September 28, 2001

Mr. William T. O'Connor, Jr.
Vice President - Nuclear Generation
Detroit Edison Company
6400 North Dixie Highway
Newport, MI 48166

SUBJECT: FERMI 2 - ISSUANCE OF AMENDMENT RE: REEVALUATION OF FUEL HANDLING ACCIDENT, SELECTIVE IMPLEMENTATION OF 10 CFR PART 50.67 (TAC NO. MB0956)

Dear Mr. O'Connor:

The Commission has issued the enclosed Amendment No. 144 to Facility Operating License No. NPF-43 for the Fermi 2 facility. The amendment consists of changes to the Technical Specifications in response to your application dated December 29, 2000, as supplemented by letters dated May 2, 2001 and July 19, 2001.

The amendment revises the Fermi 2 Technical Specifications (TS) associated with handling irradiated fuel assemblies based on reevaluation of the design basis fuel handling accident analysis with an alternative radiological source term.

A copy of our Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

Tae Kim, Senior Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-341

Enclosures: 1. Amendment No. 144 to NPF-43
2. Safety Evaluation

cc w/encls: See next page

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DETROIT EDISON COMPANY

DOCKET NO. 50-341

FERMI 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 144
License No. NPF-43

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by the Detroit Edison Company (the licensee) dated December 29, 2000, as supplemented May 2 and July 19, 2001, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. NPF-43 is hereby amended to read as follows:

   Technical Specifications and Environmental Protection Plan

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 144 , and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. DECo shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 60 days.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Claudia M. Craig, Chief, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: September 28, 2001

ATTACHMENT TO LICENSE AMENDMENT NO. 144

FACILITY OPERATING LICENSE NO. NPF-43

DOCKET NO. 50-341

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

REMOVE	INSERT
3.3-62	3.3-62
3.3-70	3.3-70
3.6-40	3.6-40
3.6-41	3.6-41
3.6-43	3.6-43
3.6-45	3.6-45
3.6-47	3.6-47
3.6-48	3.6-48
3.6-49	3.6-49
3.7-6	3.7-6
3.7-7	3.7-7
3.7-8	3.7-8
3.7-11	3.7-11
3.7-12	3.7-12
3.7-13	3.7-13
3.8-10	3.8-10
3.8-11	3.8-11
3.8-12	3.8-12
3.8-19	3.8-19
3.8-20	3.8-20
3.8-28	3.8-28

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 144 FACILITY OPERATING LICENSE NO. NPF-43

DETROIT EDISON COMPANY

FERMI 2

DOCKET NO. 50-341

1.0 INTRODUCTION

By application dated December 29, 2000, as supplemented by letters dated May 2 and July 19, 2001, the Detroit Edison Company (DECo or the licensee) requested changes to the Technical Specifications (TSs) for Fermi 2. The proposed changes would revise the requirements for handling irradiated fuel assemblies in the secondary containment. These proposed changes would allow movement of fuel assemblies that are not recently irradiated without requiring secondary containment building integrity. The licensee also proposed to revise TSs associated with ensuring that safety analysis assumptions are met for a fuel handling accident (FHA). The FHA radiological analyses that were performed by the licensee to support the proposed TS changes use an alternative radiological source term (AST). This submittal constitutes a selective implementation of an AST for analysis of the FHA only, except in the case of movement of GE11 fuel that does not meet the fuel limitations in Footnote 11 to Regulatory Guide (RG) 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors."

The May 2, 2001, supplement was beyond the scope of the original *Federal Register* notice (66 FR 9381). In order to consider the additional information, the submittal (December 29, 2000, application, as supplemented May 2 and July 19, 2001) was renoticed in the *Federal Register* (66 FR 45062).

2.0 EVALUATION

2.1 Fuel Limitations Imposed on Use of RG 1.183, Table 3

RG 1.183, Table 3, "Non-LOCA Fraction of Fission Product Inventory in Gap," gives acceptable assumptions for the fraction of the total rod fission product activity that is in the gap between the fuel pellets and cladding which is subsequently released from failed fuel for design basis accidents, with the exception of the Loss of Coolant Accident (LOCA), boiling-water reactor (BWR) rod drop accident and pressurized-water reactor (PWR) rod ejection accident. These gap fractions may be used by licensees in radiological analyses of the FHA without further staff review, provided that the conditions in Footnote 11 are satisfied. Footnote 11 indicates that the Table 3 gap fractions have been determined to be acceptable for use with currently approved light water reactor fuel with a peak (rod average) burnup up to 62 GWD/MTU (gigawatt-days per metric ton uranium) provided that the maximum linear heat generation rate does not exceed

6.3 kW/ft (kilowatts per foot) peak rod average power for burnups exceeding 54 GWD/MTU. The licensee stated that the GE14 fuel that will be loaded into the core in the future will meet the limitations given in the footnote, however, although the currently loaded GE11 fuel meets the footnote for the upcoming refueling outage, the licensee expects that in the future the linear heat generation rate limitation may be exceeded in a limited number of fuel rods.
Given the potential for the GE11 fuel to exceed the limits in Footnote 11 of RG 1.183, the licensee proposed that two separate analyses be used for each case to determine the required post-shutdown delay period used in defining the term "recently irradiated fuel." For a refueling outage where the fuel to be moved meets the fuel burnup limitations, the licensee proposed to base the definition of "recently irradiated fuel" on an FHA radiological analysis that uses an alternative source term as defined in 10 CFR 50.67 and guidance given in RG 1.183. For this case, which is expected to be the majority of the time, the licensee defined "recently irradiated fuel" as fuel that has occupied part of a critical reactor core within the previous four days. For fuel that does not meet the burnup limitations of Footnote 11 of RG 1.183, the licensee proposed the definition of "recently irradiated fuel" based on an FHA radiological analysis that uses the TID-14844 source term, guidance in RG 1.25, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors," dose acceptance criteria and guidance in NUREG-0800 Standard Review Plan (SRP) Section 15.7.4, "Radiological Consequences of Fuel Handling Accidents," and the regulatory dose limits in 10 CFR Part 100 (with acceptance criteria found in SRP 15.7.4) and 10 CFR 50, Appendix A, General Design Criterion (GDC) 19. For this second case, the licensee defined "recently irradiated fuel" as fuel that has occupied part of a critical reactor core within the previous 34 days. The NRC staff would prefer that the licensee use an NRC-approved methodology to calculate the estimated fission gas gap inventory for the fuel that does not meet the footnote limitations. However, the staff agreed that the licensee's approach would be acceptable, provided the licensee is very clear on which delay time is being considered for a particular refueling outage and how the fuel burnup limitations are determined to be in compliance with Footnote 11 to RG 1.183 prior to movement of any fuel.

The staff has reviewed the licensee's description of determination of compliance with Footnote 11 of RG 1.183 and finds the licensee's process to be acceptable, as discussed below. To determine compliance with the fuel burnup limitations before the movement of any fuel, the licensee proposed to verify the maximum power linear heat generation rate and rod average burnup based on actual fuel burnup and power distribution data obtained from the plant's core monitoring system. The General Electric (GE) 3D-Monicore core monitoring system calculates the power distribution within the reactor, typically each hour the reactor is operating above 25 percent power. The uncertainties in the power distribution and exposure accumulation calculation are the same as those for the calculation of the Safety Limit Minimum Critical Power Ratio (MCPR) and the Technical Specifications thermal limits. Nodal power and exposure data reports can be easily generated by the 3D-Monicore system to help verify compliance with the fuel limitations in Footnote 11 to RG 1.183. The licensee proposes the following process to verify compliance:

- First, the licensee would review end-of-cycle power and exposure data reports to determine if the maximum six-inch nodal exposure in the core is less than the 54 GWD/MTU peak rod average burnup limit in the footnote. If the maximum nodal exposure is less than the limit, then the fuel is verified to meet the footnote and the 4-day delay time definition of "recently irradiated fuel" can be used.

- For any nodes that have an exposure greater than 54 GWD/MTU, the licensee will calculate the rod average burnup manually by summing the 25 nodal exposures of the fuel rod in question and dividing by 25. If all the rod average exposures are found to be less than 54 GWD/MTU, then the fuel is verified to meet the footnote and the 4-day delay time definition of "recently irradiated fuel" can be used.

- If any fuel rods are determined to have a rod average burnup exceeding 54 GWD/MTU, the licensee will first verify that the rod average burnup does not exceed 62 GWD/MTU. Then, the archived 3D-Monicore data for the cycle will be reviewed to confirm that the fuel rod's average linear heat generation rate did not exceed 6.3 kW/ft any time after the fuel exceeded 54 GWD/MTU. If this is the case, then the fuel is verified to meet the footnote and the 4-day delay time definition of "recently irradiated fuel" can be used.

- If the fuel is not verified to meet the footnote limitations by any of the above, the 34-day delay time definition of "recently irradiated fuel" must be used.

2.2 Radiological Dose Analyses

In accordance with the reviewer's note to TS Task Force (TSTF) Initiative TSTF-51, Rev. 2, the licensee performed FHA radiological analyses which assume no mitigation or credit for secondary containment integrity to determine the delay time to use for the definition of "recently irradiated fuel." As discussed above, the licensee performed 2 separate radiological analyses based on whether or not the fuel meets the limitations in Footnote 11 to RG 1.183. The staff performed its own calculations using the licensee's assumptions for both the AST and RG 1.25 FHA analyses and confirmed the licensee's results for both. The staff found that both licensee FHA analyses generally followed staff guidance on assumptions, inputs and methodologies. Both analyses used the same atmospheric dispersion factors (X/Qs), of which the control room X/Q was newly recalculated. Discussion of the staff's review of the licensee's X/Qs is found below under the heading "Atmospheric Relative Concentration Estimates."

For fuel that is verified to meet the fuel limitations in the footnote, the licensee performed an FHA radiological analysis for GE14 fuel using an alternative source term. This AST analysis of the FHA, as discussed in the next paragraph, justified the definition of "recently irradiated fuel" as fuel that has occupied part of a critical reactor core within the previous four days. For fuel that does not meet the fuel limitations in the footnote, the licensee performed an FHA radiological analysis for GE11 fuel using TID-14844 (J.J. DiNunno, et al., "Calculation of Distance Factors for Power and Test Reactor Sites," USAEC TID-14844, U.S. Atomic Energy Commission, 1962) and guidance in RG 1.25; this analysis justified the definition of "recently irradiated fuel" as fuel that has occupied part of a critical reactor core within the previous 34 days.

For the FHA radiological analysis implementing the AST, the staff determined that the licensee's assumptions, inputs and methodologies followed guidance given in RG 1.183 for the FHA. The AST analysis assumptions were based on the more limiting GE14 fuel in an FHA occurring 4 days after shutdown. The analysis assumed that the gap activity from fuel rods damaged by the accident was released to the environment within 2 hours without filtration or credit for secondary containment integrity. The analysis did not assume control room

emergency filtration. The licensee calculated the Total Effective Dose Equivalent (TEDE) for the duration of the accident at the Emergency Area Boundary (EAB), Low Population Zone (LPZ) and control room. The licensee's results and the RG 1.183 dose acceptance criteria are given in Table 1. The licensee's estimated radiological consequences are within the dose acceptance criteria and the dose limits given in 10 CFR 50.67.

The FHA radiological analysis for the GE11 fuel that does not meet the fuel limitations in Footnote 11 to RG 1.183 was based on guidance given in RG 1.25, with the addition of the increased Iodine-131 gap fraction to account for high burnup fuel. The analysis assumed that the gap activity from fuel rods damaged by the accident was released to the environment within 2 hours without filtration or credit for secondary containment integrity. The analysis did not assume control room emergency filtration. The licensee calculated the whole body and thyroid doses for the duration of the accident to a person at the EAB, LPZ, and control room. The licensee's results and SRP 15.7.4 offsite and GDC-19 control room dose acceptance criteria are given in Table 2. The licensee's estimated radiological consequences are within the dose acceptance criteria and the dose limits given in 10 CFR Part 100 and 10 CFR 50, Appendix A, GDC-19.

2.3 Atmospheric Relative Concentration Estimates

With respect to the 0-2 hour relative concentration (X/Q) value for the EAB, the licensee stated that it used the value of 1.23×10^{-4} s/m^3 reported in the Fermi Updated Final Safety Analysis Report (UFSAR). Staff did not review this X/Q value as a part of this amendment request but finds that the continued use of the UFSAR value for the EAB X/Q in the FHA dose analysis to be acceptable.

For the control room X/Q value, the licensee used five years of onsite meteorological data collected during calendar years 1995 through 1998. These data were measured at 10 and 60 meters above grade at the Fermi site. Joint recovery of the wind speed, wind direction and atmospheric stability data was above 90 percent, the recommended minimum cited in RG 1.23, "Onsite Meteorological Programs, at both levels for all years. The licensee confirmed that the meteorological measurement programs meets the recommendations of RG 1.23. In addition, data from the primary and secondary meteorological instruments are compared as a means of data validation. Routine walkdowns are also performed to ensure system operability. Staff performed a review of the data for year to year consistency, comparison with historical data, and consistency of wind speed and wind direction between the two measurement heights, and found the data adequate for use in this dose assessment.

The licensee used the ARCON96 methodology described in NUREG/CR-6331, Revision 1, "Atmospheric Relative Concentrations in Building Wake," to calculate X/Q values for control room dose assessment. Calculations were made for several credible postulated release locations and the limiting value of 4.25×10^{-3} s/m^3 was selected for use in the dose assessment. This X/Q value was calculated as ground level point release and assumed no effluent flow. Because the design basis accident under consideration has a duration of two hours, the licensee only reported the 0-2 hour X/Q value. The staff has determined that the licensee's methodology, inputs and assumptions used in calculating the X/Q value for control room dose assessment are acceptable for the reasons discussed above. The staff, therefore, finds that use of the newly calculated control room X/Q in the FHA dose analysis is acceptable.

2.4 Use of the Term "Recently Irradiated Fuel"

Use of the term "recently irradiated fuel" to mean fuel that has occupied part of a critical reactor core within the previous 4 days is acceptable based on the staff finding that the licensee's FHA analysis using the guidance in RG 1.183 for an alternative source term and compensatory actions are acceptable in accordance with the reviewers note for TSTF-51. After 4 days, the fuel has undergone radioactive decay to a point that, for an unmitigated design basis FHA without building integrity, the radiological consequences calculated with an AST are within the dose limits given in 10 CFR 50.67 and acceptance criteria in RG 1.183 for persons offsite, and are also within the dose limits given in 10 CFR 50.67 for control room personnel.

Use of the term "recently irradiated fuel" to mean fuel that has occupied part of a critical reactor core within the previous 34 days is acceptable based on the staff finding that the licensee's FHA analysis using the guidance in RG 1.25 for the TID-14844 source term and compensatory actions are acceptable in accordance with the reviewers note for TSTF-51. After 34 days, the GE11 fuel has undergone radioactive decay to a point that, for an unmitigated design basis FHA without building integrity, the radiological consequences calculated using guidance in RG 1.25 are within the dose limits given in 10 CFR Part 100 and acceptance criteria in SRP 15.7.4 for persons offsite, and are also within the dose limits given in 10 CFR 50, Appendix A, GDC-19 for control room personnel.

2.5 Summary

The staff reviewed the assumptions, inputs and methods used by the licensee to assess the radiological impacts of the proposed plant modifications in the context of TID-14844, RG1.25, and SRP 15.7.4. The staff finds that the licensee used analysis methods and assumptions consistent with the guidance of RG 1.25. The staff compared the doses estimated by the licensee to the applicable acceptance criteria and the results estimated by the staff in its confirmatory calculations. The staff finds, with reasonable assurance, that the licensee's estimates of the TEDE due to design basis accidents will comply with the requirements of 10 CFR 50.67 and the guidance of RG 1.183.

The staff has reviewed the AST selective implementation proposed by Detroit Edison for Fermi 2. The staff also reviewed the plant modifications associated with the proposed AST implementation. The staff reviewed the assumptions, inputs and methods used by the licensee to assess the radiological impacts of the proposed plant modifications in the context of the AST. The staff finds that the licensee used analysis methods and assumptions consistent with the guidance of RG 1.183. The staff compared the doses estimated by the licensee to the applicable acceptance criteria and the results estimated by the staff in its confirmatory calculations. The staff finds with reasonable assurance that the licensee's estimates of the TEDE due to design basis accidents will comply with the requirements of 10 CFR 50.67 and the guidance of RG 1.183. For these reasons, and as discussed above, the staff concludes that the proposed AST implementation and the associated plant modifications are acceptable.

With this approval, the selected characteristics of the AST and the TEDE criteria become the design basis for the fuel handling accident at Fermi 2. The selected characteristics of the AST and the TEDE criteria may not be extended to other aspects of the plant design or operation without prior NRC review under 10 CFR 50.67. All future radiological analyses performed to

demonstrate compliance with the regulatory requirements shall address the selected characteristics of the AST and the TEDE criteria as described in the facility design basis.

3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Michigan State official was notified of the proposed issuance of the amendment. The State official had no comments.

4.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration and there has been no public comment on such finding (66 FR 45062). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

5.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: M. Hart
L. Brown

Date: September 28, 2001

Table 1
Licensee Calculated AST FHA Dose Consequences (GE14 Fuel)

	Time from Shutdown	EAB TEDE (rem)	LPZ TEDE (rem)	Control Room TEDE (rem)
Analysis Results	4 days	0.193	0.022	4.695
Acceptance Criteria		6.3	6.3	5

Table 2
Licensee Calculated RG 1.25 FHA Dose Consequences (GE11 Fuel)

	Time from Shutdown	EAB Dose (rem)		LPZ Dose (rem)		Control Room Dose (rem)	
		Whole Body	Thyroid	Whole Body	Thyroid	Whole Body	Thyroid
Analysis Results	34 days	0.005	1.029	0.001	0.116	0.008	29.0
Acceptance Criteria		6	75	6	75	5	30

ENCLOSURE