U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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Licensee:	ABB Combustion Engineering
Facility:	Hematite Nuclear Fuel Manufacturing Facility
Location:	Combustion Engineering, Inc. Hematite, MO 63047
Dates:	November 18, 1996 through November 22, 1996
Inspectors:	John M. Jacobson, Resident Inspector Paducah Gaseous Diffusion Plant
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Approved by:	Gary L. Shear, Chief Fuel Cycle Branch Division of Nuclear Materials Safety

EXECUTIVE SUMMARY

ABB Combustion Engineering
Nuclear Fuel Manufacturing Facility
Hematite, Missouri
NRC Inspection Report 070-00036/96005(DNMS)

The inspection involved the review and observation of selected aspects of licensee operator training, operations, maintenance and surveillance, radiation protection, and a review of task actions accomplished for the restart of evaporation operations associated with the Augmented Team Inspection documented in NRC Inspection Report 070-00036/96003(DNMS).

Operator Training (IP 88010)

- A Nuclear Criticality Safety (NCS) training session attended by the inspectors effectively integrated current criticality issues, criticality controls, and plant practices in a manner which operators could directly apply to their jobs.

Operations Review (IP 88020)

- Operations observed by the inspectors were conducted safely and in accordance with applicable written procedures. The inspectors noted, however, that the licensee did not have a process for tracking procedure review dates. As a result, approximately five percent of the licensee's procedures were outside the biennial review date. However, the content and detail of those procedures which had been reviewed or revised were improved.

- The Technical Training Project was a significant effort recently undertaken by the licensee to upgrade the quality of the plant's written procedures and associated training for workers. Discussions with some operators indicated the approach had improved their understanding and implementation of material control and accounting and criticality safety procedural requirements.

Maintenance/Surveillance (IP 88025)

- Review of functional tests for oxide conversion plant alarms and controls indicated the required surveillances for criticality safety systems had been appropriately performed.

- A new maintenance and surveillance tracking system had been initiated by the licensee. Preventive and corrective maintenance was being conducted in a timely manner with a manageable backlog of maintenance work requests.

Radiation Protection (IP 83822)

- The licensee continued a program to maintain radiation exposures as low as reasonably achievable (ALARA). The exposure results through the date of the inspection indicated that the ALARA program had resulted in a reduction of the collective dose for the facility.

- A review of high sample follow-up reports identified that the recycle hopper area had a trend of high samples over the past six months. Management follow-up on this issue appeared to be warranted.

Task Actions for the Restart of Evaporation Operations

- A walkdown of evaporation operations verified that all task actions outlined in a licensee response letter dated November 21, 1996, were complete. A minor inconsistency existed in the implementation and use of the shift-to-shift communication log for the dry recovery system.

Report Details

1.0 Operator Training (IP 88010)

a. Inspection Scope

On November 20, 1996 the licensee informed the inspectors that annual refresher training on nuclear criticality safety (NCS) would be conducted in the early afternoon. The inspectors attended the training to evaluate the content and effectiveness of the NCS training for plant operators.

b. Observations and Findings

The training covered the licensee's criticality safety program, basic criticality safety, bases for criticality safety requirements, procedures, an overview of criticality safety conditions for each area of the plant, and a review of recent violations of NCS procedural requirements. The instructor had developed course objectives and reinforced these objectives during the presentation. The instructor adequately responded to all questions posed by personnel in the class. The course exam effectively reflected topics presented in the course.

c. Conclusions

The NCS training session effectively integrated current criticality issues, criticality controls, and plant practices in a manner which operators could directly apply to their jobs.

2.0 Operations Review (IP 88020)

2.1 Conduct of Operations

a. Inspection Scope

The inspectors observed operations in the UF_6 loading dock area. oxide conversion facility, pellet processing area, recycle and recovery area, evaporation area, fuel rod assembly plant, and other areas of the plant. In particular the inspectors observed the following activities:

- change out of UF_6 cylinders in the UF_6 vaporizers
- control room operations for oxide conversion
- operations involving the "wet" and "dry" sides of the recycle and recovery area
- pelletizing operations (slugging, pressing, grinding, etc.)

The inspectors compared observations of activities in progress during facility tours with selected written procedures from the applicable procedures manual. The inspectors also walked down the oxide conversion and recycle/evaporation areas with the responsible process engineers.

b. Observations and Findings

The inspectors noted that operators performed work associated with loading UF_6 cylinders into vaporizers for heating and feeding to the conversion process according to written procedures. The inspectors also noted that the operators were cognizant of and performed a check on the conductivity probes in the vaporizers, consistent with a recent management directive to perform this check. The licensee reported problems of fouling of the conductivity probes for the vaporizers used to heat cylinders and is currently undergoing an analysis of the issue. Initial indications were that it may be a chemical used in treating the water used for steam.

Control Room activities observed conformed with current plant procedures. In particular, the inspectors compared current operating status of the oxide reactors with the applicable plant operating procedures (POPs). The POPs specified the temperature, pressure and flow conditions for each one of the three reactors in both the standby and operating modes. The inspectors verified the correct operating parameters were used by operators for both modes of operation.

The inspectors noted that operators were observant of issues ongoing in their respective areas, particularly health and safety issues associated with routine work in their areas of responsibility. In particular, an operator prevented a maintenance contractor from performing an inspection on an unused crane which was in a respiratory protection area.

During a general walkdown of the plant ventilation system, the inspectors observed that all high efficiency particulate air (HEPA) filters were within required differential pressure limits. The inspectors questioned the licensee as to whether there was a process for ensuring that operators were informed when hoods associated with a particular ventilation system were inoperable because of filter change outs. Some hoods were not in the immediate vicinity of the filter bank, and thus there would be a potential for someone to use a hood without air flow. The licensee informed the inspectors that this issue had never been addressed previously, although operators are trained to test for flow using their hands. However, licensee management indicated it would review its procedures in this area.

Operations observed in the wet and dry recovery areas conformed with the recently revised procedures for the area. The inspectors noted that the revised procedures were much more detailed than older procedures. For example, each valving operation is identifed in the revised procedures.

c. Conclusions

Operations observed throughout the inspection conformed with plant practices and applicable written procedures.

2.2 Procedure Updates and Training

a. Inspection Scope

In October 1996, the licensee began a long-term process for improving the conduct of operations and job training at the plant by assembling focus groups to review current operations, revise procedures, and train workers to the new procedures. The inspectors reviewed the status of this effort (technical training project) and discussed the results to date with selected operators and the project manager.

b. Observations and Findings

The direction of the effort was to bring operators, engineers, and other responsible parties together in a group to address areas of significant concern from a conduct of operations or regulatory standpoint. The initial efforts involved reviewing and revising the site's material control and accounting (MC&A) and NCS procedures. The licensee was also using this approach in its modification of operations in the "Red Room," the recycle and recovery area, following the chemical reaction event in August 1996 (Inspection Report 070-00036/96004(DNMS)). The focus of the groups was to simplify procedures, while assuring that regulatory requ ients were met, in order to facilitate operator under nding and compliance with procedures. As noted in Inspec on Report 070-00036/96004(DNMS), some of the plant's critica ity procedures are not easily understood. The other focus of the groups was to ensure that operators' knowledge of daily operations was included in the procedure development and training process from the beginning.

A number of action items were developed as a result of the initial efforts. These were assigned to responsible individuals and were tracked to completion. After procedures were revised, the licensee conducted training for operators. Inspector discussions with operators indicated that the process had improved the understandability and usefulness of the procedures.

c. Conclusions

The technical training project initiated by the licensee appeared to be an improvement in the method of developing or revising procedures and then training operators to them.

2.3 Periodic Procedure Review Process

a. Inspection Scope

During a review of selected procedures, the inspectors noted that a few of the procedures in various manuals had not been reviewed or revised since 1988. The inspectors discussed the status of the licensee's procedures program with various managers.

b. Observations and Findings

During a review of process, maintenance, and health physics procedures manuals, the inspectors noted that approximately 5 percent of the licensee's procedures had not been reviewed or revised since prior to January 1994. The licensee had a requirement for a biennial review of procedures to ensure the technical adequacy of their content when the renewal license was issued in July 1994. The Manager of Regulatory Affairs pointed out that the annual health physics audit (April 1996) had identified that the procedure for calibrating instruments needed to be updated. Subsequently, he indicated he had attempted to initiate a process for ensuring that procedure review dates would be flagged for action by responsible personnel. Although that process had not been finalized by the time of the inspection, he did document the procedures requiring timely review for each department manager. He also established that all out-of-date procedures be reviewed by December 13, 1996.

The inspectors noted that the licensee had significantly upgraded the quantity and quality of its written procedures since 1994. This determination was based on the revised format which included sections for scope and safety. The amount of detail and specificity in recently revised procedures was greater than that in the older procedures. Also, a number of new procedures had been added over the period. As a result, the procedures program had significant improvements, but a select few procedures had not been revised. The inspectors also noted that, although the initial issue with out-of-date procedures had been raised in the annual audit in April, the issue was still not fully resolved as of November, since a process for tracking procedure review dates on a continuous basis was not in place, and some procedures still had not been reviewed or revised.

c. Conclusions

The licensee identified a weakness in its procedures program and developed corrective actions to ensure out-of-date procedures were reviewed for technical adequacy. However, based on the length of time needed to develop a process for tracking procedure review dates and the need for the licensee to complete the biennial review of some procedures, an Inspector Followup Item has been opened to track final process implementation and procedure reviews. (IFI 070-00036/96005-01)

2.4 Housekeeping

a. Scope of Inspection

The inspectors observed the status of facility housekeeping during tours of the plant.

b. Observations and Findings

The inspectors did not identify any significant housekeeping issues during plant tours. The inspectors noted that the licensee had removed the contaminated waste and debris in the south yard. The issue was documented in NRC Inspection Report 070-00036/95002(DRSS). The majority of the contaminated items and debris which had been exposed to the elements were shipped to a licensed disposal site. The remaining debris was being prepared for shipment. The effort undertaken by the licensee to reduce the pile of waste materials stored inappropriately in the area was essentially complete.

c. Conclusions

The licensee had undertaken and essentially completed the disposal of contaminated items and debris inappropriately stored in the south yard. Based on observations of the area, the inspectors closed Inspector Follow-up Item No. 070-00036/95002-01 which had been opened to track the licensee's clean-up project.

3.0 Maintenance/Surveillance (IP 88025)

a. Inspection Scope

The inspectors reviewed selected surveillance activities and records for safety systems for the oxide conversion plant for 1996. In addition, the inspectors reviewed the licensee's program for maintenance for the oxide and pelletizing plants.

b. Observations and Findings

The inspectors noted that the nuclear criticality controls and alarms for the oxide conversion plant had functional tests conducted on the six-month frequency required by the license. Tracking the functional tests for these controls was the responsibility of the process engineer for the conversion plant. The licensee had identified a problem with fouling of the conductivity probes in the UF_6 vaporizers. As a result, the licensee was testing the operability of the probes prior to loading each new cylinder into a vaporizer while the investigation into the cause of the fouling continued. The decreased frequency for testing the probes appeared to be an appropriate response for the problem.

The licensee instituted a new maintenance program during the summer of 1996 which covered preventive and corrective maintenance. The new program was based on a database (Maintenance Management System) which allowed the user to generate work orders for preventive maintenance tasks on a monthly basis. In addition, operators could submit work requests, which were entered into the system, for mechanical failures or items needing corrective maintenance. Maintenance activities were then prioritized on a daily basis and tracked on a monthly basis, i. e., the maintenance backlog could be tracked from month to month. The inspectors noted that the backlog appeared to be manageable, on the order of 10-20 items (most requiring long-term procurement of materials or equipment). The inspectors also noted that the preventive maintenance tasks had significantly expanded when the licensee went from paper to computer-based tracking. The maintenance coordinator indicated that this was an attempt by the licensee to improve the availability and reliability of equipment, from the aspect of improved safety and production.

c. Conclusions

The licensee conducted timely functional tests for the controls and alarms required for nuclear criticality safety in the oxide conversion plant.

The implementation of a new maintenance database provided a method for tracking preventive maintenance and corrective maintenance work requests, and closing them out in a timely manner.

4.0 Radiation Protection (IP 83822)

4.1 Exposure Results

a. Inspection Scope

The inspectors reviewed the exposure results for the year through the date of the inspection and compared them with the licensee's ALARA goals for the year.

b. Observations and Findings

The main exposure pathway at the plant was through inhalation of airborne uranium, primarily Class Y uranium oxide (UO_2) powder or dust. The licensee monitored intakes by using lapel air samplers for all plant personnel and contractors who worked in the contamination control area. The licensee assigned dose to such workers by utilizing the air sample results to calculate the Derived Air Concentration-Hours (DAC-hours) for each worker on a shiftly basis. Conversion to a dose in millirem would then be done by multiplying the DAC-hours result by 2.5. The licensee then added the external dose results from its film badge program to these internal results to obtain the total effective dose equivalents (TEDEs) for each worker.

Prior to 1996, the licensee established an As Low As Reasonably Achievable (ALARA) goal of 2.0 rem for the maximum exposed worker, decreased from 2.5 rem for 1995 (maximum allowed for the year under 10 CFR 20 is 5 rem). The maximum TEDE for 1995 was 2.6 rem, and the average TEDE for the ten workers with the highest TEDEs was 2.4 rem. The licensee also established a goal of 140 person-rem for the site collective dose, a reduction from the 1995 collective dose of 163 person-rem.

As of the date of the inspection, the maximum exposed worker had received an TEDE of 2.11 rem for the year. Approximately 10 workers were projected to exceed the personal dose goal at the end of the year. The collective dose was 131 person-rem with a little over one month left in the year, indicating the licensee would end the year near its collective dose goal. The licensee indicated it was in the process of developing its 1997 ALARA goals, and planned to have aggressive goals again in 1997.

c. Conclusions

No personal TEDEs were projected to approach the annual limit of 5 rem. Projected doses for 1996 indicated approximately 10 workers could exceed the ALARA goal for workers, while the collective dose projected for the site indicated the ALARA goal for collective dose was still attainable. Projected doses for 1996 were below the actual doses for 1995 with six weeks remaining in the year. The licensee planned to continue setting aggressive goals for 1997.

4.2 High Sample Follow Up Reports

a. Inspection Scope

The inspectors reviewed recent high sample follow up (HSFU) reports. The inspectors also reviewed three high sample follow ups which occurred during the inspection.

b. Observations and Findings

HSFU reports were generated when either the daily fixed air samplers had a concentration equal to or greater than the DAC for Class Y uranium or an operator's lapel sampler (LAS) results indicated an intake of greater than 12 DAC-hours during a shift. As of the date of the inspection, none of the workers had reached the licensee's action level of 1600 DAC-hours, at which point the licensee would be required by license condition to consider restriction of work.

On November 19, 1996, an operator LAS indicated 69.6 DAC-hours. Subsequently, a HSFU report was filed by the operator's supervisor within the required two-day time period. The incident involved an operator who had been tasked to clean out a filter in a hood. The operator was not aware of the fact that when performing this particular duty, most operators wear a respirator, although one is not required because the operation was performed in a hood. During questioning by the inspectors, the operator indicated that there was no visible airborne material during the operation. The operator was not aware of anything out of the ordinary until she glanced at her lapel sampler head, and noticed discoloration of the filter paper (an indication of airborne uranium). The operator immediately reported to the HP department. The high sample may have been the result of an actual high airborne concentration or a contaminated filter. The licensee initiated an investigation which included taking fecal samples from the employee for analysis by an outside laboratory.

A second HSFU report was filed on November 20, 1996, for two operators who were loading a recycle hopper. One operator was training another on the procedure. The operators indicated to the inspectors that the hopper was not fully raised to ensure a tight seal. Subsequently, UO_2 powder spilled onto the floor. Upon realizing what had occurred, the operator immediately called HP and the area was roped off. Both employees were instructed to submit fecal samples according to the licensee's policy. Upon further review of the HSFU reports, the inspectors noted that in the past six months, the recycle hopper areas had several HSFU reports associated with them. In particular, there had been three recent incidents similar to the one above, where powder had spilled on the floor. The licensee indicated a follow-up review into the root cause of these incidents would be performed. The licensee also indicated that a new tracking system was in place to allow them to better track operations and operators associated with repeated HSFU reports.

c. Conclusions

The inspectors identified a trend in high sample results and exposures for personnel involved in loading recycle hoppers. The inspectors will follow up on the licensee's investigation into

these occurrences and the bioassay results for the incidents above as an Inspector Follow-up Item. (IFI No. 070-00036/96005-02)

5.0 Task Actions for the Restart of Evaporation Operations

a. Inspection Scope

On August 22, 1996, the licensee had an unanticipated, exothermic chemical reaction which occurred in the large evaporation and mop water boil down tanks associated with recycle and recovery operations. Subsequently, an NRC Augmented Inspection Team (AIT) conducted an inspection to determine the root cause of the incident. Subsequent to the AIT inspection, the licensee submitted an action plan, dated August 29 1996, outlining actions required to be performed before start-up of the recycle/recovery and evaporation complexes. On November 21, 1996, the licensee issued a second letter highlighting task actions which were accomplished for the restart of evaporation operations. Utilizing this last correspondence, the inspectors walked down the recycle/recovery and evaporation areas to verify all task actions were complete.

b. Observations and Findings

1. Actions Accomplished for "Dry Side" Operations

The task items listed for the "dry recovery system," which involved processing the spent liquors for the recycle/recovery furnace off-gas scrubber, were as follows:

- Disconnect and cap-off wet filtrate piping to completely isolate the intrusion of filtrates into the potassium hydroxide (KOH) material flow.
- Remove the small evaporation tank from the evaporation complex. Use only the large tank and dedicate it to KOH liquid reduction.
- Remove the mop water boil down tank from the evaporation complex to preclude the intrusion of organic chemicals.
- Replace burned out lights to improve lighting in the evaporation tank area.
- Install communication equipment to provide for direct communication between operators during the transfer of KOH liquids from the inside holding tank to the evaporation tank.

- Tag and label all equipment and valves included in the hazardous operations (HAZOP) analyses.

- Revise procedures using input from operators and supervisors.

- Retrain operators and supervisors in procedures and management expectations for running the process.

- Use a log to improve shift to shift communication between operators and supervisors.

All task actions were verified as complete by independent inspector observations, discussions with operators, and also in a walk down of the entire system with the process engineer. However, the inspectors noted that the shift to shift log exhibited inconsistencies. On October 16, 1996, the area process engineer wrote instructions directing operators to make an entry into the log during their shift. From this date through the end of October, entries were made for every shift. For the month of November, entries were less frequent. When questioned by the inspectors, the process engineer indicated that the dry side system was not in use for several days in November. He also stated that operators were only expected to make entries to the log when problems with the system occurred. The inspectors noted that this expectation appeared to be different than the written instruction. The licensee agreed to review the policy on log entries and revise the written instruction, if necessary.

2. Actions Accomplished for "Wet Side" Operations

The task actions outlined for the "wet side recovery," processing and evaporating nitric acid dissolution filtrates, and mop water liquid evaporation are as follows:

- Install separate piping and a separate tank system for the filtrates.
- Relocate the KOH tank to a separate pad, away from the filtrates tank evaporation area.

- Install a separate containment dike for the mop water evaporation tank.

- Install separate secondary containment dikes and sumps for the three evaporation systems to provide physical barriers and prevent any mixing.

- Install material transfer stop controls at the evaporation tanks.

- Add additional lighting to the evaporation work area.
- Use a log for mop water evaporation to control constituents.
- Revise procedures and train personnel.
- Place all equipment identified in the HAZOP analyses for the system as safety significant into a preventative maintenance program.
- Tag and label all equipment and valves included in the HAZOP analyses.

All task actions were verified as complete by independent inspector observations, discussions with operators, and in a walk down of the entire system with the process engineer.

c. Conclusions

All task action items necessary for re-starting recycle/recovery and evaporation operations were completed.

6.0 Management Meeting

The inspectors met with the Director of Regulatory Affairs and other staff throughout the inspection and on November 22, 1996, for the exit meeting. The inspectors summarized the scope and findings of the inspections.

The licensee did not identify any of the information discussed at the meeting as proprietary.

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel Contacted

E. Criddle, Training Coordinator
M. Eastburn, Nuclear Criticality Specialist
H. Eskridge, Senior Consultant Regulatory Affairs
K. Hayes, Industrial Safety Engineer
D. Rhode, Technical Training Project Manager
*R. Sharkey, Director of Regulatory Affairs
E. Saito, Health Physicist

* Senior licensee official at exit meeting on November 22, 1996.

Inspection Procedures Used

IP 83822: Radiation Protection
IP 88002: Entrance and Exit Meetings
IP 88010: Operator Training/Retraining
IP 88020: Operations Review
IP 88025: Maintenance/Surveillance

Items Opened, Closed, And Discussed

Closed

070-00036/95002-01 IFI

Opened

070-00036/96005-01 IFI
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