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

MAY 12 1993

Docket 70-36
License SNM-33
Amendment 24

Mr. J. A. Rode, Plant Manager
Hematite Nuclear Fuel Manufacturing
Combustion Engineering, Inc.
P.O. Box 107
Hematite, MO 63047

Dear Mr. Rode:

SUBJECT: USE OF NEW PRODUCTION LINES WITH ENRICHED URANIUM (TAC L21643)

In accordance with your amendment application dated August 5, 1992, and supplements dated November 6, 1992, and February 19, and March 2, 1993, and pursuant to Part 70 of Title 10 of the Code of Federal Regulations, Materials License SNM-33 is hereby amended to authorize the use of uranium enriched to 5.0 weight percent in the U-235 isotope for fuel production operations. Accordingly, Condition 9 is amended to include the dates of August 5, 1992, November 6, 1992, February 19, 1993, and March 2, 1993.

Approval of this amendment supersedes License Amendments 21, 22, and 23 issued on November 20, 1992, January 5, 1993, and March 26, 1993, respectively for startup activities. Accordingly, the dates of October 9, October 30, and November 24, 1992, and January 11, 1993, which were incorporated into Condition 9 for approval of License Amendments 21, 22, and 23, are hereby deleted.

All other conditions of the license shall remain the same.

This amendment is issued following preparation of an Environmental Assessment (EA) related to your proposed consolidation program. Based on this assessment, a Finding of No Significant Impact (FONSI) was prepared pursuant to Part 51 of the Code of Federal Regulations. The FONSI and corrected pages for the FONSI were published in the Federal Register on December 30, 1992, and February 2, 1993, respectively.

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Enclosed are copies of the revised Materials License No. SNM-33 and the Safety Evaluation Report.

Sincerely,

Original Signed By:

Charles W. Emeigh, Acting Chief
Licensing Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

Enclosures:
1. Revised License SNM-33
2. Safety Evaluation Report

cc w/encls:
Mr. J. F. Conant, Manager
Nuclear Materials Licensing

Distribution w/encls. (Control No. 290S)

Docket No. 70-36	PDR/LPDR	NRC File Center	NMSS R/F
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MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 39, 40 and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee	
1. Combustion Engineering, Inc.	3. License number: SNM-33 Amendment No. 24
2. P. O. Box 107 Hematite, Missouri 63047	4. Expiration date: December 31, 1989
	5. Docket or Reference No.: 70-36

6. Byproduct, source, and/or special nuclear material	7. Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
A. Uranium enriched to maximum 5.0 weight percent in the U-235 isotope	A. Any, excluding metal powder	A. 8,000 kilograms contained U-235
B. Uranium, any U-235 enrichment	B. Any	B. 350 grams
C. Source material (Uranium and Thorium)	C. Any, excluding metal powder	C. 50,000 kilograms
D. Cobalt-60	D. Sealed sources	D. 40 millicuries, total
E. Americium-241	E. Solid sources	E. 200 microcuries
F. Cesium-137	F. Sealed sources	F. 500 millicuries
G. Californium-252	G. Sealed sources	G. 4 milligrams

9. Authorized use: For use in accordance with the statements, representations, and conditions contained in Part I of the licensee's renewal application dated February 26, 1982, and supplements dated July 21, 1982; February 21, 1983; May 31, 1984; April 29, June 6, and October 11, 1988; February 10, March 22, May 1, August 18, October 23, October 26, and November 8, 1989 (2); January 3, January 12, March 16, and September 4, 1990; August 12, 1991; August 5 and November 6, 1992; and February 19 and March 2, 1993; and letters dated February 29, 1984, January 20, 1986, and March 30, 1987.

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10. Authorized place of use: The licensee's existing facilities in Hematite, Missouri, as described in the referenced license renewal application.

11. Deleted.

12. A written report shall be made by the NLS&A Supervisor to the Plant Manager every 6 months reviewing employee radiation exposure (internal and external) and effluent release data to determine:

    a. if there are any upward trends developing in personnel exposure for identifiable categories of workers, types of operations, or in effluent releases;

    b. if exposures and releases can be lowered in accordance with the ALARA commitment; and

    c. if equipment for effluent and exposure control is being properly used, maintained, and inspected.

13. The licensee shall leak test sealed sources in accordance with the enclosed "License Condition For Leak Testing Sealed Byproduct Material Sources."

14. Release of equipment and material from the plant site or to clean areas onsite shall be in accordance with the enclosed "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," dated August 1987.

15. Pursuant to 10 CFR 20.302, the licensee is authorized to treat waste and scrap materials containing uranium enriched in U-235 and/or source material by incineration.

16. Within 60 days of the date of this license renewal, the licensee shall submit to the NRC a description of a proposed monitoring program to determine the quantity and environmental effects of radioactivity on spent limestone rock used as onsite fill material and to determine the environmental effects of outdoor storage of the alpha-contaminated material.

17. The licensee shall survey spent limestone rock discharge from each HF scrubber for beta contamination. Rock with beta contamination which exceeds five times the background of fresh rock shall not be used for landfill.

18. Within 60 days of the date of this license renewal, the licensee shall submit to NMSS a plan, including schedule, for the disposal of alpha-contaminated spent limestone rock.

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19. The licensee shall decontaminate the two evaporation ponds such that the average residual contamination in each pond does not exceed the appropriate limit of either 250 picocuries of insoluble uranium or 100 picocuries of soluble uranium per dry gram of soil. The Tc-99 concentrations in a composite sample for each pond shall be determined.

20. a. If the radioactivity in plant gaseous effluents exceeds 150 μCi per calendar quarter, the licensee shall, within 30 days, prepare and submit to the Commission a report which identifies the cause for exceeding the limit and the corrective actions to be taken by the licensee to reduce the release rates. If the parameters important to a dose assessment change, a report shall be submitted within 30 days which describes the changes in parameters and includes an estimate of the resultant change in dose commitment.[1]

    b. In the event that the calculated dose to any member of the public in any consecutive 12-month period is about to exceed the limits specified in 40 CFR 190.10, the licensee shall take immediate steps to reduce emissions so as to comply with 40 CFR 190.10. As provided in 40 CFR 190.11, the licensee may petition the Nuclear Regulatory Commission for a variance from the requirements of 40 CFR 190.10. If a petition for a variance is anticipated the licensee shall submit the request at least 90 days prior to exceeding the limits specified in 40 CFR 190.10.

21. The licensee shall maintain and execute the response measures of his Radiological Contingency Plan submitted to the Commission by letters dated December 28, 1987, and August 23, 1990. The licensee shall also maintain implementing procedures for his Radiological Contingency Plan as necessary to implement the Plan. The licensee shall make no change in his Radiological Contingency Plan that would decrease the response effectiveness of the Plan without prior Commission approval as evidenced by a license amendment. The licensee may make changes to his Radiological Contingency Plan without prior Commission approval if the changes do not decrease the response effectiveness of the Plan. The licensee shall furnish the Chief, Fuel Cycle Safety Branch, Division of Industrial and Medical Nuclear Safety, NMSS, U. S. Nuclear Regulatory Commission, Washington, DC 20555, a report containing a description of each change within 6 months after the change is made.

22. At the end of the plant life, the licensee shall decontaminate the facilities and site in accordance with the general decommissioning plan submitted in the enclosure to the letter dated January 12, 1979, so that these facilities and grounds can be released to unrestricted use. The financial commitment to assure that funds will be available for decommissioning in the letter dated March 8, 1979, is hereby incorporated as a condition of the license.

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[1]The report or petition should be submitted to the Director, Office of Nuclear Material Safety and Safeguards, with a copy to the Regional Administrator, Region III.

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23. The licensee shall continue the soil sampling program for the spent limestone fill areas, as described in the letter dated February 29, 1984, until discontinuance is authorized by the Commission.

24. The monitoring program for the spent limestone shall include:

    a. Continuous air sampling at the center of, and approximately 1 meter above, the uncovered spent limestone piles for a minimum 2-year period. The weekly samples may be composited and analyzed for uranium activity on a quarterly basis. The lower limit of detection shall be 10^{-16} μCi/ml; or

    b. Measurement of the uranium activity on the surface of the spent limestone. Prior to conducting such a program, the licensee shall submit the sampling and analytical program to the NRC for approval.

25. Processing of UF_6 in 10-ton cylinders is not authorized.

26. The 10-ton UF_6 cylinders shall be equipped with valve protectors.

27. The concrete pad for storage of UF_6 cylinders and the surrounding area shall be sloped or graded so that any spilled combustible fluids would not be confined to the storage area.

28. No combustibles shall be stored on the concrete pad.

29. A CO_2 fire extinguisher shall be readily available near the storage pad.

30. In addition to the controls in Section I of the enclosure to the letter dated March 30, 1987, UF_6 cylinders which are in transport and containing UF_6 heels shall be either sealed, in sealed overpacks, or in sealed vehicles.

31. Notwithstanding the statement in Section 4.2.3 of the application, the k-effective of a unit or an array of units shall not exceed 0.95 unless specifically authorized by the license.

32. Nuclear criticality safety evaluations performed by the licensee in accordance with Section 2.7, Part I of the application, shall be based on assumptions of optimum moderation and reflection of individual safe units and of arrays.

33. Nuclear criticality safety evaluations involving k-effective calculations performed by a Nuclear Criticality Specialist shall be independently reviewed and approved by an individual having, as a minimum, the qualifications of a Nuclear Criticality Specialist.

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34. For uranium enriched to more than 4.1 w/o U-235, the licensee shall limit the agglomeration/granulation process, each agglomerated powder storage location, and the pellet pressing operation to safe mass units as specified in Table 4.2.4, Part I of the application.

35. Deleted.

36. Deleted.

37. Deleted.

38. Deleted.

39. At all times, the licensee shall limit moderating material (solutions and powders), except poreformer and lubricant, to not more than two 5-gallon pails on each of the second and third floors of Building 254.

40. The incumbent Superintendent, Production, identified in the amendment application dated August 12, 1991, is deemed to satisfy the education requirements for the position because of the incumbent's experience in the position since 1981 and his plant experience since 1974.

FOR THE NUCLEAR REGULATORY COMMISSION

Date: 5/12/93

By: Charles W. Emeigh
Division of Fuel Cycle Safety
and Safeguards, NMSS
Washington, DC 20555

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

MAY 12 1993

DOCKET: 70-36

LICENSEE: Combustion Engineering, Inc. (CE)
Hematite, Missouri

SUBJECT: SAFETY EVALUATION REPORT, LICENSE AMENDMENT APPLICATION DATED AUGUST 5, 1992, AND SUPPLEMENTS DATED NOVEMBER 6, 1992, AND FEBRUARY 19, AND MARCH 2, 1993, RE USE OF NEW PRODUCTION LINES WITH ENRICHED URANIUM

I. BACKGROUND

CE's Hematite facility is authorized by Materials License SNM-33 to convert low-enriched (up to 5.0 weight percent in U-235) uranium hexafluoride to uranium oxide, which is then formed into pellets. These pellets currently are shipped to CE's Windsor, Connecticut, facility. Once there, the pellets are sealed into fuel rods and encapsulated into fuel assemblies for use at light-water power reactors.

To improve the quality of operations, in 1991, CE management decided to consolidate its uranium fuel manufacturing operations at the Hematite facility. On February 13, 1992, CE informed the NRC of plans to construct a new fuel rod and bundle assembly building (Building 230) at the Hematite facility. The new building will be used to consolidate the Windsor and Hematite uranium fuel manufacturing operations.

By letters dated February 27 and March 30, 1992, NRC expressed no objection to construction of the building but advised that operations could not commence until License SNM-33 was amended. By letter dated August 5, 1992, supplemented November 6, 1992, CE submitted an application for consolidation of uranium fuel manufacturing operations at Hematite. By letter dated January 27, 1993, NRC staff requested additional information concerning the application. On February 19 and March 2, 1993, CE supplemented the application. CE plans to commence full production in May 1993. To achieve this goal, CE has completed the following startup activities:

1. Receive and test the fuel rod scanner containing sealed sources. This activity was approved by License Amendment 21 dated November 20, 1992.

2. Test new equipment with uranium source material. This activity was approved by License Amendment 22 dated January 5, 1993.

3. Store SNM in the new building. This activity was approved by License Amendment 23 dated March 26, 1993.

II. DISCUSSION

The proposed operations include fuel pellet handling and storage, fuel rod handling and storage, and fuel bundle assembly, storage, and shipping. The existing Building 256-1 and the new fuel rod and bundle assembly building (Building 230) will be used for the proposed operations. Building 230 measures approximately 190 feet wide by 200 feet long and contains approximately 38,000 square feet of floor space. The building is a free-standing steel frame with poured shallow concrete footings. Metal curtain walls with insulation are used on the exterior walls. The roofing is comprised of rigid insulation board placed over metal decking. The process operations that will be performed in Building 230 consist of pellet receipt, pellet storage, pellet loading, fuel rod loading and storage, and fuel bundle assembly, storage, packaging, and shipping.

A. Radiation Safety

The existing radiation protection program, as described in the license, is adequate to cover this requested action. The program includes the routine monitoring of radioactive airborne concentration in the work areas, radiological surveys for surface contamination, monitoring of the workers' exposure, waste management, and monitoring radiological effluents.

The staff has determined that the requested activities can be conducted safely.

B. Fire Protection

The facility is protected by a fire water system consisting of a 200,000-gallon elevated tank, which supplies an underground fire main, fire hydrants, and sprinklers. An electric motor-driven fire pump, driven alternatively by a diesel engine, is used to boost the pressure. A number of hydrants are installed, such that all areas of the facility can be reached by a hose stream. Water will not, however, be used as an extinguishing medium in areas of the facility designated as moderation-controlled areas. These areas are protected by portable fire extinguishers, using other extinguishing media. Portable extinguishers are available throughout the facility. Four sprinkler systems protect parts of several buildings, including warehouses in Buildings 230 and 256, a storage area in Building 255, and a laundry area in Building 240.

A fire alarm system, with centralized panels in Building 253 and in the Guard Station, provides a status indication of smoke detectors, sprinkler systems, the fire pump, and the pull-boxes.

The buildings are steel structures and are constructed of noncombustible or limited combustible materials. The licensee has a program which provides for routine inspections of buildings for fire hazards. Fire protection

equipment is inspected regularly. Plant operators receive training in the use of fire extinguishers, and individuals are assigned responsibilities for responding to fire emergencies. The nearby Hematite and Festus Fire Departments also respond to emergencies at the facility.

In consideration of the above, the staff concludes that the facility has adequate equipment and procedures to provide fire protection.

C. Nuclear Criticality Safety

CE has proposed technical requirements for nuclear criticality safety in Sections 4.2.3 (s) through (z) and in Section 4.2.4.

CE conducted safety analyses of the proposed fuel rod loading and bundle assembly manufacturing steps. These steps are upgrades of the fuel fabrication operations currently conducted at CE's Windsor facility. The safety analyses present contingencies for process changes, upsets or failures, which must occur before a criticality is possible, and describe methods for maintaining nuclear criticality safety. Sufficient detail has been provided to permit a review of the adequacy of controls. The safety analyses are intended to demonstrate that the new operations have been analyzed for potential criticality and that adequate controls have been proposed to prevent criticality.

The safety analyses provided in Part II of the submittal describe the operations and identify provisions for safe operations. The analyses include conditions and assumptions, safety factors, and abnormal occurrences. Sections 8.3.7 through 8.3.18 include process descriptions and accident analyses for the following operations: pellet alignment and bulk drying; packaging and transportation to Building 230; pellet storage and handling; fuel rod fabrication, inspection, and storage; fuel assembly fabrication, inspection, and storage; warehouse operations; and miscellaneous operations.

1. Technical Criteria

CE has proposed criteria and specified limits and controls for nuclear criticality safety. These will be used in the design and operation of equipment where special nuclear material (SNM) is processed. Safe operational limits for heterogeneous systems of fuel were derived utilizing calculational methods. Section 4.2, Technical Requirements, provides license conditions to ensure that the proposed operations will be subcritical under both normal and foreseen abnormal conditions. In particular, Table I.4.2.4 has been modified to establish new values for operational limits of heterogeneous slabs of 5 weight percent U-235 uranium dioxide. These new limits were derived from a new calculational method, which is discussed in the calculational method section of this report.

2. Pellet Inspection, Drying, and Transportation

Nuclear criticality safety for pellet inspection, drying, and transportation relies on geometry control. Geometry is controlled by handling the pellets within the criteria specified for height and spacing. Slab height limits are specified in Table I.4.2.4, and spacing criteria are specified in Table I.4.2.5. The staff has reviewed the safety limits presented in Tables I.4.2.4 and I.4.2.5 and concluded that these values are acceptable. This conclusion is based on the staff's use of calculational methods, KenoVa, and published criticality data contained in reports LA-3366 REV1 and DP-1014.

Equipment used for handling pellets during inspection, drying, and transportation includes the inspection hood, corrugated pellet trays, Kardex pans, Kardex pan transfer carts, and the transport vehicle. Pellets are inspected while present in a mono-layer under the hood. Following inspection, pellets are loaded into corrugated pellet trays, which are stacked in a Kardex storage pan. After drying, the Kardex pan is loaded onto a Kardex pan transfer cart. Kardex pans are prepared for transport to Building 230 at the transporter loading station located in Building 256. Kardex pans are loaded into transporter boxes which are, in turn, loaded onto the transport vehicle. The vehicle transports two boxes, each box contains two pans, and each pan is loaded with two stacks of trays.

To ensure nuclear criticality safety, all equipment and operations shall adhere to the slab and spacing criteria contained in Tables I.4.2.4 and I.4.2.5. Since these criteria assume full moderation, both the loss of geometry control and the presence of hydrogenous material are required for criticality. To limit the source of moderation, Section 4.2.3 (d) prohibits the installation of sprinklers and the use of firehoses in Building 256. Additional safety features not committed to in Part I of the amendment application, but discussed in the safety analysis, include the open design of equipment to prevent the retention of water and the cargo shield over the transport boxes, which aids in preventing the ingress of water. The staff has concluded that the nuclear safety limits established for pellet inspection, drying, and transportation, in conjunction with the controls established to implement these limits, are adequate to ensure safe operation. This assessment is based on the licensee's establishment and implementation of adequate geometric limits in conjunction with measures to preclude the possible ingress of moderating material into process areas. Therefore, because the failure of these two independent barriers are necessary to produce a criticality, the staff concludes, on the basis of the licensee's adherence to the double contingency principle, endorsed in ANSI 8.1, that operations described in this section may be safely executed.

3. Pellet Storage

A conveyor transfers transport boxes containing fuel pellets from the pellet transport vehicle to the Kardex unit for pellet storage. Pellets are stored

in the Kardex unit until they are loaded into rods at the pellet stacking table.

Nuclear criticality safety for pellet storage is based on moderation control. CE analyzed storage under normal and postulated adverse conditions. The analyses examined the sensitivity of the multiplication factor for the Kardex unit to postulated distributions of water within the Kardex unit. Under normal conditions, when there is no water present in the pellet trays, the storage array is highly subcritical (i.e., the effective multiplication factor is less than 0.5). Calculations for flooded Kardex pans, under optimum moderation, result in effective multiplication factors greater than 0.95. These results represent an inadequate safety margin and an unacceptable degree of subcriticality. Thus, multiple physical barriers to prevent the ingress of water are established as controls and are committed to in Section 4.2.3 (t) of Part I of the amendment application.

The proposed water barriers are described in Part II and include the building roof, Kardex unit shield wall and roof, and the metal skin on the Kardex structural frame. Although moderation control is the only Part I requirement supporting the double contingency principle, additional safety features exist that are not included in Part I of the application. These features of safety, described in Part II, include the absence of water pipes in proximity to the Kardex unit and the drain ports at the base of the Kardex shield wall enclosure.

In addition, Section 4.2.3 (t) establishes a limit on the allowed mass of hydrogenous material to account for lubricants, labels, and plastic wire insulation and fittings. Parametric studies on hydrogenous material were conducted to ensure the validity of the established limit.

CE conducted safety analyses which considered the following process upsets: Kardex storage shelf failure, SNM accumulation in the bottom of the Kardex device, leaks in the Building 230 exterior roof, and failures of the computer control system. Failure of the structural integrity of the Kardex storage unit will not alone cause a criticality; the presence of water is required to attain criticality. All process upsets remain subcritical without the presence of hydrogenous material. Section 4.2.3 (t) establishes moderation control, through design of the multiple barriers, to prevent the ingress of water to the Kardex unit.

The staff has concluded that the storage of UO_2 pellets enriched up to 5 weight percent may be safely stored in the Kardex device based on the licensee's commitment to provide the stated multiple physical barriers, the building roof, the Kardex shield wall and roof, and the metal skin on the Kardex structural frame, to prevent the ingress of water into the storage device.

4. Pellet Stacking and Loading

The pellet handling equipment and operations include: pellet stacking/rod loading, the short stack makeup hood, fuel rod salvage, and scrap pellet handling. The barriers against criticality during these operations are the limit on slab thickness and the restriction on firefighting activities. Additional safety features include the construction of equipment so as to preclude the retention of water. The nuclear criticality limits in conjunction with the equipment design should be adequate to ensure nuclear safety.

5. Rod Handling and Storage

Fuel Rod Handling

Nuclear criticality safety for rod handling is provided by geometry control. Pellet columns on the stacking tables are mechanically advanced through ports in the wall of the enclosed rod loading area and loaded into empty clad tubes. Within the enclosure, fuel rods are mechanically transported between the loading, weighing, welding, flash inspection, deflashing, and mechanical inspection operations. The orientation of the fuel rod arrays remains less than the safe slab height stated in Table I.4.2.4. In addition, the design of the system is such that the possibility of introducing sufficient water to cause the system to become critical is unlikely due to the elevation of the operations and the lack of overhead sprinklers in the process area.

The staff has concluded that the operations described above may be safely performed due to the implementation of the safe geometric limits established in Table I.4.2.4 and the engineered-safety features, that mitigate the possibility of water entering the fuel rod handling processes.

Fuel Rod Storage

Nuclear criticality safety for rod storage is based on moderation control. CE analyzed the storage of fuel rods under normal and postulated adverse conditions. The analyses examined the sensitivity of the multiplication factor of the rod box storage matrix to postulated distributions of hydrogenous material within the matrix. As a result of the analyses, Section 4.2.3 (v) requires the presence of multiple physical barriers to prevent the ingress of water. In addition, Section 4.2.3 (v) establishes a limit on the allowed mass of hydrogenous material to account for lubricants, labels, plastic wire insulation, and fittings. Parametric studies on hydrogenous material were conducted to ensure the validity of the established limit.

The proposed water barriers, described in Part II, include a sheet metal skin enclosing the rod box storage matrix and a sloped secondary roof over the enclosed matrix. Additional safety features, also described in Part II,

include the drain ports at the base of the matrix and the open design of the boxes to prevent retention of water.

The hydrogenous material limit established in Section 4.2.3 (v) is based on the design of the rod box storage matrix. The multi-level storage matrix consists of seven modules. Each module has four tiers, and each tier contains four fuel rod storage boxes. Design criteria for the rod box storage matrix are established in Section 4.2.3 (v). The separation criteria include a horizontal spacing of 3 inches between boxes within a tier, a vertical spacing of 17 inches between boxes, a horizontal spacing of 9 inches between boxes in adjacent modules, and a vertical spacing of 15 inches between the concrete floor and the box on the bottom tier.

The staff has concluded that the engineering design features which limit the ingress of moderating materials into the storage box, presented in Part II of the application, should be sufficient to ensure that the rod storage box will remain subcritical under both normal and postulated accident conditions.

6. Assembly Fabrication and Storage

In the fuel assembly fabrication, storage, and shipping areas, nuclear criticality safety controls include moderation and spacing. Nuclear criticality safety is based on the separation criteria specified in Section 4.2.3 (w), the moderation controls specified in Sections 4.2.3 (d) and (w), and the array limits specified in Sections 4.2.3 (x), (y), and (z).

Fuel Assembly Fabrication

The maximum safe square array, for pellet diameters ranging from 0.3224 to 0.4 inches, is 8.048 inches. Section 4.2.3 (x) establishes this as a limit. CE's standard 14 x 14 and 16 x 16 assemblies possess square array dimensions of 7.98 and 7.972 inches, respectively. Thus, CE's standard fuel assemblies are subcritical. Additional analyses, performed utilizing calculational methods, reveal that the multiplication factor for each assembly is less than 0.95 even under postulated flooding and complete reflection. Therefore, the staff has concluded that the operations described in this section meet the double contingency principle and may safely be performed.

Fuel Assembly Storage

Vertically positioned fuel assemblies are stored in racks which hold two rows of assemblies. Section 4.2.3 (w) establishes separation criteria for the storage of fuel assemblies. The separation criteria include a minimum center separation of 9.75 inches between assemblies within a row, a minimum center separation of 35 inches between two rows of assemblies within a rack, and a minimum separation of 37 inches between neighboring rows of adjacent racks.

The safety analyses examined the impact of water distribution within the storage racks. Water distribution was analyzed by considering mist densities between assemblies and water films on the assemblies. The conditions assumed in the analyses include a water film of 0.025 centimeters and a mist density of 0.001 grams per cubic centimeter. These conditions are comparable to heavy rainfall. The existence of such conditions is not considered credible since fire hoses and sprinklers are not permitted in the fuel assembly storage area.

The safety analyses considered the following process upsets: structural failure of the fuel assembly storage racks and roof leaks. Structural failure requires the presence of water to attain criticality and therefore by itself does not represent a criticality concern. The likelihood of roof leaks producing the water conditions discussed above is low. Regardless, the effective multiplication factor under such conditions is less than 0.8.

The staff has concluded that the geometric spacing constraints imposed by Section 4.2.3 (w), in conjunction with the constraints placed on moderating materials in the vicinity of the storage racks, should ensure under both normal and postulated accident conditions that the process area remains subcritical.

7. Calculational Method

The calculational method used for determining technical criteria for the proposed operations is different from those currently licensed. CE has utilized the CEPAK lattice code, referenced in the amendment application, to establish limits of heterogenous arrays of pellets and rods. Regulatory Guide 3.4 was used for validating the new calculational method. The validation demonstrates that the range of applicability is appropriate. The criticality analyses supporting the previous and continuing processes at Hematite are unaffected by these changes.

The new sections in Chapter II.7 describe the calculational method. The applicability of this method is also described for the systems analyzed. Section 7.9 discusses the validation of the new calculational method used for developing limits. Sections 7.10 through 7.12 provide the critical and subcritical limits for heterogenous arrays of pellets and rods. Appendix A provides the details of the method validation, and Appendix B provides details of the method applied to develop these limits.

The staff has reviewed the validation study performed by CE and concluded that CE has met the requirements for validating computational methods espoused in Regulatory Guide 3.52.

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Technical requirements are established in Section 4.2 of the amendment application. The proposed requirements for handling, storing, and transporting fuel units requires at least two unlikely, independent, and concurrent changes in conditions before a criticality event is possible. Therefore, reasonable assurance has been provided to ensure that an inadvertent nuclear criticality will not occur and pose a threat to the occupational or the public health and safety.

III. CONCLUSION/RECOMMENDATION

The staff concludes that the proposed operation will not adversely affect the public health and safety or the environment. Approval of the amendment application is recommended.

The Region III staff has no objection to this licensing action.

Original Signed By:

Marc Klasky
Licensing Section 2
Licensing Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

Original Signed By:

Sean Soong
Licensing Section 2
Licensing Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

Approved by: Original Signed By:
Michael Tokar, Section Leader

OFC	FCLB	C	FRIB		FCLB		FCLB	
NAME	SSoong:		ADatta:		MKlasky:		VTharpe:	
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