U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-315/86029(DRP); 50-316/86029(DRP)

Docket Nos. 50-315; 50-316 Licenses No. DPR-58; DPR-74

Licensee: American Electric Power Service Corporation
Indiana and Michigan Electric Company
1 Riverside Plaza
Columbus, OH 43216

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

Inspection At: Donald C. Cook Site, Bridgman, MI

Inspection Conducted: July 14 through August 11, 1986

Enforcement Conference At: Region III Office Glen Ellyn, IL

Enforcement Conference Conducted: July 29, 1986

Inspectors: B. L. Jorgensen
J. K. Heller

Approved By: B. L. Burgess, Chief
Projects Section 2A

9/2/86
Date

Inspection and Enforcement Conference Summary

Inspection of July 14 through August 11, 1986 (Report No. 50-315/86029(DRP); No. 50-316/86029(DRP))

Areas Inspected: Special inspection of the circumstances surrounding the licensee's notification to NRC on July 14, 1986, that Unit 2 had apparently been started up and operated at power levels up to about nine percent power with two of four power range excore nuclear instruments inoperable due to wiring errors. An associated Enforcement Conference, to discuss findings, implications and concerns, was held on July 29, 1986.
Results: Several examples of violations of approved procedures were identified, which constitute a violation of license requirements to follow such procedures (Paragraph 4). As a consequence, license conditions requiring that certain instrumentation be maintained operable, or (if not operable) restricting operation of the plant, were subsequently violated (Paragraph 5). Further, when the problems were found and corrected, requirements for timely notification of NRC concerning the matter were not met (Paragraph 7).

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DETAILS

1. Persons Contacted

a. Inspection of July 14 through August 11, 1986

*W. G. Smith, Jr., Plant Manager
*J. E. Rutkowski, Assistant Plant Manager, Production
A. A. Blind, Assistant Plant Manager, Administration
*L. S. Gibson, Assistant Plant Manager, Technical Support
*C. E. Miles, Control and Instrument Supervisor
B. A. Svensson, Licensing Activity Coordinator
*R. L. Simms, Shift Technical Advisor Supervisor
*T. J. Johnson, Instrument Maintenance Supervisor
L. K. Smith, Shift Supervisor

*Personnel also attending Enforcement Conference

b. Enforcement Conference July 29, 1986

AEPSC Personnel

J. E. Dolan, Vice Chairman, Engineering and Construction
M. P. Alexich, Vice President, Nuclear Operations
J. G. Feinstein, Manager, Nuclear Safety and Licensing
V. A. Lepore, Manager, Design Division
T. O. Argenta, Manager, Generation and Telecommunications Division
J. R. Anderson, Cognizant Electrical Engineer
R. L. Shoberg, Assistant Section Manager, I & C Section
P. A. Barrett, Lead Compliance Engineer

U.S. NRC Personnel

A. B. Davis, Deputy Regional Administrator
W. G. Guldemond, Chief, Projects Branch 2
J. J. Harrison, Chief, Engineering Branch
B. L. Burgess, Chief, Projects Section 2A
W. H. Schultz, Enforcement Coordinator
B. L. Jorgensen, Senior Resident Inspector
J. K. Heller, Resident Inspector

2. Introduction

The resident inspector was notified on July 14, 1986, at approximately 1:00 P.M. of the licensee's determination that Unit 2 had started up (i.e., escalated from Mode 5 to Mode 1) and had achieved power levels of nine percent rated power, while two of four excore power range nuclear instruments were "inoperable." The licensee advised the condition had been identified and corrected early on July 11, 1986,

and that the potential significance of the matter had not been determined and evaluated as "reportable," until July 14. A followup notification to NRC via the ENS notification system was performed by the licensee at 3:05 P.M. July 14, pursuant to requirements of 10 CFR 50.72.

Commencing with the onsite notification, the inspector reviewed the circumstances leading up to the event, the consequences, and the licensee's handling of the matter once it became known. This report details the findings of that review.

The licensee has also thoroughly reviewed the matter. No substantive disagreements are known to exist between licensee and the NRC findings as described herein.

3. Sequence of Events

February 28, 1986	Unit shutdown for a scheduled refueling/ maintenance/surveillance outage.
April 29, 1986	
Time: 0229 hrs.	An Engineered Safety Feature (ESF) and Reactor Trip signal was received as a result of a shorted control power wire in Power Range Nuclear Instrument Drawer NI-41. The drawer was pulled out for a scheduled surveillance test when the power supply cable snagged, causing an electrical connector failure, and allowing the wires to pull free and short the circuit. The failed electrical connector was replaced (Job Order 48275) and power restored to the drawer. The licensee corrective action plan also included an inspection of all connections and wires within the cabinets, repair/replacement of the connectors as necessary, and arranging the wires to ensure free movement of the instrument drawers. The event was reported in LER 50-316/86016.
May 21, 1986 to May 31, 1986	Job Order No. 54516, which was written to inspect all the NI drawers and assure that the problem identified in LER 50-316/86016 did not reoccur, was worked in two phases. The first was to untangle the wires as necessary to prevent future snagging. The second phase was to replace any damaged connectors. During the second phase a drawing error with NI-42 was found and resolved by tracing the wiring from the containment penetration to the drawer. The drawing error was independently verified. The technician attached Lifted Lead tags to the

wiring, indicating the print error, but did not remove previously installed, erroneous information tags. The wiring for NI-42 was properly left "as found." The print error was also erroneously determined to apply to NI-41. Its wiring was left in the believed "as found" condition which was not the correct configuration, and Lifted Lead tags were installed. The presumed drawing error for NI-41 was not independently verified. NI-43 and NI-44 were found correctly drawn and wired. When this job order was complete, NI-42 was wired correctly, but the print was wrong. NI-41 was wired incorrectly; and the print was correct. NI-41 was functionally inoperable, and no one was aware that this was so.

Note:

The configuration error involved the leads for the upper detector output and the common power supply being reversed. The power range detectors have three leads, one each for upper and lower detector outputs, and one for a shared voltage input. When the upper detector output lead is reversed with the voltage input lead the lower detector output is nullified. However, the upper detector output is still active. The power range drawer thus sees only approximately half the actual combined detector signal.

Two apparent procedure violations occurred here. The first involved the crossing of wires in NI-41 (see Paragraph 4.a below) and the second involved attachment of the erroneous (for NI-42) information tags (see Paragraph 4.b).

The C&I log indicates that a Condition Report was written to document the presumed drawing errors. The C&I Supervisor states he recalls seeing this Condition Report. This Condition Report was either lost or was not written. The Condition Report would have been the mechanism to resolve the drawing error and should have found the configuration error on NI-41.

Failure to initiate, numerate and process a Condition Report constitutes a violation of approved procedure (see Paragraph 4.c).

June 6, 1986

Time: 1442 hrs. **2 THP 4030 STP.180 "SU(1), Instrumentation Checks Prior To Startup" was performed.

This test verifies operability of: the Manual Reactor Trip System; Reactor Trip Breakers RTA and RTB; Power Range Nuclear Instrumentation Protection Set I (NI-41), II (NI-42), III

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[illegible]

[illegible]

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(NI-43), and IV (NI-44); Intermediate Range Protection Set I (NI-35) and II (NI-36); Source Range I (NI-31), and II (NI-32); and Turbine Trip Auto Stop Oil Pressure Switches Sets I, II, and III. It is designed to satisfy Technical Specifications 4.3.1.1.1, Table 4.3-1, Items 1, 2, 5, 6, 18A and 21; and Specifications 4.9.2A, 4.9.2B, 4.3.1.1.2, 4.10.3.2. and 4.10.4.2.

July 6, 1986

Time: 1532 hrs. NI-42 was connected to the reactivity computer per **12 THP 6040 Per. 355, "Reactivity Computer Calibration and Setup." The associated bistables were placed in trip, and the channel treated as administratively inoperable.

1543 hrs. The "South" control rod drive motor generator set was placed in service.

1544 hrs. The reactor trip breakers were closed.

1622 hrs. The "North" Control Rod Drive Motor Generator Set was placed in service.

At this time, Technical Specifications requiring any inoperable channel to be tripped within one hour; requiring not less than three operable channels; and providing prohibitions against changing MODE; and time limits for backing the plant down to an exempt MODE, all became effective because the rod drive system was capable of rod withdrawal. The condition of NI-41 was unknown, and the licensee proceeded in violation of the above requirements (see Paragraph 5.)

1632 hrs. Rod withdrawal commenced.

July 7, 1986

Time: 0157 hrs. Reactor trip from NI-32 (source range) "spike." The plant was in Mode 3. All withdrawn rods tripped as designed. The licensee made the required 50.72 phone notification.

This temporarily restored the plant to an exempt MODE and Technical Specification compliance.

0333 hrs. NI-32 was declared operable after performing **2 THP 4030 STP.124, "Source Range Nuclear Instrument Protection Set II (NI-32) Surveillance Test."

0609 hrs. The reactor trip breakers were reclosed.

Technical Specifications again became effective, the condition of NI-41 remained unknown, and the licensee proceeded.

1007 hrs.	All control rods removed to required height.
1617 hrs.	Plant entered Mode 2.
1812 hrs.	Reactor critical via dilution.
1817 hrs.	Reactor stable at 10 E-8 Amps on intermediate range. Low power physics testing of new core performed.

July 10, 1986

Time:	0220 hrs.	Reactivity computer removed per **12 THP 6040 PER.355 Appendix B, which includes independent verification of relanding the "A" (upper), "B" (lower) and High Voltage (supply) cables correctly. It appears that the C&I Technicians used the information tags and not the Lifted Lead tags as the mechanism to restore the leads to NI-42. As a result, the power and upper detector leads were reversed, just as they had been previously on NI-41, leaving NI-42 functionally inoperable.
	0400 hrs.	Reactor at 2 percent power.
	0402 hrs.	NI-42 declared operable after performing **2 THP 4030 STP.128.
	2205 hrs.	Reactor power increased to four percent.
	2311 hrs.	Permission given to go to Mode 1; increasing power to seven percent.
	Approximately 2200 hrs	The operators observed unusual readings for NI-41 and NI-42 but attributed the readings to incompatibility of the excore constants from the previous cycle to existing core load.

For a new core, the Nuclear Department estimates the power range detector current constants, and these constants are entered for the detector. At approximately 48 percent power, a calorimetric and incore/excore calibration is performed to determine the actual detector current constants; these corrected constants are then entered. NI-41 and NI-42 were reading approximately one-half of what NI-43 and NI-44 read.

PMI-6030, "Instrument and Control: Maintenance and Calibration," at Paragraph 3.2.14 defines the control room operators' and C&I technicians' responsibilities when an instrument channel indication deviates from another channel measuring the same parameter. The operator is responsible to properly interpret control room indications, parameter changes, possible instrument failures, and immediately notify C&I if the readings are not what is expected. In this case, C&I is responsible to determine if the channel is operable. If the channel is inoperable, a qualified technician is required to place the applicable bistables in trip within one hour from the time the channel is declared inoperable. Provisions exist which allow the Unit or Shift Supervisor (who holds a current SRO license) to declare the channel inoperable and place the bistables in trip if a qualified C&I technician is not available.

July 11, 1986

Time:		
	0038 hrs.	Plant entered Mode 1.
	0105 hrs.	Reset main turbine.
	Approximately 0110 hrs.	Management was consulted on the NI readings. The turbine roll was terminated and C&I was requested to evaluate positive Delta I readings on NI-41 and NI-42. The Plant was at nine percent power. P-10 had not been bypassed.

This decision was critical to the ultimate degree of safety significance (i.e. threat to safety) determined to apply to this matter. Maintaining the plant below P-10 preserved diverse and redundant functions to accomplish the safety actions of the inoperable channels and minimized the safety threat (see Paragraph 6).

0208 hrs.	C&I personnel who had worked on NI-41 and NI-42 in May started to investigate low detector output on NI-41, using the troubleshooting procedure **2 THP 6030 IMP.231 as a guide.
0407 hrs.	IMP.231 complete for NI-41. Nothing was identified as faulty in NI-41. IMP.231 was started for NI-42.
0414 hrs.	The technician found the power supply and signal cables from NI-42 reversed, corrected them, and went back to NI-41 to continue the investigation.
0422 hrs.	The cables from NI-41 were found reversed and were restored.

At this time, information was available that two NI channels (NI-41 and NI-42) were found inoperable. The Shift Supervisor was not immediately informed as required by procedure. Consequently, required notifications to the NRC were not thereafter made within the prescribed time (see Paragraph 7).

0436 hrs. Rolled the main turbine.

1122 hrs. Reactor at 27 percent power.

1200 hrs. Increasing reactor power to 29 percent at three percent per hour.

July 12, 1986

0000 hrs. to The Shift Technical Advisor (STA) and the C&I Supervisor, while discussing event of the 0800 hrs previous day, recognized the need for a Condition Report and prepared the report.

1422 hrs. Reactor at 29 percent power.

July 14, 1986

Time: 0555 hrs. Reactor power at 47 percent thermal power and 49 percent loop Delta T indicated power.

Time unknown STA review of Condition Report determines that a 50.72 report was required (the "inoperability" is recognized).

1300 hrs. The STA and Assistant Plant Manager - Administration informed the Resident Inspector that Mode changes had been made with two NI channels inoperable and that the 50.72 report was not made within the required time limit.

1505 hrs. The Licensee notified NRC via ENS that Mode changes had been made with two NI's inoperable.

1700 hrs. (approx.) The resident inspector requested that the licensee assure that the C&I technician did not make NI-41 and NI-42 inoperable during the repair.

2211 hrs. **2 THP 4030 STP.127, "Power Range Nuclear Instrument Protection Set I (NI-41) Surveillance Test" was completed successfully for NI-41.

2250 hrs. **2 THP 4030 STP.128, "Power Range Nuclear Instrument Protection Set II (NI-42) Surveillance Test" was completed successfully for NI-42.

July 25, 1986 — The Licensee requested a Management meeting to discuss this event.

July 29, 1986 — Enforcement Conference held

4. Root Causes

a. Loss of Control of Design Configuration for NI-41

Prior to this event, no previous examples of incorrect configurations of electrical leads within the power range drawers were identified. The initiating event in this case was an activity completed on May 31, 1986, intended to verify and improve the material conditions within the nuclear instrument drawers.

During this work a personnel error was made. The error consisted of confusing and crossing the leads for channel NI-41 such that the high voltage lead was connected to the upper detector output connection, and vice versa. Several factors may have contributed either to the error or to the subsequent failure to detect it.

First, a drawing error existed for one of the subject instruments, NI-42. The individual who erred on NI-41 had identified this drawing error and knew the drawings could be wrong because the error for NI-42 had been independently verified both onsite and via discussion with personnel at licensee headquarters in Columbus, Ohio.

Second, the condition of the leads within the drawers was somewhat tangled. This condition made keeping track of each lead difficult.

Third, administrative tools for double-checking important and/or complex activities were not utilized. No detailed procedure existed for this presumably "one time" activity, and none was prepared. An existing control mechanism commonly called a "pull sheet" (formal title: PMI-2140 Attachment No. 1, "Lifted Wire Form") was not used. The provisions of PMI-2140, "Temporary Modifications" Revision 6 (which was in effect until July 1, 1986) included a NOTE at step 3.5.2 which permits lifting wires one at a time and immediately relanding them (such as in troubleshooting) without using the Attachments. Since the power supply and upper detector output leads could not have become crossed had only one lead been lifted at a time, it is evident that the provisions of PMI-2140 were violated. The individual involved indicated it was both his intention and his recollection that only one lead at a time was lifted during the untangling process. Failure to use the "pull sheet" was, therefore, a conscious decision, rather than inadvertent.

The failure to implement more comprehensive administrative controls may have been influenced by the fact that the Unit was in a refueling outage (Mode 6) and none of the instrumentation in question was required OPERABLE.

b. Loss of Control of Design Configuration for NI-42

Channel NI-42 was left correctly aligned after the activities (which culminated May 31, 1986) to inspect cable connectors and rearrange cables for free drawer movements. Because of the recognized drawing error for NI-42, Lifted Lead tags were affixed to the leads for power supply and upper detector output to alert technicians that the drawing configuration was not correct, but the as-tagged configuration was correct. The Lifted Lead tags conflicted with "information" tags also on the subject cables, which reflected the errant drawing, and which were not removed when the Lifted Lead tags were affixed. The "information" tags had been recently placed, as a voluntary enhancement to pre-existing conditions, as part of the connector check and cable rearrangement activity. Placing these "information" tags, though well intentioned, exceeded the scope of the Job Order governing the activity. Plant procedure PMI-2290, "Job Orders" Revision 4, which applied until July 1, 1986, require under the section titled "Performance of Work" that personnel implementing Job Orders must assure that their work is performed within the scope of the assigned Job Order. Placement of the "information" tags was in violation of procedure PMI-2290.

The procedure subsequently used for core physics testing contains steps for nuclear instrument restoration following removal of the reactivity computer. These restoration steps, however, identify the cables and connectors for NI-42 upper and lower detector outputs and for power supply simply as "A," "B," and "N" respectively. The combination of two types of cable identification tags with the non-specific restoration steps of the core physics procedure, apparently resulted in a second personnel error, and channel NI-42 had the upper detector output and power supply leads reversed in the same way channel NI-41 had. In effect, the personnel error resulted in a violation of the intent of procedure **12 THP 6040 PER.355 "Reactivity Computer Calibration and Setup" in that the intended restoration was incorrectly performed.

c. Failure to Identify Adverse Conditions Early

Once the error had been made, discovery depended on observations of the response of the miswired channels to an actual neutron flux. Existing surveillance procedures only test drawer response and associated logic; responses which are checked independent of detector inputs using simulated signals.

The drawing error relating to NI-42 was known to at least two persons, and the presumed error in the drawing for NI-41 was known to at least one person. Failure to independently verify the

presumed error on the NI-41 drawing nullified an opportunity for early detection. However, such verification was not a requirement.

Plant procedure PMI-7030 "Condition Reports and Plant Reporting" requires a Condition Report when drawing/print discrepancies are noted. No Condition Report exists for the time frame when the drawing discrepancies for NI-41 and NI-42 were initially identified in May, 1986. This constitutes a violation of procedure PMI-7030. The individual who initially identified the subject discrepancies believes he wrote a Condition Report, and his supervisor believes he saw the document. The C&I log contains an entry by the identifying individual to the effect that a Condition Report was prepared. In the event a Condition Report was written, it became lost, and the provisions of PMI-7030 governing delivery of the document to a specified location, and numeration, review and processing thereafter may be considered to have been violated.

Had a Condition Report entered the corrective action system as required for the known drawing deficiency, the corrective action system processing would have involved additional review and evaluation, which should have been capable of noting the incorrect configuration of NI-41.

d. Technical Specification Violation Associated with Root Causes

Unit 2 Technical Specification 6.8.1 requires written procedures be implemented covering applicable procedures recommended in Appendix "A" of Regulatory Guide 1.33, November 1972, which includes administrative procedures covering procedure adherence. Procedure PMI-2010 "Plant Manager and Department Head Instructions, Procedures and Indexes" at Paragraph 3.1.1 "Policy Statement," addresses procedure adherence and requires instructions and procedures shall be adhered to by all plant personnel.

Procedure PMI-2140 "Temporary Modifications" requires use of its associated Attachment #1 "Lifted Wire Form" unless wires are lifted and immediately relanded one at a time. Contrary to this requirement, no "Lifted Wire Form" was used for activities conducted under Job Order No. 54516 on or about May 31, 1986 which resulted in the crossing of two wires on nuclear instrument NI-41.

Procedure PMI-2290 "Job Orders" requires under the section titled "Performance of Work" that personnel must assure their work is performed within the scope of the assigned Job Order. Contrary to this requirement, "information" tags were placed on cables in nuclear instruments NI-41 and NI-42 during conduct of Job Order No. 54516 on or about May 31, 1986 when placement of such tags was not included in the scope of the Job Order.

Procedure PMI-7030 "Condition Reports and Plant Reporting," specifies Condition Reports as the mechanism for plant personnel to notify management of conditions adverse to quality and requires a Condition

Report when print discrepancies are noted (Paragraph 5.2.c) or when a failure exists which could leave safety equipment inoperable or in a degraded mode (Paragraph 5.2.b). Contrary to this requirement, no Condition Report apprised management of the print and wiring discrepancies found on safety instrumentation channels NI-41 and NI-42 on or about May 31, 1986.

The failures to follow approved procedures described above is a violation of Technical Specification 6.8.1. (Violation 316/86029-01).

5. Operability Consequences

a. Operability

At the time NI-41 had its power supply and signal leads crossed in May, 1986, the Unit was shut down, and the operability of excore power range instruments was not required. Operability is required per Technical Specification 3.3.1.1 via reference to Table 3.3-1, for MODEs 1 and 2 and whenever the control rod drive system is capable of withdrawal in MODE 3. All four instrument channels are required OPERABLE. ACTION 2 of Technical Specification 3.3.1.1 specifies if less than four channels are OPERABLE, the inoperable channel must be placed in the tripped condition within one hour and the Minimum Channels OPERABLE requirement of three channels must be met.

Technical Specification 2.2.1, via Table 2.2-1, establishes required reactor trip system setpoints when the respective instrumentation is required OPERABLE by Table 3.3-1. For the nuclear instrumentation in question, the required setpoint values are less than 25 percent RATED THERMAL POWER for the low setpoint and less than 109 percent RATED THERMAL POWER for the high setpoint.

When the upper detector lead and the high voltage supply lead are crossed on an instrument of the design at D. C. Cook, the upper detector continues to function and supply a signal to the associated reactor protection logic. Since high voltage is not supplied to the lower detector, the lower detector will not respond to power (neutron flux) changes. Thus, the signals to the protective system will be solely from the upper detector and will approximate half the output which should be provided. This means the reactor trip (from NI-41 and NI-42) will be delayed to the point where actual power is about double that at which the sum of the two detector halves should have reached the setpoint. With setpoints about double those required, the affected instrument channels were clearly inoperable.

b. Change(s) of MODE

Technical Specification 3.0.4 prohibits entry into an OPERATIONAL MODE or other specified applicability condition unless the conditions of the Limiting Condition for Operation are met without reliance on provisions contained in the ACTION statements. This

requirement was violated when the licensee achieved the specified applicability condition of having control rods capable of rod withdrawal in MODE 3 on July 6, 1986, at 4:22 P.M. because channel NI-41 was inoperable with crossed wires and channel NI-42 was inoperable to support a test, thus leaving less than the required three minimum channels OPERABLE. This scenario was duplicated at 6:09 A.M. on July 7, 1986, after an inadvertent, unrelated reactor trip opened the reactor trip breakers and removed the plant from the "specified applicability condition" of rod withdrawal capability.

Each MODE change thereafter (to MODE 2 at 4:17 P.M. on July 7 and to MODE 1 at 12:38 A.M. on July 11, 1986) can be seen as an additional violation of Technical Specification 3.0.4. The change to MODE 2 was made with channels NI-41 and NI-42 unchanged. The change to MODE 1 followed what was thought to be restoration of channel NI-42, but both channels were identically miswired when this change occurred.

c. Time Limits for ACTION

Technical Specification 3.0.3 specifies when a Limiting Condition for Operation is not met, including failure to meet the ACTION requirements, action shall be initiated within one hour to place the unit in a MODE in which the Specification does not apply. Time limits are six hours to HOT STANDBY (MODE 3), up to an additional six hours to HOT SHUTDOWN (MODE 4), and not more than a subsequent 24 hours to COLD SHUTDOWN (MODE 5). In this instance, the condition of inapplicability involves opening the reactor trip breakers, which will assure all rods are fully inserted and are incapable of withdrawal. This is a MODE 3 condition. Therefore, Technical Specification 3.0.3 would provide not more than seven hours, cumulative, to achieve the "condition of inapplicability." This requirement was violated when Limiting Condition for Operation 3.3.1.1 and the associated ACTION requirements (four OPERABLE NI channels or, if only three, bistables tripped for the single inoperable channel) were not met from 4:22 P.M. on July 6 to 1:57 A.M. on July 7, a period of approximately nine and one-half hours. The requirement was similarly violated from 6:09 A.M. on July 7 to about 4:22 A.M. on July 11, 1986, a period of approximately ninety-four hours.

d. Technical Specification Violation Associated with Operability

Unit 2 Technical Specification 2.2.1 requires reactor trip system setpoints shall be set consistent with the Trip Setpoint values of Table 2.2-1 when the respective instrumentation is required OPERABLE as shown in Table 3.3-1. Table 2.2-1 specifies power range neutron flux trip setpoints as §25% and §109% of RATED THERMAL POWER. With setpoints less conservative than those specified, the required ACTION is to declare the channel inoperable and apply the ACTION requirements of Specification 3.3.1.1. Technical Specification 3.3.1.1 mandates trip system instrumentation be OPERABLE as shown in

Table 3.3-1, which applies in MODES 1 and 2 and whenever the control rod drive system is capable of rod withdrawal, and specifies if less than the four total channels are OPERABLE, via ACTION 2, the inoperable channel must be placed in the tripped condition within one hour and the Minimum Channels OPERABLE requirement of three channels must be met. Technical Specification 3.0.4 prohibits entry into an OPERATIONAL MODE or other specified applicability condition unless the conditions of the Limiting Condition for Operation are met without reliance on provisions contained in the ACTION statements. Technical Specification 3.0.3 specifies when a Limiting Condition for Operation is not met, including failure to meet the ACTION requirements, action shall be initiated within one hour to place the unit in a MODE in which the Specification does not apply.

Contrary to the above, at 4:22 P.M. on July 6, 1986 with the control rod drive system capable of rod withdrawal, power range nuclear instrument NI-41 had trip setpoints less conservative (by a factor of about two) than those specified in Table 2.2-1 because only the upper half of the detector was providing a flux signal; but the channel was not declared inoperable, nor was the channel placed in the tripped condition within one hour.

Also contrary to the above, channel NI-42 was concurrently inoperable, with the channel tripped, such that the Minimum Channels OPERABLE requirement (three channels) was not met. This condition existed from 4:22 P.M. on July 6, 1986 when the requirement became effective, until 4:02 A.M. on July 10, 1986; during which time the reactor was taken critical, physics testing performed, and power raised to 2 percent RATED THERMAL POWER.

Further contrary to the above, both channels NI-41 and NI-42 were thereafter concurrently inoperable, as a consequence of channel NI-42 also having non-conservative trip setpoints compared to Table 2.2-1 because it, too, had only the upper detector half providing a flux signal, from 4:02 A.M. on July 10, 1986 until 4:14 A.M. on July 11, 1986. During this time, NI-42 was not placed in the tripped condition within one hour. (Violation 316/86029-02).

At 4:14 A.M. on July 11, 1986 channel NI-42 was restored to OPERABLE by correcting reversed wiring, and NI-41 was restored OPERABLE by the same corrective action some eight minutes later.

6. Safety Significance

Automatic reactor trips apparently remained available at all times, even assuming single failure, for protection from analyzed accidents involving power increases (rod withdrawal) or rod ejection, excessive load increase, excessive cooldown, or uncontrolled dilution, both from the intermediate range high flux (25%) trips and from the remaining two operable power range low setpoint (also 25%) trips. The "inoperable" power range channels were capable of functioning to trip, but this would have occurred at around 50 percent power or higher.

Prior to raising power above the cut-off (P-6) on the source range detectors, these instruments were also available to trip on excessive flux increases. This applied from the time the rod drives were energized (and the Technical Specifications became effective) until P-6 was reached.

Additional diverse (but not independent) protection comes from the Over Power and Over Temperature Delta T trips, which have variable setpoints calculated using Delta flux as one parameter. For these trips, the "inoperable" channels were indicating an increasingly positive Delta flux, which would decrease the respective setpoints, i.e. they were conservative. The amount of conservatism in these circumstances has not been quantified.

It is concluded that the specific circumstances of operation of the Unit 2 plant for about four days, always below ten percent power, with two of the four excore power range nuclear instrument channels inoperable, though a significant violation of license requirements, did not represent a significant safety risk or hazard, either to the plant or to the public health and safety.

7. Reportability

Procedure PMI-7030, "Condition Reports and Plant Reporting" requires at Paragraph 5.3 that the Shift Supervisor be immediately notified of discovery of any plant equipment which is inoperable.

On July 11, 1986 the trouble shooting inspection of NI-41 and NI-42 found each with crossed electrical leads, rendering them inoperable. But the channels were never declared inoperable, as evidenced by the control room logs for this date, because neither the Shift Supervisor nor the operators were notified that the channels had been inoperable. Since the NI-41 and NI-42 channels were never officially declared inoperable, the on-shift licensed operators failed to make the required immediate notifications per 10 CFR 50.72. The C&I personnel involved also neglected to issue a Condition Report, apparently because they remembered the problem in May 1986 and assumed a Condition Report was still outstanding.

10 CFR 50.72(b)(2)(iii)(d) requires that the licensee notify the NRC as soon as practical, and in all cases within four hours, of an event or condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident. The time clock for reportability started at 4:22 A.M. on July 11, 1986 when sufficient information existed to determine that both NI-41 and NI-42 had been inoperable and not available to mitigate the consequences of an accident.

Failure to make the required 50.72 notification within the required time requirements is a violation of 50.72. (Violation 316/86029-03).

8. Training

No specific deficiencies were identified concerning the training or qualifications of personnel involved in the described errors, nor were there substantive indications of pervasive lack of awareness of, or intentional disregard of, procedure requirements. Interviews typically showed the contrary to be true.

9. Enforcement Conference

An Enforcement Conference was held at the Region III office on July 29, 1986. The attendance is documented in Paragraph 1 of this report. During the Enforcement Conference the licensee discussed:

a. Some immediate corrective and preventive actions.

b. The configuration of NI-41 and NI-42. This discussion confirmed that the output from NI-41 and NI-42 would be approximately half and that the trip setting would be doubled.

c. The sequence of events leading to the late 50.72 report on the inoperability of NI-41 and NI-42.

d. The safety analysis for two NI(s) being inoperable below ten percent power and the licensee's conclusion that safety was not compromised.

In addition, supervisory personnel involved in the late reporting and inoperability of NI-41 and NI-42 were present to answer questions.

10. Conclusion

As shown above, the licensee operated Unit 2 (i.e. escalated from Mode 5 to Mode 1) and achieved a maximum power level of nine percent with two of four power range nuclear instruments inoperable. The items listed below are a summary of the factors contributing to this.

- Failure to maintain design configuration of NI-41 and NI-42 - Paragraphs 4.a. and 4.b.

- Failure to issue a Condition Report when the drawing error for NI-42 and the suspected drawing error for NI-41 were found - Paragraph 4.c.

- Failure to properly communicate the inoperable status of NI-41 and NI-42 - Paragraph 7.

Review of this event showed the following positive attributes.

- The operators were cognizant of control room indications such that assistance was sought when NI-41 and NI-42 were not reading as expected - Paragraph 3, July 10 entry.

- The operators advised management of the questionable readings on NI-41 and NI-42. Management secured the power escalation until the readings were resolved - Paragraph 3, July 11 entry.

- Interviews typically showed a strong awareness of the administrative requirements - Paragraph 8..