

March 29, 2005

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

SUBJECT: FERMIL 2 - ISSUANCE OF AMENDMENT RE: TECHNICAL SPECIFICATION
SURVEILLANCE REQUIREMENT 3.7.6.1 FOR TURBINE BYPASS VALVE
CYCLING (TAC NO. MC4477)

Dear Mr. O'Connor:

The Commission has issued the enclosed Amendment No. 165 to Facility Operating License No. NPF-43 for the Fermi 2 facility. The amendment consists of changes to the Technical Specifications (TSs) in response to your application dated September 16, 2004.

The amendment, which revises TS Surveillance Requirement (SR) 3.7.6.1, allows a 5 percent stroke rather than a complete (100 percent) stroke of each turbine bypass valve (TBV), and extends the surveillance frequency from 92 days to 120 days. The complete stroke verification currently required by SR 3.7.6.1 once after each entry into MODE 4 will be retained and renumbered SR 3.7.6.2. The system functional test (current SR 3.7.6.2) and the TBV response time test (current SR 3.7.6.3) will be renumbered as SR 3.7.6.3 and SR 3.7.6.4, respectively.

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/

Nihar K. Ray, 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.165 to NPF-43
2. Safety Evaluation

cc w/encls: See next page

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The amendment revises TS Surveillance Requirement (SR) 3.7.6.1 that will allow a 5 percent stroke rather than a complete (100 percent) stroke of each turbine bypass valve (TBV), and extends the surveillance frequency from 92 days to 120 days. The complete stroke verification currently required by SR 3.7.6.1 once after each entry into MODE 4 would be retained and renumbered SR 3.7.6.2. The system functional test (current SR 3.7.6.2) and the TBV response time test (current SR 3.7.6.3) will be renumbered as SR 3.7.6.3 and SR 3.7.6.4, respectively.

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Package: **ML050900007**

Amendment: **ML050880394**

TS: **ML050900102**

No major changes to input provided by memo dated 3/2/05.

OFFICE	PDIII-1/PM	PDIII-1/LA	SC:EEIB*	SC: IROB-A	OGC	PDIII-1/SC
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Fermi 2

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DETROIT EDISON COMPANY

DOCKET NO. 50-341

FERMI 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 165

License No. NPF-43

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by the Detroit Edison Company (DECo) dated September 16, 2004, 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. 165, 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 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

L. Raghavan, 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: March 29, 2005

ATTACHMENT TO LICENSE AMENDMENT NO. 165

FACILITY OPERATING LICENSE NO. NPF-43

DOCKET NO. 50-341

Replace the following page of the Appendix A Technical Specifications with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

REMOVE

3.7-17

INSERT

3.7-17

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 165 FACILITY OPERATING LICENSE NO. NPF-43

DETROIT EDISON COMPANY

FERMI 2

DOCKET NO. 50-341

1.0 INTRODUCTION

By application to the U.S. Nuclear Regulatory Commission (NRC, Commission) dated September 16, 2004 (ADAMS ML042680322), Detroit Edison Energy Company (the licensee) requested changes to its Technical Specifications (TSs) for Fermi 2.

The proposed changes will revise the scope and the frequency of TS Surveillance Requirement (SR) 3.7.6.1 for verification of one complete cycle of each turbine bypass valve (TBV) every 92 days. The proposed change to SR 3.7.6.1 will allow a 5 percent stroke rather than a complete (100 percent) stroke of each TBV, and will extend the surveillance frequency from 92 days to 120 days. The complete stroke verification currently required by SR 3.7.6.1 once after each entry into MODE 4 will be retained and renumbered SR 3.7.6.2. The system functional test (current SR 3.7.6.2) and the TBV response time test (current SR 3.7.6.3) will be renumbered as SR 3.7.6.3 and SR 3.7.6.4, respectively.

The licensee states that changing the valve stroke test from full open to 5 percent open will minimize the secondary plant transients that Fermi 2 currently experiences when the valves are fully cycled for this test during power operation, and will minimize wear on the valves and the condenser internals resulting from the significant amount of steam bypassed directly to the condenser. The frequency change from 92 days to 120 days will allow TBV testing to be performed coincident with control rod pattern adjustments and the TS required control rod scram time testing, thus minimizing the number of down-power evolutions necessary for each cycle to perform these required activities.

2.0 REGULATORY EVALUATION

Fermi 2 TSs currently require that each turbine bypass valve be demonstrated operable by full-stroke exercising the valve at least once per 92 days.

The purpose of Fermi 2 TS SR 3.7.6.1 is to ensure operability of the TBVs through a simple valve stroke demonstrating mechanical freedom of movement. The system functional test (current SR 3.7.6.2) checks the system response to an actuation signal (System Functional Test) and the response time test (current SR 3.7.6.3) checks the system's response time (Response Time Test).

The system functional test demonstrates that, with the required initiation signals, the valves will actuate to their required positions, while the response time test ensures that this valve actuation occurs within a rate bounded by the assumptions in the appropriate safety analyses. Both the system functional test and the response time test are performed once every 18 months with the plant shut down. The licensee states that the 18-month frequency is based on the need to perform these surveillances under shutdown conditions because of the potential for an unplanned transient if the surveillance is performed with the reactor at power. Operating experience has shown that this 18-month frequency is acceptable from a reliability standpoint. SR 3.7.6.2 and SR 3.7.6.3 remain unaffected by the proposed change.

The current TS valve stroke test requires that each of the TBVs be tested through one complete cycle (closed to 100 percent open to closed) every 92 days and once after each entry into MODE 4. This is performed utilizing the unitized actuators (UAs) at a reduced system hydraulic pressure of approximately 300 to 325 psi, whereas the 18-month test is conducted at full hydraulic system pressure of approximately 1,500 psi. Cycling each main turbine bypass valve through one complete cycle of full travel during operations is not a test of the system hydraulics per se, but demonstrates that the valves are mechanically operable and that they will function when required.

The licensee's code of record for the Fermi 2 inservice testing program for valves is the 1989 Edition of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI which references the ASME Operation and Maintenance Part 10 standard (1987 Edition up to and including the 1988 Addenda).

3.0 TECHNICAL EVALUATION

The NRC staff has reviewed the licensee's regulatory and technical analysis in support of its license amendment which is described in Enclosure 1 of the licensee's submittal.

In its submittal, the licensee states:

The proposed change to SR 3.7.6.1 will allow a 5% stroke rather than a complete (100%) stroke of each TBV, and will extend the surveillance frequency from 92 days to 120 days. The complete stroke verification currently required by SR 3.7.6.1 once after each entry into MODE 4 will be retained and renumbered SR 3.7.6.2. The system functional test (current SR 3.7.6.2) and the TBV response time test (current SR 3.7.6.3) will be renumbered SRs 3.7.6.3 and 3.7.6.4, respectively. The Technical Specification Bases will be revised to reflect these changes.

The Fermi 2 TBVs are unique in that they are the largest of the boiling water reactor TBVs (12.5 percent steam bypass each) and they were manufactured by Alstom in England. The only other plants utilizing similar Alstom TBVs are the Ringhals units in Sweden. This change from full stroke testing to 5 percent open testing is consistent with the online surveillance testing performed for the Ringhals TBVs.

TBV should operate as designed, provided the following three primary elements are met:

- 1) The valves and the actuator linkages must be mechanically sound and free to operate.
- 2) Sufficient oil pressure to open the valves must be available.
- 3) The control circuitry that provides the signal to the valves to fast open must function as designed.

SR 3.7.6.1 is intended to verify the first requirement that the valves are mechanically operable and will function when required. The system functional test (current SR 3.7.6.2) and the response time test (current SR 3.7.6.3), performed once every 18 months with the plant shut down, ensure that requirements 2 and 3 are met.

The TBV UA configuration consists of a number of inter-linked components that produce controlled valve movement. The UA hydraulic servo ram is linked to a horizontal rod, which is connected to the vertical arm of an 'L' shaped lever crank, which is pivoted at a fulcrum pin on the lever housing. The midpoint of the vertical arm of the lever crank is connected to a horizontal closing spring spindle. The horizontal arm of the lever crank is connected to a vertical spindle which connects to the valve head.

Hydraulic pressure in the servo ram pushes the vertical arm of the lever crank in a horizontal direction, compressing the closing spring and lifting the horizontal arm of the lever crank such that the valve opens.

In its submittal, the licensee states:

Unitized actuator hydraulic system pressure is approximately 2,200 psi. The valve closing spring loading, with the valve closed is approximately 19,250 pounds (manufacturers data). With the TBV in the closed position, and 970 psi steam at the 52 inch manifold, the closing steam force on the valve head is approximately 60,000 pounds. When the valve opens, the closing force reverses, to assist in opening the valve, with a force of approximately 9,300 pounds (calculation based on valve head/spindle diameter/s).

The geometry of the lever crank is such that the ratio of the vertical/horizontal arms is 2.5 to 1. When moments are applied about the fulcrum point, the calculated force necessary to open the valve is approximately 33,600 pounds, which corresponds to a servo ram pressure of approximately 940 psi. When the valve is opened 5%, neglecting the small increase in spring force, the servo ram pressure necessary to maintain the valve open is less than 300 psi. With a spring compression of 2.3 inches, and an estimated spring rate of 1,500 pounds/inch, the required hydraulic pressure necessary to maintain the valve in the fully open position increases to approximately 325 psi.

The greatest UA hydraulic force and, therefore, servo valve positioning force, is needed to lift the TBVs off of their closed seat. Once the TBVs are open under servo control, the hydraulic

forces required to open them fully are greatly reduced and do not significantly change over the entire range of movement.

While difficult to control operationally, the TBVs have historically performed well during the surveillance testing. In a review of past performances of the surveillance testing, it has been successfully completed each time with two exceptions. The first occurred during the Fall 1989 refueling outage rebuild of the valve when a longer stem was installed in the East TBV. The setup required to mate the valve to its associated valve actuator was not properly performed, resulting in the linkages being skewed out of their normal positions. When the valve was stroked open, the linkages moved such that they contacted a mechanical stop at approximately 88 percent open. No post maintenance testing was conducted (Notice of Violation 50-341/90-007-01) following this rebuild, and this problem was not identified until reactor startup when the valve opened only 88 percent during performance of its surveillance procedure. In the other instance, on November 18, 1994, the East TBV failed to open during testing following plant maintenance on the valve's unitized actuator. This surveillance test was being used as post maintenance testing (PMT) following maintenance on the East TBV UA. The cause of the valve's failure to operate was a loose pump discharge line on the UA, which was a direct result of the maintenance activity on the UA. The PMT was successful in identifying the workmanship issue. Upon rework of the line, the PMT/surveillance was completed successfully.

In its application, the licensee states that regularly scheduled maintenance is performed on the TBVs, their respective UAs and valve linkages to ensure continuing high reliability. Complete valve disassembly and inspection of valve internals and a detailed inspection of the valve linkage is performed every 4 refueling outages and valve disassembly and inspection every 6 years. TBV Unitized Actuators are changed out with rebuilt units every other outage. For those outages where the UA is not replaced, the oil pump motor, filter and strainer are replaced along with a draining and replacement of the oil. Valve position and control loops are calibrated every outage.

In summary, there have been no freedom of movement or mechanical linkage issues associated with these valves other than those that were a direct result of maintenance. Per the ASME Operation and Maintenance Code, PMT is required after significant maintenance and is expected to detect and identify changes in valve operation. PMT for the valve disassembly preventative maintenance involves performance of SRs 3.7.6.1, 3.7.6.2, and 3.7.6.3 (i.e., the valve operability surveillance, the functional test and the response time test). Position indication and valve control calibrations, as well as the UA replacements and/or maintenance utilize the valve operability test (SR 3.7.6.1) as PMT.

While a partial stroke test would continue to show that the valves are mechanically free to operate through the more critical areas of operation (i.e., coming off the shut seat), it would not verify free movement through the valve's entire range. In an effort to assess the impact on valve reliability of a partial stroke test at the increased interval, Alstom, the valve's original equipment manufacturer, was contracted by the licensee to establish and compare probabilities of the TBVs failing to full open on demand as a result of the proposed changes to the testing requirements.

Alstom's study evaluated several different testing conditions to assess the effects of revising the surveillance requirements on the valve failure probability. The case studies of interest are as follows: (1) the current full stroke operational test performed every 92 days with the

functional and response time tests performed every 18 months, and (2) the proposed partial (5 percent) stroke operational test performed every 120 days with functional and response time testing remaining unchanged at 18 months.

The results of this study showed that the increase in failure probability that one TBV would fail to fast open due to the proposed testing change is conservatively estimated to be 0.40 percent. This increase is due to the increase in the testing interval by one third (from 92 days to 120 days), and to an assumed doubling of the failure rate from 7.5 E-04 to 1.5 E-03 failures/month for the steam valves themselves. The doubling was based solely on engineering judgment, because no empirical data exists for all particular failures mode of these valves. The NRC staff reviewed the study results and find them to be reasonable and conservative.

In conjunction with TS required surveillance testing, TBV system performance is maintained by a monitoring regime. Continuous monitoring of UA oil pressures, temperatures and levels, oil filter differential pressure, as well as power supply fault and valve misposition indication provide alarm annunciation in the main control room to alert operators to abnormal conditions. Shift walkdowns by operations personnel and monthly walkdowns by the system engineer of the TBV UAs monitor the physical condition of accessible components such as hoses, fittings, linkages, etc. Quarterly monitoring of UA repressurization times provides trend data to evaluate UA oil pump performance.

Performance of the "Turbine Bypass Valve Operability Test," has historically proven challenging to plant operators and has affected severe transients in the heater drains system. Since 1994, Surveillance Procedure 24.109.02 has been performed sixty times. Twenty-three of these sixty surveillance tests were performed with the plant in MODE 1 and with the heater drains system "pumping forward." The heater drains system was perturbed in twenty-one of these twenty-three tests to an extent that a loss of the heater drains system occurred, and in two cases, resulted in recirculation pump runbacks to below 65 percent reactor coolant flow. Other consequences of performing this surveillance have been feedwater level transients, some resulting in extraction steam isolations.

The proposed change to SR 3.7.6.1 from full stroke testing to 5 percent stroke testing, and from 92 days to 120 days produces only a minimal increase in the failure probability of a TBV during each cycle that is outweighed by the elimination of the adverse impacts of full stroke testing during power operation. A partial stroke test at 120 days in place of a complete cycle at 92 days will be sufficient to detect mechanical degradation and to ensure that the valves remain mechanically operable when called upon to perform their safety related functions.

The proposed change will reduce operating risk by eliminating the potential for a unit shutdown. Additionally, retaining the requirement to full stroke test each TBV once after each entry into MODE 4 will continue to verify that the valves are mechanically operable prior to their first use following each startup from MODE 4. The surveillance test that ensures the main turbine bypass system meets its system's response time limits (SR 3.7.6.3) is not affected by these proposed changes. The surveillance will continue to be performed at its current 18-month frequency.

4.0 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.

5.0 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 and changes the surveillance requirements. The NRC 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 (69 FR 64985). 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.

6.0 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 Contributor: S. Unikewicz, NRR

Date: March 29, 2005