

FEB 3 1986

Docket No. 70-36

Combustion Engineering, Inc.
ATTN: Mr. H. V. Lichtenberger
Vice President
Manufacturing
Nuclear Power Systems
Windsor, CT 06095

Gentlemen:

This refers to the routine safety inspection conducted by Mr. G. M. France, III, of this office on December 9-13, 1985 and January 16, 1986, of activities at your Hematite facility authorized by NRC Special Nuclear Material License No. SNM-33, and to the discussion of our findings with Mr. J. A. Rode and others at the conclusion of the onsite inspection.

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 the course of this inspection.

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

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

Sincerely,

"Original signed by W.D. Shafer"

W. D. Shafer, Chief
Emergency Preparedness and
Radiological Protection Branch

Enclosure: Inspection Report
No. 70-36/85003(DRSS)

cc w/enclosure:
J. A. Rode, Plant Manager
DCS/RSB (RIDS)

RIII
em/for
France/jk
JK

RIII
em/for
Greger
JK

RIII
for
Weil
2/5/86

RIII
W.D. Shafer

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 70-36/85003(DRSS)

Docket No. 70-36

License No. SNM-33

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

Facility Name: Hematite

Inspection At: Hematite, MO

Inspection Conducted: December 9-13, 1985 and January 16, 1986

Inspector: G. M. France, III

D. E. Miller/for

1/30/86
Date

Approved By: L. R. Greger, Chief
Facilities Radiation
Protection Section

D. E. Miller/for

1/30/86
Date

Inspection Summary

Inspection on December 9-13, 1985 and January 16, 1986 (Report No. 70-36/85003(DRSS))

Areas Inspected: Routine, unannounced safety inspection, including organization, training, operations review, maintenance surveillance, criticality safety, radiation protection program (audits, procedures, instruments, and surveys), UF6 cylinders, and allegation review. The inspection involved 32 inspector-hours onsite by one NRC inspector.

Results: No violations or deviations were identified.

DETAILS

1. Persons Contacted

- *L. Duel, Manufacturing Engineer
- *H. Eskridge, Nuclear Licensing, Safety, and Accountability Supervisor
- *R. Fromm, Quality Assurance Manager
 - J. Harter, Shipping and Receiving Foreman
 - C. Hercher, Engineering Specialist
 - C. Lovell, Production Supervisor
- *G. McKay, Health Physicist
- *A. Noack, Production Superintendent
 - B. Pigg, Quality Control Laboratory Supervisor
- *J. Rode, Plant Manager
 - R. Stokes, Health Physics Technician
 - N. Wilpur, Health Physics Technician
 - B. Lenz, American Nuclear Insurers

*Denotes those present at the exit meeting.

2. General

This inspection, which began at 1:30 PM on December 9, 1985, was conducted to examine licensee actions in complying with regulatory requirements related to fuel facilities. The inspection included an investigation of allegations made by a former site worker.

The allegation was forwarded to NRC, Region III by the Missouri Department of Natural Resources.

3. Management Organization and Controls

The inspector reviewed the licensee's management organization and controls for radiation protection and operations, including changes in the organizational structure, procedure revising and updating, and utilization of audit systems.

a. Organization

Several personnel changes have occurred since the previous inspection. Inspection Report No. 70-36/85001(DRSS)

- Due to the retirement of the QA Manager, a Principal Consultant Scientist from the corporate organization will review all equipment modifications and process changes requiring nuclear safety analysis. Other QA duties will be assigned to the recently hired QA Manager.
- In other personnel changes, a Maintenance Supervisor retired and was replaced by a Foreman. Three operators were also hired.

The inspector concluded that these personnel changes are routine in nature and will not affect the public health and safety or compromise the environment.

b. Internal Reviews and Independent Audits

The inspector verified that the licensee utilizes independent audits conducted by the Corporate Consultant Scientist and American Nuclear Insurers as means of reporting deficiencies to management. Audit findings performed by the Corporate Consultant Scientist are discussed in Section 7 (Criticality Safety) of this report.

c. Safety Committee Meetings

According to plant policy, a portion of the safety committee meetings are conducted by radiation protection personnel. Subjects discussed included: Nuclear Criticality Safety, Fire Drills, Evacuation and Fire Protection, and First Aid.

The licensee noted that during a recent fire drill, the time allotted for evacuation was exceeded. Hence, the drill was repeated until all personnel had adequately responded in the time allotted.

No violations or deviations were identified.

4. Radiation Protection

The inspector reviewed the licensee's internal and external exposure control programs, including the required records, reports and notifications, and the licensee's program for maintaining occupational exposures ALARA.

a. Internal Exposure Control

The inspector reviewed the results of routine urinalyses performed on plant personnel since the last inspection, No. 70-36/85003(DRSS). Third quarter bioassay results disclosed that the 40 MPC-hour intake limit for soluble uranium was not exceeded. According to the plant Health Physicist, as verified by results of whole body counts, one worker has been restricted from uranium production work for several years because he exceeds the action level of 130 μgm U-235. His whole body counts over the last 15 years are summarized below:

	<u>WBC</u>	<u>ug</u>	<u>U-235</u>
January 1981 - December 1985	Ave:	280	± 59
January 1976 - December 1980	Ave:	302	± 59
January 1971 - December 1975	Ave:	388	± 59

Results of his most recent whole body count showed 355 ± 64 μg of U-235. Whole body counts for other plant workers were below the 130 μgm U-235 action level.

b. External Exposure Control

The inspector reviewed the licensee's exposure control program including adequacy of procedures used to evaluate, control, and minimize exposures and required records, reports, and notifications.

TLD data for the third quarter 1985 disclosed that individual doses did not approach the quarterly limit of 1.25 rem. The licensee indicated that the UF₆ cylinder wash campaign was the source of highest exposure during the operating year. This led to the highest cumulative exposure of 660 mrem to one operator. The UF₆ dissolver heels campaign was discussed in inspection report No. 70-36/85001(DRSS).

c. Instrument Calibration

Records of portable instrument calibrations indicated that portable health physics survey instruments were calibrated quarterly as required.

d. Surveys

The inspector reviewed the licensee's program for control of radioactive materials and contamination, including schedules for periodic surveys and effectiveness of survey methods in controlled areas.

In response to inspector concerns over exit contamination monitoring, the licensee indicated that surveillance had shown that precautions against trafficking of radioactive material to uncontrolled areas were adequate. The inspector recommended that HP Technicians continue to perform periodic surveillance of workers exiting the plant. Monitoring of personnel exiting the plant was also discussed during the inspector's exit meeting.

e. Air Sampling

The inspector reviewed the licensee's program for determining exposure to personnel from airborne radioactivity detected by lapel samplers.

During the last quarter of 1985, the licensee processed UF₆ through to UO₂ pellets. Airborne activity monitored around the pellet grinder was showing a weekly activity of about 3.5 to 17 MPC-hours. During plant cleanout for assay change, one worker's lapel sample showed an airborne concentration in excess of the licensee's action level. The worker was wearing a protective mask, which limited the worker's calculated intake to below regulatory and licensee action limits.

f. Notifications and Reports

The inspector reviewed licensee reports submitted in accordance with requirements of 10 CFR 20.408 (reports of personnel monitoring on termination of employment or work). The inspector concluded that licensee records were in compliance with 10 CFR 20.408 and 10 CFR 19.13 (notifications and reports to individuals).

g. Source Leak Tests

The inspector examined licensee records for leak testing byproduct material sealed sources. The licensee's leak test records appeared to be complete and tests were performed in accordance with the provisions of Special Nuclear Material License No. SNM-33.

h. Respiratory Protection

The inspector reviewed the licensee's respiratory program including discussions on the licensee's use of the half-face mask for respiratory protection.

In response to a licensee question the inspector noted that 10 CFR 20, Appendix A specifies that prior to each donning of the half-face mask the user must test the facepiece fit with irritant smoke. An accepted irritant smoke is stannic oxychloride or its equivalent, listed under MSA No. 5645. The inspector further noted that while use of the half-face mask is acceptable, the full-face mask is more effective against airborne radioactive particulate matter and has less rigorous fit test requirements than the half-face mask. This matter was discussed with the plant Health Physicist via telephone on December 20, 1985.

No violations or deviations were identified.

5. Operation Review

The inspector accompanied a representative of American Nuclear Insurers and the licensee's Nuclear Licensing, Safety, and Accountability Supervisor on a tour of the facility. The inspector observed the licensee's performance of plant operations to include handling and storage of SNM material in accordance with applicable regulatory requirements.

a. Observation of Operations

The plant operating mode involved the processing of UF₆ through to UO₂ powder and pellets. Throughout the plant fixed air samplers are located in the radioactive airborne particulate pathways from process equipment. Workers operating pellet presses and pellet sintering devices were noted to be equipped with lapel air samplers. Pellet and powder spills appeared to be minimized by individual operator control and periodic HP surveys. There was no evidence of waste pellets around pellet production equipment. Localized areas

and/or equipment contaminated to levels in excess of 10,000 dpm/100cm², as shown through HP surveys, did not significantly increase the concentration of airborne radioactivity or personnel urinalysis results. Nonetheless, the HP program is aggressive in reminding production personnel to clean up localized contamination. The inspector noted that localized areas and equipment with contamination levels in excess of 10,000 dpm/100cm² are recorded on a followup action form. The form is reviewed by management for prompt response to initiate decontamination schedules. The inspector acknowledged that initiating this kind of action level in a timely manner lends support to ALARA programs. The inspector's concern about recovery from radioactive spills was discussed during the exit meeting.

b. Housekeeping

Temporary storage for process waste containing SNM material appeared to be adequately marked. Long term SNM storage arrays were maintained to include evacuation pathways.

The inspector concluded that the licensee's production activities are being conducted in a manner that is commensurate to practices that appear adequate to protect the health and safety of facility workers and members of the general public.

No violations or deviations were identified.

6. Training

The inspector reviewed the training program for newly hired workers as related to employee work assignments with radioactive and fissionable materials.

Three new operators were hired since the last inspection, No. 76-36/85001(DRSS). In addition, a former employer was hired as QC Manager.

Subjects given new employees during orientation include nuclear and industrial safety, including written examinations. The inspector examined documentation of attendance records and noted that the training sessions appear to meet the requirements of 10 CFR 19.12, "Instructions to Workers."

No violations or deviations were identified.

7. Criticality Safety

The inspector reviewed the licensee's documentation of facility changes requiring criticality considerations, including determination of whether the licensee has positive management controls to ensure that facility operations are conducted within nuclear criticality safety limits.

a. Nuclear Safety Analysis

The inspector reviewed documentation of the following facility changes requiring criticality considerations performed since May 1985, Inspection Report No. 70-36/85001(DRSS):

- A request was submitted to store solidified liquid waste to allow curing of cement ingots.

The nuclear safety analysis allowed a mass limit of 350 grams U-235 per cement ingot. The transport index and the available storage space allowed also limits the accumulation of U-235.

- A request was submitted for the temporary storage of used HEPA filters containing UO₂ powder.

The filters were gamma counted and proved to be less than the mass allowed for a safe batch. Hence, storage was provided in an existing array.

- Approval was requested to place 15-30 gallon drums containing a safe mass on a roller platform. The drums contain filter media treated at elevated temperatures under an oxidizing atmosphere.

The NSA disclosed that the roller platform forms an exclusion area for safe volume at 9 ft². Since the safe mass exclusion area requires 3 ft², the change is nuclearly safe.

The inspector noted that criticality analyses data and procedures showed required approvals and sign offs by the licensee.

b. Nuclear Safety Audit

The inspector reviewed licensee files concerning independent audits conducted by corporate consultants trained in criticality safety.

The inspector confirmed that audit findings were submitted to plant management for completing corrective actions in a timely manner. The licensee also noted that a recertification requirement for UF₆ cylinders consisting of hydrostatic, internal/external visual inspection for wall thickness, and vacuum leak tests was performed on the licensee's UF₆ cylinders. The inspection was performed by the Hartford Steam Boiler Inspection and Insurance Company.

An annual inspection of Raschig Rings in filtrate tanks and blend tanks disclosed that the rings were within the limits required for nuclear safety.

The inspector confirmed that management of the licensee's nuclear safety program is commensurate with the license application.

No violations or deviations were identified.

8. Onsite Burial of Radioactive Material

An allegation concerning burial of radioactive material on the Combustion Engineering site was forwarded to the NRC, Region III Office by the Missouri Department of Natural Resources. The individual who made the allegation was contacted on October 18, 1985. The alleegeer's concerns were reviewed onsite during this inspection, including discussions with licensee personnel, review of radioactive disposal and environmental monitoring records, and observation of the current physical condition of the burial site. The inspector also reviewed NUREG/CR-3387 which documents a radiological survey of the burial site conducted by Radiation Management Corporation in 1982, performed under contract to the NRC.

- Allegation

The individual indicated his concern that buried radioactive material might be causing radioactive contamination of nearby Joachim Creek. He stated that waste from the fuel manufacturing process was buried onsite during the late 1950's and the 1960's, that the metal barrels containing the radioactive waste were not always sealed, and that water had been observed in the burial trenches on occasion.

- Discussion

The plant is located approximately 35 miles south of St. Louis in a rural area isolated from large residential or commercial developments. Since startup the plant has had four different operators. Initial operations began in 1956 under Mallinckrodt Chemical; in 1961, United Nuclear took control; in 1970, United Nuclear and Gulf engaged in a joint venture; and in 1974, Combustion Engineering assumed responsibility.

According to licensee personnel and licensee records, approximately 30 kilograms (60 mCi) of uranium-235 principally in the form of contaminated waste materials and equipment, were buried in up to 40 trenches measuring approximately 20 feet by 40 feet and 12 feet in depth from plant startup through the early 1970's. Such burials were allowed by existing Atomic Energy Commission (predecessor to the NRC) regulations for burials (10 CFR 20.304). Those regulations did not require that the buried radioactive material be in containers; nor did they impose restrictions on water encroachment in the burial ground.

In the spring and summer of 1982, Radiation Management Corporation (RMC), under contract to the USNRC, performed a radiological evaluation of the burial site adjacent to the Combustion Engineering plant (NUREG/CR-3387). The purpose of the survey was to clearly define the radiological conditions at the burial site and to determine if radioactive material is migrating from the burial site into the surrounding environment. The survey included measurements of gross alpha and beta activity in Joachim Creek and a smaller

creek east of the burial site. The creek surface water samples all showed gross alpha activities within EPA drinking water standards. Radionuclide concentrations in all creek sediment samples were indistinguishable from normal background concentrations. The overall conclusion of the RMC radiological evaluation was that "relatively small quantities of uranium have been buried and that the buried material is essentially stable at this time. The burial pits have little or no effect on the population or the surrounding environment."

The licensee conducts a routine environmental monitoring program which involves periodic sampling of Joachim Creek. This monitoring program also has confirmed that gross alpha and beta activity in the creek water is within EPA standards.

While radioactive material is buried on the Combustion Engineering site, no evidence was found that the burials violated applicable NRC (or AEC) regulations. The allegation that Joachim Creek may have become contaminated because of radioactive seepage from buried radioactive material on the Combustion Engineering, Hematite site was not substantiated. The licensee's environmental sampling program appears adequate to ensure that any future creek contamination will be detected.

9. Transportation

The inspector reviewed transportation activities to determine whether the licensee is maintaining an adequate program to assure radiological safety in the receipt, packaging, and delivery of licensed radioactive materials.

The inspector reviewed licensee shipping records. Only one minor discrepancy, failure to completely record the results of a health physics beta survey, was identified. The Shipping Foreman and the Plant Health Physicist were cautioned about initialing any part of an incomplete shipping record; this matter was also discussed during the exit meeting. In reviewing records maintained by the Production Control and Administration Manager and the Shipping and Receiving Foreman, the inspector noted that a system is in place to maintain a record of each shipment of licensed material in accordance with 10 CFR 71.

No violations or deviations were noted.

10. Maintenance and Surveillance Testing

The inspector reviewed the licensee's maintenance operations to determine specifically whether process monitoring instrumentation is being maintained and calibrated as required, and records maintained on plant systems pertinent to safety.

During a tour of the facility safety system, the licensee noted that the two emergency generators are powered by natural gas. The main emergency generator provides utility services for air, water, steam and instrumentation and evacuation alarm systems. The generator is exercised during the first midnight shift of the week. Records are kept in the maintenance log.

For criticality evacuation gamma sensitive detectors with audible alarms are also indicated on the instrument display panel located in the administrative building guard office. The licensee noted that spare alarms for gamma sensitive detection are maintained as replacement units.

In other safety systems concerning the mitigation of UF₆ leaks, the UF₆ vaporizer condensate alarm system is designed to close an automatic shut off valve and interrupt the steam supply in the event of a UF₆ leak.

The inspector concluded that emergency utility services and surveillance tests as conducted under general maintenance operations are being maintained and that satisfactory test results were obtained.

No violations or deviations were identified.

11. Uranium Hexafluoride (UF₆) Cylinders

The inspector reviewed licensee procedures for the recertification of uranium hexafluoride (UF₆) cylinders. Discussions were held with licensee personnel associated with the coordination of emergency planning with offsite agencies. Pertinent sections of the licensee's Radiological Contingency Plan were also reviewed.

a. UF₆ Cylinder Recertification

In accordance with OR-651, Revision 4, UF₆ handling procedures and container criteria, and ANSI NNN14-17, packaging of UF₆ for transport, the licensee performs and documents a 5-year reinspection program of company owned UF₆ cylinders. The licensee developed special evaluation travelers for each cylinder and performed the following tests:

- hydrostatic test
- visual inspection and ultrasonic wall thickness measurement
- valve inspection and installation
- drying and pneumatic leak testing

The licensee noted that the requirement to visually inspect the inside of the 30A-2.5 ton cylinder was time consuming, but was being successfully accomplished.

b. UF₆ Heel Removal

During a previous inspection (Inspection Report No. 70-36/85001) the inspector observed licensee performance during cylinder washing to remove UF₆ heels. The UF₆ heel is reduced or removed from 2.5 ton cylinders prior to their return to the enrichment facility for refilling. The licensee noted that cylinders filled with UF₆

arriving at CE's Hematite facility undergo a rigorous limit of error calculation that compares parameter limits for the weight of U-235 in UF_6 , and the cylinder weight. The limit of error is calculated at the 95 percent confidence limits.

Either an overfilled cylinder or U-235 content calculated outside of the 95 percent confidence limit would be cause for the licensee to reject the cylinder and return it to DOE.

c. Emergency Planning With Offsite Agencies

The licensee has postulated a radioactive material release to the environs. In the case of a massive cylinder failure the standard 30-inch diameter cylinder (2.5 ton) has a capacity of about 5,000 pounds. The escaping radioactive material would form UO_2F_2 and HF. The licensee's offsite planning assumes that about 22 percent of the material would escape from the cylinder. Support agreements have been obtained with the Hematite, Festus and Desoto Fire Departments. Although liaison is maintained with these departments the evacuation of people is handled by the Sheriff's Department.

There were no violations or deviations identified during the course of inspecting this module.

12. Exit Meeting

The inspector met with licensee representatives (denoted in Section 1), at the conclusion of onsite inspections on December 13, 1985, and January 16, 1986. In response to comments by the inspector, the licensee acknowledged inspector concerns about completing and recording HP survey data on shipping records.

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