

July 23, 2001

Mr. R. P. Powers  
Senior Vice President  
Nuclear Generation Group  
American Electric Power Company  
500 Circle Drive  
Buchanan, MI 49107-1395

SUBJECT: D.C. COOK NUCLEAR POWER PLANT, UNITS 1 AND 2  
NRC INSPECTION REPORT 50-315/01-12(DRP); 50-316/01-12(DRP)

Dear Mr. Powers:

On June 26, 2001, the NRC completed a supplemental inspection at your D. C. Cook Nuclear Power Plant regarding a white performance indicator for unplanned power changes. The performance indicator is related to the Initiating Events Cornerstone in the Reactor Safety Strategic Performance Area. The enclosed report presents the results of that inspection which were discussed on June 26, 2001, with you and members of your staff.

This supplemental inspection was an examination of activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. Within these areas, the inspection consisted of a selected examination of procedures and representative records, and interviews with personnel. Specifically, the inspectors reviewed the issues and circumstances surrounding the White Performance Indicator and assessed your staff's root cause evaluations and associated corrective actions.

Based on the results of this inspection, no findings of significance were identified. Further, the unplanned power changes did not result in any adverse consequences to plant risk.

Based on the results of this inspection, we concluded that plant personnel adequately identified the problems that resulted in the three unplanned power changes. Your staff's follow-up investigations demonstrated that the root and contributing causes were understood. Proposed preventive and corrective actions to address the root and contributing causes were appropriate. Short-term corrective actions necessary to address regulatory compliance were implemented in a timely manner. Longer-term corrective actions were scheduled and were being tracked consistent with the overall safety significance of the problems.

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Sincerely,

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Anton Vegel, Chief  
Branch 6  
Division of Reactor Projects

Docket Nos. 50-315; 50-316  
License Nos. DPR-58; DPR-74

Enclosure: Inspection Report 50-315/01-12(DRP);  
50-316/01-12(DRP)

cc w/encl: A. C. Bakken III, Site Vice President  
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MI Department of State Police  
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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No: 50-315; 50-316  
License Nos: DPR-58; DPR-74

Report No: 50-315/01-12(DRP); 50-316/01-12(DRP)

Licensee: American Electric Power Company

Facility: D. C. Cook Nuclear Power Plant, Units 1 and 2

Location: 1 Cook Place  
Bridgman, MI 49106

Dates: May 31, 2001 through June 26, 2001

Inspector: B. L. Bartlett, Senior Resident Inspector

Approved by: Anton Vogel, Chief  
Branch 6  
Division of Reactor Projects

## SUMMARY OF FINDINGS

IR 50-315/01-12(DRP), IR 50-316/01-12(DRP); on 05/31 - 06/26/2001, Indiana Michigan Power Company, D. C. Cook Nuclear Power Plant, Units 1 and 2. Supplemental inspection of White Performance Indicator (PI) pertaining to unplanned power changes greater than 20 percent on Unit 1.

The inspection was conducted by a resident inspector. No findings of significance were identified.

### **Cornerstone: Initiating Events**

This supplemental inspection was performed in accordance with NRC Inspection Procedure 95001 to assess the licensee's evaluation and corrective actions pertaining to a White PI for unplanned power changes. The PI crossed the Green-White threshold of more than six unplanned power changes greater than 20 percent per 7,000 hours of critical operation following an unplanned power change in March 2001. While the rate per 7,000 hours of critical operation was exceeded, the number of unplanned power changes was three due to the PI becoming valid at 2,400 hours of critical operation. Licensee personnel reported this White PI to the NRC with the first quarter PI data submitted in April 2001.

The first Unit 1 unplanned power change greater than 20 percent was due to a failed power supply in the Solid State Protection System (SSPS). The second Unit 1 unplanned power change greater than 20 percent was due to a steam leak on a non-vital secondary side steam line level switch. The third Unit 1 unplanned power change greater than 20 percent was due to fouled main feedwater pump condensers.

During this supplemental inspection, the inspector determined that licensee personnel adequately identified the problems that resulted in the three unplanned power changes. The licensee's follow-up investigation demonstrated that the root and contributing causes were properly identified. Licensee personnel assessed the three individual problems collectively and determined that there were no generic issues.

In general, proposed preventive and corrective actions to address the root and contributing causes were appropriate. Short-term corrective actions necessary to address regulatory compliance were implemented in a timely manner. Implementation of longer-term corrective actions were being tracked and scheduled for implementation consistent with the overall safety significance of the problems.

## Report Details

### 01 Inspection Scope (Inspection Procedure 95001)

The inspector conducted the supplemental inspection because of the potential risk significant performance issue that was revealed when the PI pertaining to unplanned power changes of greater than 20 percent changed from Green to White. An unplanned power change in March 2001 caused the PI to cross the Green-White threshold. Licensee personnel reported this White PI to the NRC with the first quarter PI data submitted in April 2001.

Unplanned power changes directly challenge plant operations because of the need to decrease plant power without adequate time for pre-planning. The lack of time for pre-planning increases the probability of an unexpected plant response or transient and associated challenge to plant safety systems. Therefore, this PI is related to the initiating events cornerstone in the Reactor Safety Strategic Performance Area.

The inspector reviewed condition reports and associated root cause evaluations for the three unplanned power changes that caused the associated PI to change from Green to White. Also, the inspector reviewed a condition report that collectively assessed the three events for potential generic issues. In addition, the inspector reviewed several other condition reports and associated evaluations pertaining to the unplanned power changes. The reviews were conducted to provide assurance that:

- root causes and contributing causes were understood;
- extent of condition was identified; and
- proposed corrective actions were sufficient to address the root and contributing causes, and to prevent recurrence.

The inspector reviewed the following condition reports and associated evaluations that directly addressed the three unplanned power changes:

- CR 01039047, "Input breaker for Reactor Protection Train "B" 48 volt power supply tripped open";
- CR 01064019, "Steam leak in piping near 1-HLS-10-V2";
- CR 01087068, "After opening 12-WMO-30 from 1 percent open to 20 percent open, a transient occurred on the West Main Feedwater Pump"; and
- CR 01102028, "During the first quarter of 2001, the performance indicator in the initiating events cornerstone entered the White "Increased Regulatory Response Band."

The inspector also reviewed the following condition reports related to the events and circumstances that contributed to the White PI:

- CR 01093023, “Unit 1 reduced power to approximately 55 percent so that the main feedwater pump turbine condensers could be cleaned”;
- CR 01169003, “NRC inspector identified that the condition evaluation for CR 01093023 did not document all corrective actions taken”;
- CR 00361015, “Procedure revision request for annunciator alarm response, “Condenser Recorded Delta T High Alarm”; and
- CR P-00-04895, “Operations department self-assessment SA-2000-OPS-008, identified deficiencies in several annunciator response procedures”

In addition, the inspector reviewed applicable portions of the following documents during the inspection:

- Design Information Transmittal (DIT) S-00944-00, “Annunciator Response Procedure 01-OHP 4024.121, Drop 44 - MAIN XFMR OIL TEMP HIGH”
- 01-OHP 4024.115, “Annunciator #115 Response: FEEDWATER,” Revision 10
- 01-OHP 4024.116, “Annunciator #116 Response: CONDENSATE,” Revision 10
- 01-OHP 4024.117, “Annunciator #117 Response: TURBINE,” Revision 4
- 02-OHP 4024.215, “Annunciator #215 Response: FEEDWATER,” Revision 6
- 02-OHP 4024.216, “Annunciator #216 Response: CONDENSATE,” Revision 7
- 02-OHP 4024.217, “Annunciator #217 Response: TURBINE,” Revision 4

## 02 Evaluation of Inspection Requirements

### 02.01 Problem Identification

- a. **Determination of who (i.e., licensee, self-revealing, or NRC), identified the issue and under what conditions:**

The condition leading to the first unplanned power change was self-revealing. The conditions leading to the second and third unplanned power changes were self-identified. The self-revealing problem became apparent after a failed RPS power supply brought in a control room annunciator. One of the self-identified conditions was identified during routine non-licensed equipment operator rounds in the turbine building and the other condition was identified by a Reactor Operator (RO) observing the main feedwater pump condenser vacuum during the opening of valve 12-WMO-30, “Circulating Water Intake Tunnel Shutoff Valve.”

The inspector concluded that the licensee’s evaluations for the three unplanned power changes adequately determined who identified the problems and under what conditions.

b. **Determination of how long the issue existed and prior opportunities for identification:**

The condition leading to the first unplanned power change was immediately recognized by licensee personnel following the actuation of the control room annunciator. Licensee assessment of the inputs to the annunciator determined that a +48 dc volt power supply had failed in the RPS. The licensee's annunciator response procedure directed that the SSPS train associated with the failed power supply be declared inoperable. Technical Specification 3.3.1.1, action 1 was entered which required that the licensee either correct the problem or be in Hot Standby within 6 hours. Approximately 2 hours and 22 minutes following entry into the TS action statement, the power change was begun.

The steam leak leading to the second unplanned power change was identified by licensee personnel during routine operator rounds. Due to the location of the steam leak in a relatively well traveled area and the obvious nature of the leak, the licensee determined that the leak had recently developed. The power change to depressurize the line for repair was begun approximately 62 hours after the leak was identified.

The decreasing main feedwater pump condenser vacuum leading to the third unplanned power change was identified through enhanced monitoring of plant parameters by licensed operators during a planned activity. Valve 12-WMO-30 normally closed for de-icing during the winter months was slowly being opened. The operators had been informed by underwater divers that there was an unusually large amount of sand, silt, zebra mussels, and other small debris which had collected at the closed valve. As the valve was opened, the increased flow would tend to sweep the material towards the traveling screens and then the intakes of the circulating water, service water, and essential service water pumps. The operators were closely monitoring the feedwater pump condenser parameters to identify any fouling which might occur. When the feedwater pump condenser vacuum dropped significantly, feedwater pump performance degraded. Several days later, a down-power was initiated to allow cleaning of the feedwater pump condensers.

The licensee determined that the Unit Supervisor who decided to slowly open 12-WMO-30 instead of having divers first remove the material as recommended by engineering personnel, made a non-conservative decision. In previous spring seasons 12-WMO-30 had been opened in a similar manner but this time the valve was opened more quickly than usual. In addition there was more material than usual upstream of the valve.

The equipment issues which resulted in the three unplanned power changes were identified quickly by the licensee during the course of normal plant operations. Prior opportunities for identification did not exist as the equipment issues emerged with little warning.

c. **Determination of the plant specific risk consequences (as applicable) and compliance concerns associated with the unplanned power changes:**

The licensee's evaluations determined that the unplanned power changes did not result in any significant increase in overall plant risk.

Compliance issues are addressed below:

- The licensee conservatively declared Train "B" SSPS inoperable when the +48 volt power supply failed. The standby +48 volt power supply had taken over for the failed power supply, ensuring Train "B" SSPS operability. Compliance with TS shutdown requirements were met until further licensee evaluation determined that the requirement to declare the Train "B" of SSPS inoperable was not consistent with conservative plant operations. After plant procedures were appropriately revised, Train "B" SSPS was declared operable and the power decrease was halted. The failed +48 volt power supply was replaced, tested, and the system fully restored to service.
- The failed extraction steam drip pot level switch line in the turbine building was not a safety-related component and was not required to prevent or mitigate accidents.
- The partially fouled main feedwater pump condensers were not safety-related components and were not required to prevent or mitigate accidents.

The inspector determined that the licensee's evaluations appropriately concluded that the problems did not result in any increase in plant risk. In addition, the three unplanned power changes were completed by plant operators without incident. Therefore, there were no resultant adverse plant transients or challenges to plant system's safety functions. The inspectors determined that the licensee complied with TS and other regulatory requirements.

02.02 Root Cause and Extent of Condition Evaluation

a. **Evaluation of methods used to identify root and contributing cause(s):**

The CR's for the three events and the CR for crossing the White PI threshold were Action Category 3 Condition Reports. In accordance with the licensee's corrective action program, Category 3 CR's require, as a minimum, an Apparent Cause Determination be made. The licensee's evaluations all utilized a systematic method to determine the root causes for the unplanned power changes. The evaluation process included barrier analysis and time sequence event analysis. During the process, licensee evaluators collected evidence through several different mechanism such as interviewing key personnel, reviewing maintenance and design documents, and reviewing applicable plant procedures.

The inspector determined that the systematic methods utilized by license personnel to evaluate the three unplanned power changes were adequate.

b. **Level of detail of the root cause evaluation:**

Root cause evaluations for the problems that caused the three unplanned power changes contained the level of depth commensurate with the significance of the problem. Identified root causes by licensee personnel included the following:

- A specific root cause for the failure of the +48 volt power supply was not determined by the licensee. A failed capacitor was listed as the most probable cause. The licensee sent the power supply to a vendor to be re-built.
- The apparent cause of the steam leak was determined to be the failure of non-safety related welds due to improper preparation and installation by a welder.
- The apparent cause of the main feedwater pump condenser fouling was the decision by the Unit Supervisor to open 12-WMO-30 while knowing of the large amounts of debris.

The inspector determined that the root cause evaluations contained an appropriate level of detail.

c. **Consideration of prior occurrences of the problem and knowledge of prior operating experience:**

Licensee personnel reviewed industry and D. C. Cook operating experience data bases during the apparent cause evaluations that addressed each individual unplanned power change. Information obtained from the review of operating experience was assessed and factored into the potential failure mode analysis when applicable.

- The licensee determined that the +48 volt power supplies were reliable and did not have a history of failing. In addition, the licensee determined that the ongoing level of review to improve operating procedures would not have identified the unnecessary conservatism contained in the annunciator response procedure.
- The licensee determined that in 1997 there had been previous steam leaks in the same portion of the extraction steam drip pot level switch; however, the repairs intended to correct the leaks were performed incorrectly. A search of the data bases did not identify any other repeated pipe leaks due to poor fit-up and welding.
- The licensee's evaluation of the fouling of the main feedwater pump condensers determined that previous cycling of 12-WMO-30 had not resulted in excessive fouling. In addition, during the time frame of this unplanned power change, main feedwater pump condenser fouling had been occurring on both Unit 1 and Unit 2, but that the root causes were unrelated to 12-WMO-30.

The inspector concluded that the evaluations for the three individual problems that caused the unplanned power changes adequately considered operating experience information and prior occurrences of the problems.

d. **Consideration of potential common cause(s) and extent of condition of the problem:**

The licensee's evaluations of contributing factors to the three unplanned power changes considered potential generic implications and evaluated the extent of condition of the identified problems. For example:

- The licensee reviewed other annunciator response procedures to search for unnecessarily restrictive operability conclusions and performed a review to determine 48 volt power supply reliability.
- The licensee searched their data bases for other steam leaks that were similar in nature to the leak at 1-HLS-10 V2. In addition, the licensee searched for and identified previous leaks on the same drip pot level switch. The licensee's evaluation appropriately concluded that similar root causes did not exist.
- The licensee recognized that buildup near 12-WMO-30 had occurred in the past and performed a specific assessment to determine adequacy of corrective action.

In addition, the licensee performed an evaluation to collectively assess the individual problems that caused the unplanned power changes to look for similar root causes or cross-cutting issues. The licensee concluded there was no similar root cause between the three unplanned power changes.

The inspector concluded that the licensee's collective evaluation of the three individual problems was effective. The licensee's evaluations adequately considered potential common causes and that the extent of condition was appropriately addressed.

### 02.03 Corrective Actions

a. **Appropriateness of corrective actions:**

Licensee personnel determined that a common cause did not exist between the three unplanned down powers. Consequently, no specific corrective actions were planned for the change from Green to White. The inspector's review determined that the licensee's conclusion was reasonable.

Licensee personnel developed specific corrective actions for each root and contributing cause and in one instance, provided the appropriate justification for why no corrective action was needed. Immediate actions taken and long term corrective actions planned were also noted in the evaluations. Corrective actions to prevent recurrence for the individual problems that caused the three unplanned power changes included the following:

- Revised the appropriate annunciator response procedures to delete the requirement to declare the associated train of SSPS inoperable upon loss of a 48 volt or 15 volt power supply.
- Inspected the screen wash system and the forebay for potential bypass mechanisms.
- Enhanced monitoring of the screens when they are in service to correct any carry over.
- Replaced screen wash nozzles to improve and redirect flow to improve debris removal efficiency.
- Installed a water lance in the Unit 1 main feedwater pump water boxes to enhance cleaning while on-line.
- Distributed a lessons learned to plant operators regarding conservative decision making.

The inspector concluded that the implemented and proposed corrective actions to address the identified root and contributing causes for the individual problems were appropriate.

The inspector noted that not all corrective actions implemented and/or planned had been documented in the CRs. Condition Report 01169003 was issued on June 18, 2001, documenting the inspector's finding that CR 01093023 did not document all corrective actions taken in response to the unplanned down power following the opening of 12-WMO-30.

**b. Prioritization of corrective actions:**

Licensee personnel implemented immediate corrective actions, when necessary, to address TS and regulatory compliance issues in a timely manner. Corrective actions to prevent recurrence were prioritized through scheduled implementation dates.

The inspector concluded that corrective actions were scheduled to be implemented consistent with the overall safety significance of the problem.

**c. Establishment of schedule for implementing and completing the corrective actions:**

Each corrective action was assigned a condition report action (CRA) for tracking purposes. A licensee individual responsible for the action and the required completion dates were also noted on each CRA. The inspector concluded that the identified corrective actions all had completion due dates established and responsible individuals assigned to them.

The inspector selected some CRAs that were shown as completed for verification. All selected CRAs had been completed as documented.

d. **Establishment of quantitative or qualitative measures of success for determining the effectiveness of the corrective actions to prevent recurrence:**

A common cause did not exist between the specific issues resulting in the unplanned down powers. Without a common thread tying two or more of the events together, corrective actions and measures of success were not required.

4OA6 Management Meetings

The inspector presented the inspection results to licensee management listed below on June 26, 2001. The licensee acknowledged the findings presented. No proprietary information was identified.

## KEY POINTS OF CONTACT

### Licensee

R. Gaston, Regulatory Affairs, Manager  
S. Greenlee, Director, Design Engineering and Regulatory Affairs  
R. Meister, Regulatory Affairs  
J. Molden, Maintenance Department Director  
D. Moul, Assistant Operations Superintendent  
T. Noonan, Director, Performance Assurance  
J. Pollock, Plant Manager  
R. Powers, Senior Vice President  
M. Rencheck, Vice President, Nuclear Engineering  
L. Weber, Manager, Operations  
T. Woods, Regulatory Affairs

### NRC

A. Vogel, Chief, Reactor Projects Branch 6

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

None