R-3. Operators can operate and

view safety systems such as, the backup valves installed on UF_6 and process steam lines.

After a generic training session and examination, and after the licensee installs a specified percent of the new control logic, operators receive one-on-one instruction from the process engineer. The inspector verified through interviews of two operators and records review that each operator received and understood the training.

The licensee stated that operator comments and recommendations are reviewed by management for possible process improvements. An example of operator input was demonstrated when the licensee changed the software to display graphs that show movement of SNM material in the fluidized bed on the computer screen in lieu of the movement normally displayed by pressure gages.

The inspector concluded that the transfer process and the understanding and use of the new logic system is proceeding adequately and in a timely manner.

c. Backshift Oversight

The Plant Manager informed the inspector that although the facility is experiencing upgrades in many areas, as well as new employees, the transition is being monitored. There is no sign that the level of supervisory staff should increase. Furthermore, several key staffers including the Emergency Director have residences less than 15 minutes from the plant. Many staff members have electronic beepers, and are on call. Additionally, the new rod loading facility will only operate during the day shift.

During future inspections, the inspector will continue to monitor licensee activities on the backshift.

d. Storage and Retrieval System (Kardex Unit)

To meet fuel rod loading requirements, the licensee installed a storage and retrieval system (manufactured by Kardex) in the new fuel rod plant, to handle several tons of uranium oxide pellets. The Kardex unit is made up of 6 modules. Each module is 20 feet in height and wide enough to accommodate pellet trays that are 2 square feet. Each module has an elevator controlled by computer logic for storing and retrieving the pellet storage trays.

On April 14, 1993, the licensee met with representatives from NRC HQ and Region III about the configuration of the shelf spacing in the Kardex unit.

In the license amendment application, the licensee stated that the shelves were configured to handle 330 trays. A nuclear safety analysis assumed a configuration of 360 shelves. The licensee performed an inspection of the Kardex unit and determined that the as-built configuration was 5 9/16 inches instead of the design

based 6 9/16 inches. The as-built configuration could accommodate 414 trays, albeit, it would not affect criticality safety that is based on moderation control.

Rather than change the license amendment application, the licensee chose to realign the shelves to the original design 6 9/16 inch spacing. NRC agreed to the licensee's choice with the understanding that the licensee would not load SNM material in the Kardex unit until the configuration was completed.

During the inspection, the inspector verified no uranium oxide was stored in the Kardex unit. To be sure of the shelf spacing, the inspector performed independent measurements of the spacing between 99 of the 330 shelves and calculated a statistical average of 6.54 +/- 0.037 inches @ 95% confidence limits. Based on these measurements, the inspector concluded that the configured shelf spacing is adequate to meet the as-designed dimension of 6.56 inches.

In resolving another inspector concern, the Quality Assurance Supervisor described how depleted uranium oxide pellets are maintained separately from SNM material. The licensee will use depleted UO_2 pellets to check out the operating features of the Kardex unit. Depleted UO_2 pellets were manufactured in December 1992, and placed in a storage vault, isolated from SNM material. No problems were identified.

e. <u>HEPA Filter Testing</u>

The inspector toured the facility to determine the number and location of HEPA filter housing assemblies. There are 22 filter housings in use. Three do not have testing ports and are scheduled to be replaced by the end of 1993. Each filter housing has two banks of filters in series, with each bank containing six HEPA filters. The exhaust systems and HEPA filter housings are under negative pressure compared to atmospheric pressure. The licensee has developed a procedure for DOP (Dioctyl Phthalate) aerosol in place testing of HEPA filters. This procedure provides step-by-step instructions for personnel conducting the tests. The procedure includes acceptance criteria for the percent leakage down stream of the filters. The acceptable percent leakage is 5% for the front filter bank and 0.3% for the back filter bank. HEPA filters are tested at initial installation, after being removed for visual inspection or when the filter seals are broken. The licensee only records acceptable leak tests results. Filters that do not pass the leak tests are reseated and retested. The inspector observed the DOP leak testing of one bank of filters in the filter housing for the UO_2 pellet drying process area. From the observation it appears that the licensee is following its procedures.

Testing of Nuclear Air Treatment Systems, ASME N510, is the standard that covers the requirements for field testing of high efficiency air-cleaning systems for the nuclear industry. This standard is arranged so only those tests that are relevant to each

particular user application may be selected. The inspector informed the licensee that current procedures should include applicable requirements of the standard to assure that HEPA filter systems are adequately tested. The licensee is not committed to following this standard in its current license. However, a commitment to perform HEPA filter testing is discussed in the license renewal application.

ASME N510 states that a visual inspection be conducted and the results recorded on the filter housing and filters before conducting the acceptance test. Through discussions with licensee representatives it appears the licensee may be conducting some of these checks, but is not documenting them as stated in ASME N510. The visual inspection and use of the checklist may identify areas requiring attention, before testing the filters, which if not corrected could lead to the failure of the DOP leak test. The inspector concluded that the licensee should modify its current procedures to include the visual inspection checklist. Modifications to the licensee's HEPA filter testing procedures and program will be reviewed during a future inspection (Open Item No. 70-0036/93001-04).

f. Receipt of Pressurized 30B Cylinders From Department of Energy Gaseous Diffusion Plants

According to the American National Standards Institute ANSI N14.1, UF_6 shall be shipped only after it has solidified and the vapor pressure of the cylinder has been measured to be below one atmosphere. Cylinders received at CE Hematite typically contain UF_6 under subatmosheric pressures, or vacuum, ranging from 14 to 27 inches of mercury.

On March 4, 1993, a representative of a fuel fabrication facility located in NRC Region II, reported that eight 30B cylinders (2 1/2 tons each) containing SNM material in the chemical form of UF_6 were received in a slightly pressurized condition. The slight pressure was caused by Freon-114, a liquid fluorocarbon used as a refrigerant in the gaseous diffusion process. The gaseous diffusion plant had failed to purge the Freon-114 from the UF_6 fill tank. The NRC notified all licensed UF_6 users.

During this inspection, the inspector reviewed the licensee's procedure for pressure checking incoming UF_6 cylinders for Freon-114.

CE Hematite developed a Shop Traveler (ST) to provide written instructions to operators for pressure checking incoming UF_6 cylinders.

Effective March 6, 1993, the licensee began pressure testing incoming UF_6 cylinders before heating the cylinders for the start up of the UF_6 to UO_2 conversion process. The cylinder valve is slightly opened and the vapor pressure of UF_6 is measured by a gage connected to the valve. The operator compares the measurement with a vapor pressure *vs* temperature plot prepared for

Freon-114. The operator log showed that during the March 6 through April 27, 1993, period operators pressure checked 18 cylinders. The UF_6 vapor pressure of all 18 cylinders was measured to be below one atmosphere. Hence, there is no sign that UF_6 cylinders received at the CE Hematite facility contain pressures above subatmospheric levels. The licensee plans to continue pressure checking UF_6 cylinders until DOE assures the industry that the problem has been resolved. In future operations, any cylinders received from foreign countries may also be pressure checked. The inspector concluded that the licensee has demonstrated the importance of thoroughly inspecting the cylinder and checking its cold pressure before heating, so any abnormalities can be detected and corrected.

No violations or deviations were identified.

9. Criticality Safety (IP 88015) Uranium Wet Scrap Recovery

The inspectors toured the facility and observed the uranium wet scrap recovery process and operator performance about compliance with nuclear criticality safety requirements.

Background This specific inspection of the licensee's wet scrap recovery process was in response to the potential criticality that occurred in a waste accumulation tank at the General Electric - Wilmington plant in May of 1991. The problems identified as contributing to the potential criticality at the GE site included the following: (1) accidental transfer of 150 kilograms of uranium to an unfavorable geometry waste treatment tank ("Unfavorable Geometry" refers to a container or vessel that can hold enough uranium to produce a criticality); (2) not enough mixing of uranium scrap recovery liquids stored in unfavorable geometry tanks before the tanks were sampled; (3) sampling of tanks before the tanks were filled; (4) not enough purging of sample lines before collecting a sample; and (5) a lack of QA/QC documentation regarding both procedures and results. These deficiencies resulted in GE Wilmington collecting non-representative samples. Consequently, sample analysis results were not indicative of the true concentrations of uranium in the tanks.

The uranium wet scrap recovery process at CE Hematite is a batch process. One of the obvious conservative features about the batch process is the location of the process equipment. The operator can see the entire wet recovery process in one room. Similar to the GE Wilmington process, the licensee processes scrap solutions through containers with unfavorable geometry. However, the total mass of uranium is batch controlled in five gallon pails. The supervisor schedules a calculated batch of SNM material for the wet recovery process. Once the operator has weighed and batch sized the scheduled amount, no additional accumulation of SNM material is transferred to unsafe geometry vessels. Boron impregnated Raschig rings are used in all three tanks as a secondary criticality control parameter. Unlike the problem identified at GE Wilmington, at Hematite, the process engineers have established mixing requirements for ensuring homogenous solutions for sampling each tank.

In addition, the licensee controls uranium concentration at low levels due to chemical process concerns. The licensee stated that the concentration of uranium in the blend tank was about 186 grams per liter. This provides additional criticality safety margin in that according to ANSI/ANS-8.5-1986, the Hematite system could allow a uranium concentration for 5% enriched uranium-235 homogenous solutions at 270 to 400 grams U/liter, for unlimited size tanks packed with Raschig rings. However, at these high concentrations uranium salts would probably form and cause stratification along the walls of the blend tank. Thus, the low concentration of uranium is maintained and the Hematite batch process is conservative.

The process has additional safety margin by metering the transfer of blend tank solution into a treatment trough, where solutions of peroxide and ammonia are added. This dilutes the concentration of the scrap solution from 186 to about 60 g U/liter before UO_4 precipitation occurs. The inspectors concluded that the Hematite wet scrap recovery process is designed and implemented with significant safety margins for criticality. This conclusion is based on the following discussion and observation.

Discussion The inspectors toured the wet scrap recovery process and interviewed the Manager of Chemical Operations, the Process Engineer, and the cognizant operator. The inspection emphasis was on the steps in the process where samples are taken, how the samples are taken and the sufficiency of recirculation to prepare homogeneous solutions for sampling and processing in the holding tanks. The inspector interviewed the Laboratory Supervisor, examined Quality Assurance analysis results, and the analyses that the laboratory performs in support of the wet scrap recovery process.

The laboratory samples waste solutions from three tanks with unfavorable geometry; a blend tank that holds the dissolved contents from all the buckets of scrap and two waste hold-up tanks that contain the dilute uranium supernatant from the UO_4 precipitation step. These tanks are packed with Rashchig rings above the overflow ports. The capacity of the blend and hold-up tanks are 2400 and 1120 liters, respectively and the tanks are sampled only after being filled to capacity and recirculated. At 186 grams U/liter, the blend tank contained about 600 pounds more than the 320 pounds that was discovered in an unsafe geometry vessel at GE Wilmington. However, the difference in the Hematite process is the presence of Raschig rings which allows for the greater mass of uranium.

The recirculation rate for these tanks is 90 gallons per minute. The recirculation time for the blend tank before sampling is three hours, resulting in a mixing of 25.5 tank volumes. The recirculation time for the waste hold-up tanks before sampling is two hours, resulting in a mixing of 37.4 tank volumes. Unlike the GE Wilmington process, these mixing procedures produce homogeneous solutions.

Dry samples are collected from two points in the recovery process. A sample is collected from each bucket of scrap after the contents have been milled for dissolution. The milling process provides adequate

mixing of the scrap for the collection of a representative sample. A dry sample is also taken from each bucket of UO_4 precipitate. The precipitation step immediately follows the mixing in the blend tank, which undergoes thorough mixing. Dry samples are collected from the center of the bucket with a hollow metal core sampler.

In addition to the collection of dry samples, there are three points in the wet scrap recovery process where liquid samples are taken. The operator follows a carefully devised sampling scheme that assures a proper sample for analysis. The first liquid sample collected is taken from the blend tank after recirculation. The sample spigot, which has a volume of about 150 ml, is purged with one liter of the solution before the sample is collected.

The laboratory analyzes the sample for nonradioactive contaminants (iron and nickel). The next liquid sampling point is the supernatant from the UO_4 precipitation. This solution flows from the centrifuge through an open trough to an open tank, and a sample is collected from the mouth of the trough every two hours and analyzed for uranium content. The final liquid sampling step is from the waste hold-up tanks after recirculation. The sampling spigot, about 250 ml in volume, is flushed with one liter of solution before the sample is collected. This sample is analyzed for uranium content.

There are two methods employed for uranium content analysis. After delivery to the lab, the samples are weighed to the nearest 0.0001 gram on analytical balances that are calibrated quarterly by the CE QA group. The CE lab uses the Davis and Gray potentiometric titration, to find %U of the dry scrap material.

The procedure is referenced to the National Bureau of Standards Lab method. With each batch of milled scrap samples being analyzed, three aliquots of a uranium standard obtained from the National Institute for Standards and Technology (NIST-950B) are analyzed at the beginning, in the middle, and at the end of the batch. The results from the three standards are averaged and this average is both logged and plotted on a control chart in the lab. The results are checked by the Laboratory Supervisor for both accuracy and precision. Results that fall outside control limits would require re-analysis of the batch.

In addition to the NIST-950B uranium standard, one scrap recovery sample is analyzed in duplicate, and these results are logged and checked for precision.

The two liquid samples, the supernatant from the UO_4 precipitation and the solution from the filled and recirculated waste hold-up tank are both analyzed for uranium content by a colorimetric method. While the wet scrap recovery process is in operation, dilute solutions prepared by the Laboratory Supervisor from the NIST-950B uranium standard are analyzed periodically to ensure the accuracy of the analysis. The results of the Quality Assurance samples are logged and standard results falling outside the control limits would require a re-analysis. Any solutions exceeding one gram of uranium per liter are passed back through wet scrap recovery process.

This inspection focussed on the implementation of criticality safety in the uranium wet scrap recovery process. This included a discussion about the sufficiency of recirculation of solution tanks before sampling, purging of sampling spigots before a sample is collected, and the laboratory analyses performed in support of the wet scrap recovery process. The mixing of the contents of the blend and hold-up tanks appears to be sufficient. Although two tank volumes are considered to be sufficient, the presence of the Raschig rings would necessitate a greater number of tank volumes be recirculated. The licensee's current practice appears to be more than sufficient to ensure the collection of a representative sample.

Sampling lines and spigots should be flushed with several volumes of solution to sufficiently purge the sampling port and thereby ensure the collection of a representative sample. The current practice of the licensee appears to be satisfactory.

The analytical methods employed by the laboratory to determine uranium content are proven methodologies used throughout the industry.

The associated Quality Assurance analyses conducted by the lab personnel were found to be approximately 20% of the total analyses performed. The results of those analyses were found to be acceptable for both accuracy and precision. The batch process which prevents the accumulation of SNM material, with the sampling schemes for both solid and liquid samples minimizes the degradation of safety parameters that could lead to a nuclear criticality accident.

No violations or deviations were identified.

10. Criticality Safety (IP 88015) NRC Bulletin 91-01

In October of 1991, NRC issued Bulletin 91-01, requesting licensees of fissile quantities of SNM material to provide a description of their process to identify and report a loss or significant degradation of a criticality safety control. Although the licensee's response to Bulletin 91-01 is still under NRC review, the licensee investigates incidents involving fissile material according to its Bulletin 91-01 response plan.

Under the above reporting criterion, on April 1, 1993, the licensee reported to the NRC that the concentration of boron in their Raschig ring analysis was less than the ANSI standard (ANSI/ANS-8.5 use of Borosilicate-Glass Raschig Rings as a Neutron Absorber in Solutions of Fissile Material) allowed. The ANSI standard allows that the minimum weight percent of boron for Raschig rings is about 3.66%. The licensee's vendor reported a boron content of 2.9 to 3.16%. The loss of boron appeared to be a substantial degradation of a controlled parameter. However, the actual concentration of uranium in the tank solution was significantly less than the amount allowed in the tanks packed with Raschig rings (< 200g U/liter vs 270 or > g U/liter). Hence, the potential for a criticality accident was still minimal. The licensee's investigation showed that the vendor had difficulty with the preparation of a standard boron solution, causing a low bias in the sample data. The licensee submitted separate samples of the original

samples ranged from 3.88 to 3.94%. The follow up investigation proved there was no actual degradation of a criticality barrier.

The inspector reviewed audits performed by the Corporate Criticality Specialist and internal audits performed by the Manager, Regulatory Compliance and determined that since the start of the licensee's program under Bulletin 91-01, initiated in May 1992, no loss of a criticality barrier has been identified. The auditors have reported findings that are documented in internal reports. In each instance, the corrective action was also documented. These self-identified violations include the following:

Failure to properly stack contaminated filters, leaving an overhang that narrowed the spacing to less than the 12" requirement.

Accumulation of moderator material on the second floor where the volume limit for mop water is 10 gallons. Apparently, a one gallon and 5 gallon containers of paint were being used in the presence of a mop bucket that was 2/3 full with water.

Unauthorized storage of pellets in cabinet near QC room.

A newly installed electrical panel partially restricted the criticality sign, "moderation control."

Unmarked squirt bottles, normally filled with distilled water were observed in various locations in the plant.

The maximum quantity of SNM in the laboratory areas is limited to 740 grams of U-235 for criticality safety limits. During the April 19-23, 1993, Material Control and Accounting Safeguards inspection, the inspectors reported that the licensee has not implemented a monitoring program to determine the exact amount of SNM material that accumulates in the lab (see Inspection Report No. 70-36/93201, Inspector Follow-up Item No. 93-201-05). The issue was discussed with the licensee during this inspection and by telephone on May 26, 1993. Internal material control audits have shown that the laboratory would have to accumulate more than 14 kilograms of UO_2 enriched to 5%, in order to exceed the 740 gram limit. Under the present mode of operation it is unlikely that the laboratory would accumulate quantities of SNM material that exceed 740 grams U-235. In addition, the licensee disposes of lab samples in a safe geometry pail that is used for a secondary criticality barrier. Consequently, the safety impact is minimal. Although, the inventory is not maintained on a daily basis, the licensee should improve its program for monitoring SNM in the laboratory to assure compliance with the 740 gram U-235 limit. The licensee also indicated that this program will be modified after the laboratory is moved to its new facility. The inspector will monitor the licensee's progress in this area under Inspector Follow-up Item No. 93-201-05.

With the exception of the problems identified in the licensee's laboratory, the findings were more of a housekeeping problem. However, the auditors documented their findings, and appropriate corrective actions were initiated. It appeared that the licensee's program for reporting the loss of a criticality barrier meets the intent of Bulletin 91-01.

No violations or deviations were identified.

11. Exit Meeting

The scope and findings of the inspection were discussed with licensee representatives shown in Section 1 of this report at the close of the onsite inspection on April 26, 1993.

The inspector stated that the use of a checklist before performing HEPA filter testing may identify areas requiring attention (Section 7. Operations Review).

The licensee agreed to review the transportation manifest for possible improvement of the shipping checklist. (Section 5. Transportation)

The licensee agreed to enhance the Corporate audit format to ensure that QA audits of the transportation program are not only performed in accord with 10 CFR 71.137, but specifically reference Part 71 in the audit report. (Section 5. Transportation)

The licensee agreed to improve the training attendance forms in order to properly document and differentiate training programs for retraining operators, visitors, contractors, and new hires. (Section 6. Operator Training)

The inspectors stated that the licensee's procedure for pressure checking incoming UF_6 cylinders is adequate for identifying volatile contaminants. (Section 7. Operations Review)

The inspectors stated that the uranium wet recovery program demonstrated good criticality safety practices and management oversight.

The inspector stated that maintenance procedures had been significantly improved; alerting workers about as-found data; and instructing workers about the radiological and nonradiological hazards associated with the equipment.

During the inspection and exit meeting, the licensee did not identify any documents or statements and references to specific processes as proprietary.