FERMI 2

ANNUAL OPERATING REPORT

JANUARY 1 - DECEMBER 31, 1993

DETROIT EDISON COMPANY

NRC DOCKET NO. 50-341

FACILITY OPERATING LICENSE NO. NPF-43

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1.0 Introduction

The Fermi 2 Nuclear Power Plant site is located on the western shore of Lake Erie in Frenchtown Township, Monroe County, Michigan. The Nuclear Steam Supply System is a General Electric BWR 4, with a Mark I pressure-suppression containment. The plant is fully owned by the Detroit Edison Company.

2.0 Summary of Operating

2.1 Summary of Operating Experience

This summary covers the operation of Fermi 2 from January 1, 1993 to December 31, 1993. During this period, Fermi 2 generated 8,646,210 MWH (net) and was available 92.2 percent of the time. The forced outage rate was 4.4 percent.

The plant was on line from January 1 until February 10. The plant shutdown for a condenser tube leak which caused condensate chemistry to reach specified action levels. The plant was shutdown for condenser tube plugging. Following the repair, the plant was synchronized to the grid on February 13.

On February 19, 1993 circulating water pump number 3 was removed from service for performance of preventative maintenance. Electrical maintenance personnel were to perform procedure 35.318.017, the inspection and testing of multi-contact auxiliary relays. An electrician located and connected his test equipment to the incorrect relay which resulted in the loss of 4160 VAC bus 69J. Circulating water pumps number 1 tripped and 2 de-energized, and their discharge valves de-energized in the open position. Circulating water pumps numbers 4 and 5 continued to operate. However, their discharge was partially re-directed through circulating water pumps 1 and 2 in the opposite direction. Because of the inadequate cooling water, condenser pressure began to increase. The main turbine tripped on high condenser pressure. At 1202 hours, an automatic reactor protection system shutdown was initiated by the main turbine control valve fast closure trip signal. The reactor shut down and all safety systems responded properly.

The root cause of this event was determined to be personnel error. The electrician did not verify that he was on the proper relay before connecting and energizing his test equipment. The general supervisor of electrical maintenance discussed the importance of self checking and verification with electrical maintenance personnel. Training for electricians on self checking, and trip relays was reviewed with these maintenance personnel. The plant was synchronized to the grid on February 21. The plant remained on line until April 10.

On April 10, the plant was shutdown due to failure of the extraction steam line. The extraction steam line was replaced.

On April 20, with the reactor at 510 psig during plant start-up, a control room operator noticed that the main steam manifold pressure control system was unexpectedly switching between the "A" and "B" regulators when the electric governor trouble alarm actuated. The turbine bypass valves opened approximately 40 percent. Reactor pressure began to decrease and reactor water level increased due to the increased void fraction resulting from increase steam flow. The operators began to gradually close the bypass valves, reactor water level decreased. As water level decreased through the normal operating band, feed water flow automatically increased. The addition of cold feed water caused reactor power to increase until the reactor automatically shutdown on Intermediate Range Monitors' (IRM) upscale. All safety systems responded properly.

This event occurred because leakage past a threaded adapter allowed steam and water to leak into an instrument cabinet which contained the pressure transmitters used to control main steam manifold pressure, causing failure of these transmitters. The cause of this event was personnel error in that a threaded adapter used to install temporary test equipment for start-up monitoring did not match the fitting into which it was threaded. Training was conducted for this event to reinforce the need for control of contractor activities. The plant was re-started and synchronized to the grid on April 22. The plant remained on line until August 13.

On August 13, while performing rounds, a Nuclear Power Plant Operator (NPPO) removed some tape from the valve handle on a manifold to instrument B21-R004B for the reactor vessel division 2 pressure indicator. While removing the tape residue, the NPPO noticed a pressure spike on instrument B21-R004B and heard the scram pilot valves vent. He called the main control room and was informed that an automatic reactor shutdown had occurred.

An investigation determined the cause of the event to be personnel error. The NPPO inadvertently unseated an instrument calibration/vent isolation valve while removing tape residue from the valve handle. This induced a pressure transient into an instrument header shared by other instruments. A false high reactor water level signal caused the main turbine generator to trip. Closure of the main turbine generator control valves initiated the automatic reactor shutdown. A lessons learned meeting was conducted as part of the corrective actions. The plant was synchronized to the grid on August 15. The plant remained on line until September 17.

On September 17, an inadvertent breach of the feedwater system occurred during a planned reactor shutdown with the reactor at 17 percent power. Maintenance personnel had begun work on the number 5 north feedwater heater level control valve, N22-F415A, located on the discharge side of the heater drain pump prior to the establishment of the proper plant conditions. As a result, control room operators automatically shutdown the reactor in order to shutdown the feedwater system and isolate the leak. All plant systems performed as expected and all leakage was contained within the plant.

The cause of the event was personnel error for failing to follow established work control practices. Poor communications, weaknesses in the implementation of the work control process, and modification to the planned schedule of activities contributed to this event. Corrective actions included counseling of those involved, and training of appropriate plant personnel. The Plant was synchronized to the grid on September 21. The plant remained on line until December 25.

On December 25, an automatic reactor shutdown occurred when the main turbine generator tripped off the line. The turbine generator tripped when the mechanical overspeed device was activated. This was most likely due to high vibration levels and was not due to an actual overspeed condition. The turbine generator unit and associated support systems sustained significant damage. All safety systems and isolations performed as designed during the event. The presence of a fire at the main generator exciter was extinguished by the plant fire brigade using hand held extinguishers.

The probable cause of the high turbine vibration was due to blade failure in the low pressure turbine number 3. The root cause of the failure is under investigation. The plant remained shutdown through the end of the year.

2.2 Summary of Outages and Forced Reductions Greater than 20 Percent of Full Power

February, 1993

- February 10 - 81.8 Hours Shutdown

  Condenser tube leak caused condensate chemistry to reach the specified action levels; the plant shutdown for condenser tube plugging.

- February 19 - 31.7 Hours Shutdown

  Routine pump breaker Preventative Maintenance (PM) testing inadvertently actuated in-service trip relays; an in-service pump breaker trip relay failed to properly actuate, leading to inability to transfer the feed to the alternate power supply. The loss of power to two circulating water pumps and their associated discharge valves resulted in inadequate cooling water flow to the condenser leading to a turbine trip on high condenser back pressure. This event was reported by Licensee Event Report (LER) 93-004 and was described in section 2.1 of this report.

April, 1993

- April 8 - Power Reduction

  Power reduction to monitor number 4 feedwater heater extraction steam line.

  April 10 - 239.6 Hours Shutdown

  Repair of ruptured extraction steam line.

  April 20 - 33.4 Hours Shutdown

  Automatic Reactor shutdown occurred during recovery from extraction steam line repair outage (i.e., failed startup). Automatic shutdown caused by incorrectly installed test instrument which leaked steam and water onto main steam manifold pressure transmitters. The transmitters' failure initiated reactor pressure and feedwater transient, causing the reactor to trip from the Intermediate Range Monitors' (IRM) upscale. This event was reported by LER 93-007 and was described in section 2.1 of this report.

August, 1993

- August 13 - 49 Hours Shutdown

  The reactor automatically shutdown, which was initiated by a trip of the main turbine due to a false high reactor water level signal. The false high water level signal was initiated by a pressure transient on the common instrument reference leg which occurred when an operator was attempting to clean tape residue from an instrument test valve handle connected to the same reference leg. The operator did not realize that the subject valve was hydraulically connected to this reference leg. Warning signs were posted and lessons learned training was conducted cautioning operators on the sensitivity of these instruments. This event was reported by LER 93-010, and was described in section 2.1 of this report.

September, 1993

- September 17 - 70.4 Hours Shutdown

  While shutting down to repair a heater drain system level control valve, pressure integrity was lost due to maintenance activities on the valve. This resulted in leakage from the feedwater system which was terminated after the reactor was automatically shutdown from 17 percent power and the feedwater system was shutdown. Repairs were completed on the level control valve and improved work sequence controls are in place to prevent recurrence. This event was reported by LER 93-013 and was described in section 2.1 of this report.

- September 20 - 22 Hours Shutdown

  During reactor startup, the main turbine turning gear circuit breaker failed. The reactor was shutdown to minimize differential heating of the turbine shaft during the time that the turning gear was out of service. The turning gear breaker was replaced.

October, 1993

- October 9 - Power Reduction

  Reactor power was reduced to approximately 35 percent for As Low As Reasonably Achievable (ALARA) purposes during replacement of the air operator for the reactor water clean-up system return line outboard isolation check valve, G3300F120.

- December, 1993

December 15 - Power Reduction

Power was reduced for ALARA purposes to facilitate replacement of a unitized actuator for turbine low pressure stop valve number 3.

December 25 - 154.8 Hours Shutdown

The reactor automatically shutdown following a trip of the main turbine. Extensive damage to the low pressure turbine number 3, the main generator, and the main exciter occurred during this event. Causes of this equipment damage are under investigation. This event was reported by LER 93-014 and was described in section 2.1 of this report.

2.3 Fuel Performance

In 1993 Fermi 2 generated 311.1 Full Power Days (FPD). Although the implementation of power uprate for cycle 4 increased 100 percent rated thermal power to 3430 MW thermal, power was restricted to an administrative limit of 93.5 percent due to turbine turbine control valve limitations encountered during power uprate testing. Cycle 4 ended prematurely on December 25, instead of the intended March 12, 1994, as a result of the turbine generator failure, with an end of cycle exposure of 349.1 FPD. Since the cycle 5 core was designed assuming cycle 4 would generate between 410 and 435 FPD, General Electric and Detroit Edison will re-perform the Cycle 5 core design and analysis.

In August, indications of a leaking fuel pin were observed. Power suppression testing was performed on August 8 and was successful in identifying the failure as one of two bundles in adjacent control cells. Power was suppressed in these bundles by inserting four control rods, reducing the possibility of further fuel degradation and the spread of contamination throughout the plant. It was calculated that operating with these four control rods fully inserted for the remainder of the cycle would result in a loss of approximately 30 FPD; which would have resulted in a seven to ten day coastdown going into the fourth refuel outage had the plant not ended the cycle prematurely.

During the fourth refuel outage, fuel sipping will be performed to identify the leaking bundle. Also, due to adverse water chemistry following the event on December 25, selected parts from the two fuel assemblies may be sent to General Electric (GE) for analysis. A complete core off

load will be performed again, and 228 new-GE11-type fuel bundles will be used for the re-load.

2.4 Shore Barrier Survey

A survey of the Fermi 2 shore barrier was completed as per Procedure 43.000.01, "Shore Barrier Surveillance", and as required by Technical Specification 4.7.3. The results of the survey indicated no damage, significant movement, or deterioration of the barrier. All forty-seven survey point elevations were within the tolerance specified in Technical Specification Table 3.7.3-1. Civil Engineering Drawings 6C721-44 through 49 were revised to incorporate the survey data. No unusual incidents occurred in 1993 that would have required additional surveillance.

2.5 Safety Relief Valve Challenges

There were no safety relief valve challenges during 1993.

2.6 Personnel Monitoring and Exposure

Table 2.6-1 provides a breakdown of radiation exposure by work and job function as required by Technical Specification 6.9.1.5(a). The thermoluminescent dosimeter (TLD) dose is direct reading dosimeter (DRD) dose adjusted with a TLD adjustment factor (multiplier) for Total Effective Dose Equivalent (TEDE).

TABLE 2.6-1

ANNUAL EXPOSURE REPORT BY FUNCTION
01/01/93 to 12/31/93

Work & Job Function	Number of Personnel			TEDE Manrem (TLD Adjusted)			TEDE Manrem(DRD)		
	Station Employees	Utility Employees	Contractors Employees	Station Employees	Utility Employees	Contractors Employees	Station Employees	Utility Employees	Contractors Employees
Reactor Ops & Surveillance									
Maintenance Personnel	123	2	56	5.523	0.008	0.945	6.939	0.010	1.187
Operating Personnel	80	1	42	6.067	0.000	3.580	7.622	0.000	4.497
Health Physics Personnel	29	0	0	3.190	0.000	0.000	4.007	0.000	0.000
Supervisory Personnel	121	11	65	0.705	0.049	0.501	0.886	0.062	0.630
Engineering Personnel	126	3	4	2.270	0.012	0.017	2.852	0.015	0.021
Reactor Maintenance/ISI									
Maintenance Personnel	36	0	0	1.737	0.000	0.000	2.182	0.000	0.000
Operating Personnel	4	0	0	0.057	0.000	0.000	0.071	0.000	0.000
Health Physics Personnel	2	0	0	0.332	0.000	0.000	0.417	0.000	0.000
Supervisory Personnel	3	0	3	0.000	0.000	0.000	0.000	0.000	0.000
Engineering Personnel	1	0	0	0.223	0.000	0.000	0.280	0.000	0.000
Special Maintenance									
Maintenance Personnel	3	0	0	0.038	0.000	0.000	0.048	0.000	0.000
Operating Personnel	25	0	0	0.447	0.000	0.000	0.561	0.000	0.000
Health Physics Personnel	3	0	0	0.166	0.000	0.000	0.209	0.000	0.000
Supervisory Personnel	18	0	0	0.030	0.000	0.000	0.038	0.000	0.000
Engineering Personnel	11	0	1	0.020	0.000	0.004	0.025	0.000	0.005
Waste Processing									
Maintenance Personnel	26	0	68	2.903	0.000	1.135	3.647	0.000	1.426
Operating Personnel	28	0	3	2.306	0.000	0.293	2.897	0.000	0.368
Health Physics Personnel	7	0	0	0.991	0.000	0.000	1.245	0.000	0.000
Supervisory Personnel	4	0	18	0.000	0.000	0.039	0.000	0.000	0.049
Engineering Personnel	10	3	3	0.166	0.011	0.029	0.208	0.014	0.037
Refueling									
Maintenance Personnel	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000
Operating Personnel	2	0	2	0.050	0.000	0.486	0.063	0.000	0.611
Health Physics Personnel	1	0	0	0.183	0.000	0.000	0.230	0.000	0.000
Supervisory Personnel	0	0	1	0.000	0.000	0.000	0.000	0.000	0.000
Engineering Personnel	0	0	0	0.000	0.000	0.000	0.000	0.000	0.000
Totals									
Maintenance Personnel	188	2	124	10.201	0.008	2.080	12.816	0.010	2.613
Operating Personnel	139	1	47	8.926	0.000	4.359	11.214	0.000	5.476
Health Physics Personnel	42	0	0	4.862	0.000	0.000	6.108	0.000	0.000
Supervisory Personnel	146	11	87	0.735	0.049	0.540	0.924	0.062	0.679
Engineering Personnel	148	6	8	2.678	0.023	0.050	3.365	0.029	0.063
Grand Totals	663	20	266	27.403	0.080	7.029	34.427	0.101	8.831

2.7 Service Life of Main Steam Bypass Line

In accordance with Detroit Edison letter VP-86-0154, dated November 7, 1986, the cumulative time the main steam bypass lines are operated with the bypass valves between 30 percent and 45 percent opened will be reported annually. A cumulative value of 100 days is not to be exceeded without prior NRC notification.

Evaluations performed by Stone and Webster and by Hopper and Associates concluded that the bypass lines are acceptable for safe operation when operated within the 100 day constraint. Based on these evaluations, the new main steam bypass piping that was installed in 1985 has a service life which will allow it to function for the life of the plant under anticipated operating conditions. The total value for 1993 was 10.22 hours and the cumulative value was 32.25 days, well within the constraint of 100 days.

2.8 Specific Activity Analysis of the Primary Coolant Exceeding the Limits of Technical Specification 3.4.5

During 1993, the specific activity of the primary coolant did not exceed the limits of Technical Specification 3.4.5.

2.9 ECCS Outages

Pursuant to Fermi 2 technical specification 6.9.1.5.c, a summary of the ECCS system outages which occurred between January 1, 1993 and December 31, 1993 is provided. The tabulation of ECCS outage hours (Table 2.9-1) includes both forced and planned outages for the Low Pressure Coolant Injection (LPCI), Core Spray, High Pressure Coolant Injection (HPCI), and Automatic Depressurization Systems (ADS). An outage was considered to be whenever one of the ECCS systems was out-of-service at a time it was required to be operable per Technical Specifications.

ECCS Outages

Table 2.9-1

ECCS Outage Hours
January 1, 1993 to December 31, 1993

ECCS System	Forced Hours	Planned Hours
LPCI Division I	84.17	24.90
LPCI Division II	69.15	33.33
Core Spray Division I	0.0	23.00
Core Spray Division II	0.0	47.00
ADS	0.0	8.14
HPCI	26.18	76.81

DIVISION I LOW PRESSURE COOLANT INJECTION

o ECCS System Outage: Division I Low Pressure Coolant Injection
Out of Service from 2041 03/01/93 to 2135 03/02/93
Duration: 24.90 hours Planned Outage

Outage Summary:

The division I LPCI system was removed from service to perform various Corrective Maintenance (CM) and Preventive Maintenance (PM) activities. Following completion of the activities and required surveillances, the division I LPCI system was returned to service.

o ECCS System Outage: Division I Low Pressure Coolant Injection
Out of Service from 1847 05/25/93 to 0515 05/26/93
Duration: 10.47 hours Forced Outage

Outage Summary:

The division I LPCI system was removed from service to perform CM to E1150F028A Valve Motor Contactor. Following completion of the activity and required surveillance, the division I (Low Pressure Coolant Injection) LPCI system was returned to service.

o ECCS System Outage: Division I Low Pressure Coolant Injection
Out of Service from 1012 06/09/93 to 0400 06/10/93
Duration: 17.80 hours Forced Outage

Outage Summary:

The division I LPCI system was removed from service to perform CM to E1150F024A valve motor operator pinion. Following completion of the activity and required surveillance, the division I LPCI system was returned to service.

o ECCS System Outage: Division I Low Pressure Coolant Injection
Out of Service from 1136 11/09/93 to 1930 11/11/93
Duration: 55.90 hours Forced Outage

Outage Summary:

The division I LPCI system was removed from service to perform CM to E1150F028A Valve Motor Contactor. Following completion of the activity and required surveillance, the division I LPCI system was returned to service.

DIVISION II LOW PRESSURE COOLANT INJECTION

o ECCS System Outage: Division II Low Pressure Coolant Injection
Out of Service from 1940 03/08/93 to 0500 03/10/93
Duration: 33.33 hours Planned Outage

Outage Summary:

The division II LPCI system was removed from service to perform various CM and PM activities. Following completion of the activities and required surveillances, the division 2 LPCI system was returned to service.

o ECCS System Outage: Division II Low Pressure Coolant Injection
Out of Service from 0520 12/26/93 to 0231 12/29/93
Duration: 69.15 hours Forced Outage

Outage Summary:

The division II LPCI system was removed from service to perform CM to B3105F031B valve motor operator wiring. Following completion of the activity and required surveillance, the division 2 LPCI system was returned to service.

DIVISION I CORE SPRAY

o ECCS System Outage: Division I Core Spray
Out of Service from 0400 05/24/93 to 0300 05/25/93
Duration: 23.00 hours Planned Outage

Outage Summary:

The division I core spray system was removed from service to perform various PM activities. Following completion of the activities and required surveillances, the division I core spray system was returned to service.

DIVISION II CORE SPRAY

o ECCS System Outage: Division II Core Spray
Out of Service from 0530 03/16/93 to 1206 03/17/93
Duration: 30.60 hours Planned Outage

Outage Summary:

The division II core spray system was removed from service to perform various PM activities. Following completion of the activities and required surveillances, the division II core spray system was returned to service.

o ECCS System Outage: Division II Core Spray
Out of Service from 0436 11/23/93 to 2100 11/23/93
Duration: 16.40 hours Planned Outage

Outage Summary:

The division II core spray system was removed from service to perform two PM activities. Following completion of the activities and required surveillances, the division II core spray system was returned to service.

AUTOMATIC DEPRESSURIZATION SYSTEM

o ECCS System Outage: Automatic Depressurization
Out of Service from 1040 04/26/93 to 1440 04/26/93
Duration: 4.00 hours Planned Outage

Outage Summary:

Automatic Depressurization System (ADS) logic "A" was removed from service to implement Engineering Design Package (EDP) 12636. This EDP replaced a General Electric time delay relay with an Agastat time delay relay for reliability purposes.

o ECCS System Outage: Automatic Depressurization
Out of Service from 0932 04/29/93 to 1340 04/29/93
Duration: 4.14 hours Planned Outage

Outage Summary:

ADS logic "B" was removed from service to implement EDP 12636. This EDP was described above.

HIGH PRESSURE COOLANT INJECTION

o ECCS System Outage: High Pressure Coolant Injection
Out of Service from 1711 01/04/93 to 0320 01/05/93
Duration: 10.15 hours Forced Outage

Outage Summary:

The HPCI system was removed from service to replace a failed relay which closed the turbine exhaust valve. Following relay replacement and required testing, the HPCI system was returned to service. This event was reported by LER 93-001.

o ECCS System Outage: High Pressure Coolant Injection
Out of Service from 1313 01/14/93 to 0230 01/15/93
Duration: 13.28 hours Forced Outage

Outage Summary:

The HPCI system was removed from service to replace a failed resistor in the flow control loop which resulted in a failure to start during surveillance testing. Following resistor replacement and required surveillances, the HPCI system was returned to service. This event was reported by LER 93-002.

o ECCS System Outage: High Pressure Coolant Injection
Out of Service from 0422 03/19/93 to 0750 03/19/93
Duration: 3.46 hours Forced Outage

Outage Summary:

The HPCI system was considered inoperable due to loss of emergency cooling water capability for the HPCI room cooling unit from loss of power caused by a blown fuse. Following power restoration, the HPCI system was declared operable. Subsequent engineering analysis has shown HPCI system operability during this time period. Therefore, these hours are not included in the totals on page 12.

o ECCS System Outage: High Pressure Coolant Injection
Out of Service from 1513 04/27/93 to 1227 04/28/93
Duration: 21.23 hours Forced Outage

Outage Summary:

The HPCI system was declared inoperable due to loosened supports discovered during an engineering walkdown of the system. Following completion of the repair activities, the HPCI system was returned to service. Subsequent engineering analysis showed the system was operable with the loosened supports. Therefore, these hours are not included in the totals on page 12.

o ECCS System Outage: High Pressure Coolant Injection
Out of Service from 1749 05/05/93 to 0640 05/09/93
Duration: 84.85 hours Planned Outage

Outage Summary:

The HPCI system underwent flow testing to determine the cause of the above stated support damage. The supports were again loosened during confirmation of the root cause. The HPCI system was then declared inoperable. Following further investigation and successful testing, the HPCI system was declared operable. Engineering analysis showed the system was operable with the loosened supports. Therefore, these hours are not included in the totals on page 12.

o ECCS System Outage: High Pressure Coolant Injection
Out of Service from 0300 06/07/93 to 1700 06/09/93
Duration: 62.00 hours Planned Outage

Outage Summary:

The HPCI system was removed from service to perform various CMs and PMs including flow and speed loop calibrations. Following completion of these activities and required surveillances, the HPCI system was returned to service.

o ECCS System Outage: High Pressure Coolant Injection
Out of Service from 1053 10/29/93 to 1338 10/29/93
Duration: 2.75 hours Forced Outage

Outage Summary:

The HPCI system was removed from service due to loss of power created by a malfunction in a battery charger during a surveillance. Following restoration of power and cause investigation, the HPCI system was returned to service.

o ECCS System Outage: High Pressure Coolant Injection
Out of Service from 0610 12/21/93 to 2059 12/21/93
Duration: 14.81 hours Planned Outage

Outage Summary:

The HPCI system was removed from service to perform preventative maintenance on the inverter power supply to verify its trip setpoint as part of the investigation into the previous loss of power event. Following this work, the HPCI system was returned to service.