U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos:	50-315, 50-316
Licenses No:	DPR-58, DPR-74
Reports No:	50-315/96010(DRS); 50-316/96010(DRS)
Licensee:	Indiana Michigan Power Company
Facility:	Donald C. Cook Nuclear Generating Plant
Location:	7700 Red Arrow Highway Stevensville, MI 49127
Dates:	August 5-29, 1996
Inspectors:	D. Butler, Reactor Inspector, RIII R. Lerch, Reactor Inspector, RIII
Approved by:	M. A. Ring, Chief Lead Engineers Branch Division of Reactor Safety

Inspection Summary

Routine inspection of previously identified issues from the Integrated Performance Assessment Process and other inspections. One violation for lack of test control was identified for lack of surveillance testing of some component cooling system flows. One unresolved item was initiated regarding the appropriateness of a revision to the Updated Final Safety Analysis Report.

Report Details

M8 Miscellaneous Maintenance Issues

M8.1 (Closed) Violation 50-315/95014-01(DRP): The licensee did not properly train Instrument and Control (IC) technicians and provide adequate calibration details in maintenance procedure No. 12 IHP 6030 IMP.014, "Protective Relay Calibration."

In response, the licensee requalified all of the IC technicians that calibrate protective relays. In addition, the maintenance procedure was revised with a note defining the relay pick-up current as the point where the continuity light "just flickers." The inspectors reviewed the technician training records, training lesson plan No. IC-C-0720, "Protective Relays," the maintenance procedure, and observed two protective relay calibrations in the field. The inspectors concluded the licensee had addressed this violation in an acceptable manner. In addition, the IC technicians that performed the calibrations clearly understood proper protective relay calibration techniques. This item is considered closed.

E2 Engineering Support of Facilities and Equipment

E2.1 Follow-up of NRC Issues Regarding Component Cooling Water (CCW) System Flow Balancing

a. Inspection Scope

In February 1996, an Integrated Performance Assessment Process (IPAP) inspection team identified that the completed Unit 1 CCW flow balance procedure, 1 EHP 4030 STP.248, "Unit 1 Component Cooling Water Flow Balance," completed on September 28, 1995, was inadequate because:

1. Sample cooler flows were not met, although objectives were provided in the procedure. The objectives were not acceptance criteria, although the flows were described as the minimum required flows in the Updated Final Safety Analysis Report (UFSAR).

2. Cooling flow to the containment air recirculation fan was not verified by the surveillance.

Additional details on these observations may be found in Inspection Reports No. 50-315/316-96003 and No. 50-315/316-96006 (Inspection Follow-up Item (IFI) 96006-03). The inspector reviewed licensee actions taken since conclusion of the IPAP inspection with regard to CCW surveillances and discussed the issues with the licensee's staff. The inspectors also reviewed the UFSAR revision dated July 1996 and a safety evaluation performed regarding the CCW system description revision to the UFSAR.

b. Observations and Findings

A Unit 2 flow balance surveillance, 2 EHP 4030 STP.248, "CCW Flow Balance," was started in April and completed May 1, 1996, using a procedure similar to the one reviewed by the IPAP team. No changes in response to NRC concerns had been made; however, the IPAP inspection report had not been received/reviewed by the licensee. The IPAP report was issued April 17, 1996. Nonetheless, inspector interviews with members of the engineering staff indicated the requirement for the surveillance program to verify and maintain system performance in accordance with the UFSAR was not well understood or appreciated by several members of the engineering staff.

A UFSAR revision dated July 6, 1996, was submitted to the NRC, which revised Table 9.5-2, making miscellaneous header flows (sample coolers, thermal barriers, seal injection, and others) for information only rather than minimum required flows.

The licensee completed a safety evaluation dated July 31, 1996, to evaluate the July UFSAR revision. The position of the safety evaluation was that only safe shutdown cooling loads needed to have minimum requirements specified. Issues such as license commitments made to meet Three Mile Island action items for post-accident sample cooling, or the importance of reactor coolant pump thermal barrier cooling to potential events were not addressed. Given the importance of miscellaneous header cooling flows to plant operations, the designation of flow information as "for information only" could be misleading.

Discussions with the licensee indicated that based on recent system flow readings and sampling by the chemistry department, the sample coolers were useable with reduced coolant flow under normal conditions. Additional cooling of samples could be obtained by slowing the flow of the sample through the cooler.

c. Conclusions

The inspectors identified the following issues:

1. The containment recirculation/hydrogen skimmer fan cooling flow is not verified by any surveillance.

2. The CCW sample cooler flows were measured by surveillances 1 EHP 4030 STP.248, "Unit 1 Component Cooling Water Flow Balance," completed on September 28, 1995, and 2 EHP 4030 STP.248, "CCW Flow Balance," completed May 1, 1996, but measurements indicated they were less than required by the test objectives and the UFSAR. The chemistry staff stated that samples can be adequately cooled with existing flows; however, the ability to cool samples under accident conditions was undetermined and had not been evaluated.

3. When engineers created surveillance procedure objectives and accepted surveillance flow results which were less than the UFSAR specified for

CCW flow to sample coolers, they changed the operation of the system as described in the UFSAR. Although the effects appear to have been minimal, they were not evaluated and safety evaluations were not performed.

4. The inspectors were concerned that it was not appropriate for the UFSAR revision to describe the flow requirements for the miscellaneous header as nominal and for information only.

Issues 1 and 2 were examples of inadequate test control. The licensee initiated condition report 96-1367 to track corrective actions for these issues. The failures to verify adequate CCW flows through surveillances were examples of a violation of 10 CFR 50, Appendix B, Criterion XI, "Test Control" (50-315/316-96010-01). Issue 3 was related to the concerns of Issue 2.

Issue 4 required further review by the NRC to determine the information and level of detail needed in the UFSAR. This is an unresolved item (URI) pending further review by the NRC (50-315/316-96010-02).

E2.2 NRC Information Notice (IN) 92-18: Potential for Loss of Remote Shutdown Capability During a Control Room Fire

The NRC notified the industry via IN 92-18 about an unanalyzed condition regarding fire protection and a plant's safe shutdown capability during a control room fire that forced reactor operators to evacuate the control room. This fire location could cause hot shorts, such as short circuits between motor operated valve (MOV) control circuit conductors and their control power source. As a result, spurious operation of certain MOVs may occur before the operators shifted control of the valves to the remote/alternate shutdown panel. Motor thermal overload protection may be bypassed, set high or set with a longer tripping time to allow for additional valve duty cycles and/or reversing of the MOV during stroking. The IN identified that MOV torque and limit switches would not electrically disconnect the stroking valve, causing mechanical damage to the valve and/or damaging the motor due to the hot short bypassing the limit or torque switches. Licensees took credit for manual manipulation of certain MOVs in many of the Appendix R safe shutdown scenarios, but in some instances, did not consider the valves could be mechanically damaged.

The licensee provided the inspectors a list of electrically operated Appendix R valves. The D. C. Cook design uses a double break scheme around the valve open/close contactor. In most cases this was provided by both limit/torque switch contacts and remote/alternate transfer switch contacts. For the above, two hot shorts of the correct polarity and conductors must occur to operate a valve. The inspectors reviewed the electrical design of the Appendix R valves for both units. All the valves incorporated the double break design. The inspectors noted that four steam generator (SG) turbine driven auxiliary feedwater pump (TDAFP) feed valves had common relay contacts, such as relay 63X1-SG1T for the valve feeding SG1, that could initiate valve operation due to

one hot short. However, the torque switch remained electrically connected and would prevent mechanical damage to the valve. The emergency remote shutdown procedure had the operators electrically disable the individual TDAFP to SG valve power supplies. This would effectively remove any continuous close signal and permit manual valve manipulation. In addition, only two SGs were required for an Appendix R scenario. The probability of a single hot short on more than two TDAFP feed valves was extremely low. The inspectors concluded that D. C. Cook met the intent of the IN.

E2.3 Susceptibility of Taylor MOD 30 Digital Controllers to Electrostatic Discharge (ESD)

On March 17, 1996, the differential pressure controller for the Unit 1 feedpump (1-RU-05) failed without operator interaction and resulted in a reactor trip. Unit conditions were stabilized and the controller was replaced. Initial investigations identified that the controller had failed in the unconfigured state. During this period, several other controllers exhibited control panel "flicker" when touched. The licensee's root cause analysis determined that ESD was causing the MOD 30 controller problems.

The licensee concluded that controller circuit board static drain clips were not properly oriented and were not grounding the controller. In addition, the control room humidity was very low and had increased ESD buildup. The licensee had installed ESD limiting carpeting. Samples were sent to the manufacturer to verify that the correct carpet had been installed. The test results indicated that the installed carpet was ESD limiting (1.1 KV, step and 0.9 KV, scuff). In addition, the licensee installed grounded static step-off pads in front of ESD sensitive equipment.

The MOD 30 manufacturer performed ESD sensitivity tests on the failed controller. ESD levels to 3 KV were capable of inducing control panel "flicker." The manufacturer installed an additional ground wire from the module mounting case that increased ESD tolerance to 7 KV. The extra ground wire has been installed on the feedpump controller at D. C. Cook. In addition, the manufacturer has identified that the electrical conductor ribbon strip that attached to the membrane keypad switch control panel (face-plate) was also susceptible to ESD. The manufacturer was testing different face-plate modifications. The ESD immunity has been increased to 12 KV by insulating the ribbon strip. Replacement of the currently installed face-plates was being reviewed by the licensee.

The licensee has initiated other actions to improve ESD immunity. These include control room humidity monitoring and improving control room humidifier operation. The inspectors concluded that the licensee was effectively addressing ESD affects on digital equipment.

E8 Miscellaneous Engineering Issues

E8.1 (Closed) IFI 50-315/316-95005-05(DRP): During the past several years, numerous Foxboro N-2AO-V2H (V2H) voltage to current cards have failed due to design and/or component related weaknesses. These included an undersized circuit board fuse and the encapsulated (potted) DC to DC converter module. The licensee has worked closely with Foxboro to resolve these issues. The resultant design changes have replaced the fuse with a larger size and added additional fuse protection. The DC to DC converter module was completely redesigned and installed on all of the safety related cards. Only one new card failure has occurred. This was attributed to a card burn-in type failure.

The licensee indicated that the new DC to DC converter module had a manufacturing flaw. Two surface mount biasing resistors were installed at a lower resistance value than called for in the design. Testing has demonstrated that the lower resistor values have slightly increased the module heat generation. However, module components thermal design margin was high (≈ 50%) so that this flaw should not affect functionality. The licensee indicated that card life testing will continue to determine if the mean time before failure of the cards had increased. This item is considered closed.

E8.2 (Closed) IFI 315/316-93012-01a and c(DRS): The Systems Based Instrument and Control Inspection (SBICI) team determined that certain Westinghouse WCAP-13055, "Setpoint Methodology for Protection Systems - D. C. Cook, Unit 1," and WCAP-13801, "Setpoint Methodology for Protective Systems - D. C. Cook, Unit 2," protective action setpoints did not include an environmental allowance (EA) term in diverse secondary (backup) trip functions. The trip functions of interest included SG water low level, low-low level and high-high level; and main steam flow/feedwater flow mismatch.

In response, Region III requested assistance from the Office of Nuclear Reactor Regulation (NRR) to determine if backup trip functions were required to include an EA term in the setpoint methodology. NRR reviewed the above backup trips and determined that the accident analysis did not include an EA in the uncertainty calculations. NRR concluded that the licensee's methodology concerning EAs was consistent with Westinghouse's methodology and IEEE Standard 279; "Criteria for Protective Systems for Nuclear Power Generating Stations." This item is considered closed.

E8.3 (Closed) IFI 315/316-93012-01d(DRS): The SBICI team noted that the D. C. Cook design used containment pressure to detect a steam line break inside containment rather than steam line flow. The team was concerned that this design was not meeting the intent of IEEE Standard 279-1968, since containment pressure was not a direct variable measurement of this accident condition.

In response, Region III requested assistance from NRR to determine if containment pressure was an acceptable variable to detect a steam line

break inside containment. NRR reviewed UFSAR Section 14.3.4, "Containment Integrity Analysis," and concluded that the containment pressure variable was the accepted licensing basis for this accident scenario. This item is considered closed.

E8.4 (Closed) IFI 315/316-93012-01e(DRS): The SBICI team noted that Regulatory Guide 1.97, Category 1, condensate storage tank (CST) level instrument loop accuracy calculation did not include a seismic bias error term.

In response, the licensee provided the Foxboro equipment qualification reports for Model N-E13DM and E13DM pressure transmitters. The qualification report showed that the differential pressure transmitters would return within their reference accuracy following a seismic event. NRR concluded that the licensee's treatment of the EAs for the CST level instrument loop calculation was acceptable. This item is considered closed.

E8.5 (Closed) IFI 315/316-93012-01f(DRS): The SBICI team noted that the refueling water storage tank (RWST) level instrumentation cables were routed through a high energy line break (HELB) area. The D. C. Cook UFSAR indicated that the RWST level channels were used to mitigate an SG blow down event. As such, an EA term should be included for the cable routed through the HELB area.

In response, the licensee provided NRR a calculation that included cable insulation losses. NRR reviewed the calculation and concluded that the licensee had addressed cable insulation losses in an acceptable manner. This item is considered closed.

E8.6 (Closed) IFI 50-315/316-96006-03: CCW flow balance surveillances did not meet the UFSAR. This is closed to violation 50-315/316-96010-01 in this report.

E8.7 (Closed) URI 50-315/96006-15(DRS): NRC Inspection Report No. 50-315/316-95010, Section 3.5, identified that the Unit 1 west motor-driven auxiliary feedwater pump (MDAFP) had a history of instantaneous relay (PJC type) trips during Mode 4, 5 or 6 testing. The testing took place prior to entering Mode 3. The MDAFP was required to be operable in Modes 1, 2 and 3.

In response, the licensee issued condition report No. 95-1204 to address this concern. The licensee's investigation identified that the MDAFP instantaneous relay (1-50-50N-TA2) had insufficient margin for motor starts during high voltage conditions (4280 volts). The safety buses were supplied from the reserve auxiliary transformer (RAT) during Modes 4, 5, or 6 testing. Since Unit 1 was shut down, house loads were at a minimum (< 2.5 MW) while operating plant loads were typically 20.5 to 36 MW. This resulted in higher bus voltage due to a lightly loaded RAT. Normal Mode 1, 2 or 3 electrical supply to the safety buses was from the unit auxiliary transformers that also power the house loads. During the past year's Mode 1, 2 or 3 operation, the Unit 1 safety bus high average

voltage was about 4195 volts. The Unit 1 west pump has tripped four times since 1987. All of the trips occurred during Mode 5 or 6 testing of the pump. There have been over a hundred successful Unit 1 west pump starts since 1987. In addition, the Unit 1 east and both Unit 2 MDAFPs were successfully started during bus high voltage conditions.

The licensee determined that the Unit 1 west MDAFP current transformer (CT) saturated at a higher value than the manufacturer's saturation curve. Therefore, the resultant CT excitation voltage change was greater for a given CT current change at the PJC relay. At higher motor starting voltages, an induction motor starting current will increase, since electrically the motor appears as an impedance device. This generated higher current flow to the PJC relay and caused the relay to trip sooner.

The four MDAFP PJC relays were set for a nominal primary current of 27 amperes. Calculation PS-4KV-001, "4 KV Safety Motor Electrical Protection," developed the setpoints based on IEEE 242-1989 recommendations. Although the setpoint margin was lowest for the MDAFP motors, the results were within the calculation acceptance criteria. The licensee increased the Unit 1 west MDAFP setpoint to a primary current of 33 amperes and was reviewing the other MDAFP setpoints. In addition, the licensee indicated that additional CT testing was being performed. The licensee reviewed all of the current 4 KV motor protective setpoints and concluded the calculation had been performed satisfactorily.

The inspectors reviewed the above information and CT design standards, and concluded that the licensee's root cause determination and corrective actions were reasonable. In addition, the inspectors concluded that the Unit 1 west MDAFP was operable, since safety bus voltage did not exceed 4280 volts during past Mode 1, 2 or 3 operation. This item is considered closed.

V. Management Meetings

X1 Exit Meeting Summary

The inspectors met with various licensee representatives on August 9, 1996, and summarized the scope and findings of the inspection in the electrical and instrumentation and control areas. Inspectors also conducted an exit meeting by phone on August 29, 1996, and summarized the scope and findings with regard to follow-up on component cooling water flow balancing. The persons listed under the partial list of persons contacted participated in the telephone exit. The licensee did not identify any of the documents reviewed by the NRC as proprietary.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

A. Blind, Site Vice President
K. Baker, Assistant Plant Manager
P. Schoepf, Supervisor, Safety-Related Systems
J. Kobyra, Manager Nuclear Engineering
R. Ptacek, Licensing
W. McCrory, System Engineer

INSPECTION PROCEDURES USED

IP 37551	On-site Engineering
IP 62703	Maintenance Observation

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-315/316-96010-01	VIO	Lack of test control for CCW flow balance FSAR requirements.
50-315/316-96010-02	URI	Revision to the FSAR changed the minimum required CCW miscellaneous flows to nominal flows for information only.

Closed

50-315/95014-01	VIO	The licensee did not properly train IC technicians and provide adequate calibration details.
50-315/316-96005-05	IFI	During the past several years, numerous Foxboro N-2AO-V2H (V2H) voltage to current cards have failed due to design and/or component related weaknesses.
50-315/316-96006-03	IFI	CCW flow balance tracked under VIO 50-315/316-96010-01.
50-315/96006-15	URI	NRC Inspection Report No. 50-315/316/95010, Section 3.5, identified that the Unit 1 west MDAFP had a history of instantaneous relay (PJC type) trips during Mode 4, 5 or 6 testing.
315/316-93012-01a & c	IFI	Certain Westinghouse protective action setpoints did not include an EA term in diverse secondary (backup) trip functions.
315/316-93012-01d	IFI	The D. C. Cook design used containment pressure to detect a steam line break inside containment rather than steam line flow.
315/316-93012-01e	IFI	The Regulatory Guide 1.97, Category 1, CST level instrument loop accuracy calculation did not include a seismic bias error term.
315/316-93012-01f	IFI	The RWST level instrumentation cables were routed through an HELB area.

LIST OF ACRONYMS USED

CCW	Component Cooling Water
CST	Condensate Storage Tank
CT	Current Transformer
EA	Environmental Allowance
ESD	Electrostatic Discharge
HELB	High Energy Line Break
IC	Instrument and Control
IFI	Inspection Follow-Up Item
IN	Information Notice
IPAP	Integrated Performance Assessment Process
MDAFP	Motor-Driven Auxiliary Feedwater Pump
MOV	Motor Operated Valve
NRR	Office of Nuclear Reactor Regulation
RAT	Reserve Auxiliary Transformer
RWST	Refueling Water Storage Tank
SBICI	Systems Based Instrument and Control Inspection
SG	Steam Generator
TDAFP	Turbine Driven Auxiliary Feedwater Pump
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
VIO	Violation