

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-315/88026(DRS); 50-316/88030(DRS)

Docket Nos. 50-315; 50-316

Licenses No. DPR-58; DPR-74

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

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

Inspection At: D. C. Cook Site, Bridgman, Michigan

Inspection Conducted: November 7-29, 1988

Inspector: *Beth A. Wetzel*
B. A. Wetzel

12/2/88
Date

Approved By: *Monte P. Phillips*
Monte P. Phillips, Chief
Operational Programs Section

12/2/88
Date

Inspection Summary

Inspection on November 7 through 29, 1988 (Reports No. 50-315/88026(DRS);
No. 50-316/88030(DRS))

Areas Inspected: Safety inspection of licensee action on previous inspection findings (92702), recurring problems with the estimated critical position (92701), and calibration of nuclear instrumentation systems (61705).

Results: The licensee is currently taking several measures to increase the accuracy of their estimated critical position calculations to avoid missing critical positions during startups, which had occurred in the past. One open item and one violation in the area of core physics were closed during this inspection. One unresolved item, which dealt with a new methodology for calibrating excore detectors was identified. The unresolved item will be referred to NRR for a technical evaluation. No violations or deviations were identified.

8812130005 881202
PDR ADOCK 05000315
Q PNU



DETAILS

1. Persons Contacted

Indiana and Michigan Electric Company

- *L. S. Gibson, Assistant Plant Manager
- *R: W. Hennen, Nuclear Supervisor, Technical Engineering
- T. Postlewait, Technical Engineering Superintendent
- *H. F. Runser, Production Supervisor, Operations
- B. A. Svenson, Licensing Activities Coordinator
- *M. M. Terry, Senior Performance Engineer, Technical Engineering
- *A. Verteramo, Nuclear Group, Technical Engineering
- M. Whitley, Nuclear Group, Technical Engineering
- *J. Wojcik, Technical Physical Sciences Superintendent
- *S. J. Wolt, Quality Assurance

American Electric Power Services Corporation (AEPSC)

- M. Ackerman, Nuclear Safety and Licensing Section
- G. John, Nuclear Fuels and Analysis Section
- D. Malin, Nuclear Fuels and Analysis Section
- E. Neymotin, Nuclear Fuels and Analysis Section

*Denotes persons attending the exit meeting of November 10, 1988.

2. Licensee Action on Previous Inspection Findings (92701 and 92702)

- a. (Closed) Open Item (315/86006-03(DRS); 316/86006-03(DRS)): This item was opened pending NRR's review of Technical Specification (TS) Clarification No. 17, TS 3.2.4, "Application of the Quadrant Power Tilt Technical Specification," reviewed by the Plant Nuclear Safety Review Committee on January 8, 1980. TS Clarification No. 17 was initiated by American Electric Power (AEP) personnel to verify that the practice of normalizing out a core power tilt during an Incore/Excore calibration is appropriate. TS Clarification No. 17 is consistent with "Westinghouse Position Statement on Core Tilt," dated November 10, 1982. It states that the purpose of TS 3.2.4 is to limit gross changes in quadrant to quadrant power distribution between incore flux maps, therefore, indicated Quadrant Power Tilts may be "zeroed out" after determination that the core peaking factor technical specifications are met.

The inspector consulted with personnel from NRR, Reactor Systems Branch, who also indicated that D. C. Cook's practice of normalizing out the Quadrant Power Tilt on the excore detectors following a flux map is acceptable. NRR stated that the tilt is used as an alarm and every time an incore measurement is taken (i.e., a flux map is performed) the alarm can be reset. It was also stated that the Quadrant Power Tilt Ratio (QPTR) limit of 1.02 is the lowest value



that can be used for an alarm without spurious action. Other vendors, such as Combustion Engineering and Babcock and Wilcox use a larger value for their QPTR limit and do not zero out the Quadrant Power Tilt on the Excores following a flux map.

Based on a review of "Westinghouse Position Statement on Core Tilt" and discussions with personnel from NRR, this item is considered closed.

The inspector had no further concerns in this area.

- b. (Closed) Violation (315/87028-02(DRS)): A violation of Technical Specification 6.8.1.C was discovered during a review of completed Procedure **1-THP.6040 PER.352, "Rod Worth Verification Utilizing RCC Bank Interchange," performed October 6, 1987. Step 8.2.5 of the procedure was not followed, in that boron samples were not recorded on data Form No. 352-3, as instructed by procedure. The inspector was also concerned that procedure reviews performed by licensee personnel failed to identify the error. The Lead Nuclear Engineer subsequently found the boron samples recorded in the Nuclear Engineers' Logbook and added a revised Form No. 352-3 to the procedure, which included the boron samples that were previously missed. All Nuclear Group personnel received training on the importance of following procedures and performing adequate procedure reviews.

The inspector has no further concerns in this area.

3. Estimated Critical Position (92701)

The inspector reviewed information pertaining to recurring problems with Estimated Critical Position (ECP) calculations. The most recent occurrence was during a startup on September 15, 1988, in which the reactor did not go critical at the calculated ECP plus a 500 pcm margin for error allowed by procedure. A temporary change was made to Procedure **1-OHP 4021.001.001, "Determination of Critical Conditions," to permit a margin of + 800 pcm in the ECP calculation and the reactor was taken critical at approximately 514 pcm greater than the calculated ECP. It should be noted that the + 500 pcm margin is strictly administrative; TS allow a margin of ± 1000 pcm in the calculation of ECP.

Personnel from the AEPSC corporate office made a formal presentation to the inspector on November 9, 1988, which identified probable causes for the error in the ECP calculations and addressed potential methods for correcting the errors.

The first probable error was attributed to Boron-10 depletion. Some past ECP calculations were adjusted for Boron-10 depletion, such as a calculation performed for Unit 2 on April 8, 1987 which subtracted approximately 435 pcm from the ECP. The ECP calculation for the startup on September 15, 1988 was not adjusted for Boron-10 depletion for several reasons. The shutdown occurred near the end of cycle, therefore, the

boron concentration in the core was low and Boron-10 depletion effects on the ECP calculation were relatively small and well within the + 500 pcm error. Also, the plant did not go into half-loop operation, during the brief shutdown, which replaces depleted boron with fresh boron and increases the error in reactivity due to Boron-10 depletion in the ECP calculation. In retrospect, the error due to Boron-10 depletion for the September 15 startup was determined to be approximately 90 pcm and if this effect would have been taken into consideration the calculated ECP would have been within the + 500 pcm acceptance criterion.

The second error was attributed to the effects of Westinghouse changing their methodology for calculating the power defect from a two-dimensional core model to a more accurate three-dimensional core model. In past ECP calculations there was a cancellation of errors in terms, when Westinghouse computed a more accurate total power defect term the errors became additive. The total power defect includes the following three terms:

- DOP - reactivity change due to Doppler effect.
- TD - reactivity change due to moderator temperature change.
- FR - reactivity change due to flux redistribution effect.

The FR term was underpredicted in past calculations. The difference between previous power defect calculations and new calculations is approximately 360 pcm. As a result, AEP personnel are recalculating terms that are input into the ECP by considering secondary effects on the parameters and thereby reducing error in the terms. Terms input into the ECP calculation were previously assumed to be separable; however, they are not. The following secondary effects are being investigated:

- 1) Xenon and Samarium negative reactivities influence differential boron worth. For example, differential boron worth is higher in a Xenon-free core because the spectrum of neutrons is softer and Boron-10 contains a higher cross-section for absorption of slower neutrons.
- 2) Flux redistribution effects may be lower than calculated because measured axial offset values were less negative than calculated values due to operation at reduced power levels.
- 3) Reactivity increase due to Plutonium buildup during reactor shutdown may be partly offset by deposition of certain isotopes of samarium.

It should be noted that the error in the ECP calculation of September 15 was in the conservative direction. That is, the core had more negative reactivity than was expected. Utility personnel are in the process of refining terms input into the ECP calculation to better predict criticality. A computer code is also being approved for operator use to facilitate performance of more accurate ECP calculations by Operations.

The inspector identified one concern during the review of the event. Boron-10 depletion is expected to contribute error in an ECP calculation under certain operating conditions, such as a startup after a trip from an extended run. However, Procedure **1-OHP 4021.001.001, which calculates the ECP does not discuss Boron-10 depletion. The licensee has agreed to revise the procedure to at least include a precaution or note that describes under what operating conditions Boron 10 depletion should be accounted for in the ECP calculation. The procedure revision will also include the results from AEP personnel's investigation into secondary effects on reactivity parameters.

4. Calibration of Nuclear Instrumentation Systems (61705)

The licensee is in the process of implementing a new technique for performing Excore Detector calibrations known as the one-point method. This technique permits calibration of excore instrumentation based on the results from one incore flux map rather than the previous method which used three to ten flux maps. The inspector reviewed the following documents pertaining to the one-point calibration methodology:

- "One Point Incore/Excore Methodology Verification for D. C. Cook, American Electric Power, August 31, 1988, Utility Resource Associates."
- "Technical Evaluation - One Point Incore/Excore Cross Calibration Methodology for D. C. Cook, August 16, 1988, by Alberto Verteramo."
- "Safety Review Memorandum: New Technique for Calibrating the Ex-Core Power Range Nuclear Instrumentation System."
- Procedure, **1-THP 4030 STP.363, "One Point Incore-Excore Detector Calibration," Revision 0.

The question of whether the one-point incore/excore calibration methodology is acceptable for use is an Unresolved Item (Nos. 315/88026-01(DRS) and 316/88030-01(DRS)) and will be forwarded to NRR for review to determine whether implementation without prior NRC approval is acceptable.

5. Unresolved Items

Unresolved Items are matters about which more information is required in order to ascertain whether they are acceptable items, violations, or deviations. An unresolved item disclosed during this inspection is discussed in Paragraph 4.

6. Exit Interview

The inspector met with licensee representatives (denoted in Paragraph 1) on November 10, 1988. The inspector summarized the scope and findings of the inspection. The inspector also discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspector during the inspection. The licensee acknowledged



statements made by the inspector and stated that the Utility Resources Associates Report dated August 31, 1988, was considered proprietary, but references to this document would not be considered proprietary. A second exit meeting was held on November 29, 1988, via teleconference, to discuss the unresolved item denoted in Paragraph 4.

RIII REPORT/LETTER TRAVELLER

Total days to issue: _____

Licensee: AMERICAN ELECTRIC POWER SERVICE INDIANA & MICHIGAN POWER COMPANY	Draft Completion Date: 11/29/88	Report No(s): 50-315/88026 50-316/88030
Facility(s): D. C. COOK - UNITS 1 & 2	Initial Typing: Received _____ Start _____ End _____	Inspection End Date: November ²⁹ 10 , 1988
License No(s): DPR-58; DPR-74	*Inspector Review: Start _____ End _____	Inspector (S) : B. A. Wetzel
	Date Mailed: _____	
	Date Received: _____	

Review Process **

Doc. Format	Insp/PM		S.C.		B.C.		D.D.						Data Mgmt. Unit	
	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
Draft	11/30	11/30	11/30	12/1	12/1	12/1							11/30	11/30
FINAL	12/1												12/1	

NOTES **

Note No.	Comment
	Re-exited Nov. 29 1988
	dup to additional information

Issue Date: 12/2/88

Licensee: HQ(DMB)

Proprietary Review Notif. Telephone

Written Due Received

Licensee Response: Due Issued Received

Thank You Letter: Due Issued

Form 591 Applicable? Yes No

Issued From: Field Office

*Resident Inspectors Only
 Add Reviewer to Add Additional Reviewers or Notes



INSPECTOR'S REPORT
Office of Inspection and Enforcement

Wetzel, Beth A.
REVIEWER: Phillip M. Papp

INSPECTORS: Beth A. Wetzel

LICENSEE/VENDOR	TRANSACTION TYPE	DOCKET NO. (8 digits) OR LICENSE NO. (BY PRODUCT) (13 digits)	REPORT		NEXT INSP. DATE	
			NO.	SEQ.	MO.	YR.
D.C. Cook Units 182	<input checked="" type="checkbox"/> I - INSERT	05000315	89026	A		
	<input type="checkbox"/> M - MODIFY	05000316	89030	B		
	<input type="checkbox"/> D - DELETE			C		
	<input type="checkbox"/> R - REPLACE			D		

PERIOD OF INVESTIGATION/INSPECTION						INSPECTION PERFORMED BY		ORGANIZATION CODE OF REGION/HQ CONDUCTING ACTIVITY (See IEMC 0530 "Manpower Reporting-Weekly Manpower Reporting" for code)		
FROM			TO			1 - REGIONAL OFFICE STAFF	OTHER	REGION	DIVISION	BRANCH
MO.	DAY	YR.	MO.	DAY	YR.					
11	07	88	11	29	88	<input checked="" type="checkbox"/>		3	3	1

REGIONAL ACTION (Check one box only)		TYPE OF ACTIVITY CONDUCTED (Check one box only)				
<input type="checkbox"/> 1 - NRC FORM 591	<input checked="" type="checkbox"/> 2 - REGIONAL OFFICE LETTER	<input checked="" type="checkbox"/> 02 - SAFETY	<input type="checkbox"/> 03 - INCIDENT	<input type="checkbox"/> 04 - ENFORCEMENT	<input type="checkbox"/> 05 - MGMT. AUDIT	<input type="checkbox"/> 06 - MGMT. VISIT <input type="checkbox"/> 07 - SPECIAL <input type="checkbox"/> 08 - VENDOR <input type="checkbox"/> 09 - MAT. ACCT. <input type="checkbox"/> 10 - PLANT SEC. <input type="checkbox"/> 11 - INVENT. VER. <input type="checkbox"/> 12 - SHIPMENT/EXPORT <input type="checkbox"/> 13 - IMPORT <input type="checkbox"/> 14 - INQUIRY <input type="checkbox"/> 15 - INVESTIGATION

INSPECTION/INVESTIGATION FINDINGS (Check one box only)				TOTAL NUMBER OF VIOLATIONS AND DEVIATIONS				ENFORCEMENT CONFERENCE HELD				REPORT CONTAIN 2.790 INFORMATION				LETTER OR REPORT TRANSMITTAL DATE					
A	B	C	D	A		B		C		D		A		B		C		D			
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			0	0													12	02	88	

MODULE INFORMATION												MODULE INFORMATION																													
REC. ORD.	MODULE NUMBER INSP.					PRIORITY	DIRECT INSPECTION EFFORT IN STAFF HOURS EXPENDED THIS INSPECTION	PERCENTAGE COMPLETED TO DATE	STATUS	MODULE REQ. FOLLOWUP					REC. ORD.	MODULE NUMBER INSP.					PRIORITY	DIRECT INSPECTION EFFORT IN STAFF HOURS EXPENDED THIS INSPECTION	PERCENTAGE COMPLETED TO DATE	STATUS	MODULE REQ. FOLLOWUP																
TYPE	NUMBER	PHASE	MANUAL CHAPTER	PROCEDURE NUMBER	LEVEL					PHASE	MANUAL CHAPTER	PROCEDURE NUMBER	LEVEL	TYPE	NUMBER	PHASE	MANUAL CHAPTER	PROCEDURE NUMBER	LEVEL	PHASE					MANUAL CHAPTER	PROCEDURE NUMBER	LEVEL														
B	1530	7.0.3			5	A	0.03					B																													
		Entrance/Exit				B																																			
B	2592	7.0.1			1	A	0.28			561710		B																													
		Followup on Open Item and ECP Issue				B																																			
B	3592	7.0.2				A	0.04					B																													
		Followup on Violations				B																																			
B	4561	7.05				A	0.06			10C		B																													
		IS Calibration				B																																			

* CIRCLE SEQUENCE IF VIOLATION OR DEVIATION



OUTSTANDING ITEM LIST (OIL) TRACKING FORM

Submitted by: B. Wetzel

Sec. Chief Approval *[Signature]* 01A

Item No.	Type Code	Func. Area
<u>315188026-01</u> (Unit 1)	<u>UNR</u>	<u>Q6</u>
<u>316188030-01</u> (Unit 2)		

Original Inspector	Resp. Sec.	Note
<u>B. WETZEL</u>	<u>DPS</u>	

Responsible Inspector (<i>leave blank</i>)	Closed	Final Report
<u>M. PHILLIPS</u>	<u>1-1</u>	

Interim Insp. Reports _____

Followup Date	Remarks:
<u>1-1</u>	<u>NRR Review of One Point Incore/Exc core Calibration Methodology</u>

Status Code 0

TYPE CODE		FUNCTIONAL AREAS	SECTION
ALO	ABNORM. ENVIR. OCC.	1. OPERATIONS	EPS P1A
ALG	ALLEGATION	2. RADIOLOGICAL CONTROLS	FRP P1B
BUL	BULLETIN	3. MAINTENANCE/SURVEILLANCE	MLS P2A
CAL	CONFIR. ACTION LTR.	4. EMERGENCY PREPAREDNESS	MOS P2B
CIR	CIRCULAR	5. SECURITY	MPS P3A
DEV	DEVIATION	6. ENGINEERING/TECH. SUPPORT	NM1 P3B
GLR	GENERIC LETTER	7. SAFETY ASSESS/QUALITY VERIF.	NM2 PSS
IAL	IMMEDIATE ACTION LETTER	8. OTHERS	OL1 REC
INF	INFORMATION NOTICE		OL2 SGS
LER	LICENSEE EVENT REPORT		OPS TSS
NC	NON-COMPLIANCE (1-2-3-4-5)		
NV6	NO VIOLATION 10 CFR 2, 101.11		
OPN	OPEN ACTION SEC. V.A		
ORD	ORDERS TO LICENSEE		
OTH	OTHER		
P20	10 CFR PART 20		
P21	10 CFR PART 21		
R3R	REGION III REQUESTS		
REC	RECOMMENDATIONS		
RIP	REGULATORY IMPROVEMENT PROGRAM		
SEP	SAFETY EVAL. PROGRAM		
SER	SAFETY EVAL. REPORT		
SGR	73.71 SAFEGUARDS REPORTS		
SSF	SIGNIFICANT SAFETY FINDING		
THI	THREE-MILE ISLAND ACTION ITEMS		
UNR	UNRESOLVED ITEMS		
WON	WITHDRAWN		
XXX	10 CFR 50.55(a) ITEMS		

Attachment 1
Revised 09/08/8



Submitted by: B. Wetzel

Sec. Chief Approval [Signature]

Item No.	Type Code	Func. Area	Date Entered
315186006-03 (Unit 1)	OPN	04	1-21
316186006-03 (Unit 2)			
Original Inspector	Resp. Sec.	Note	
<u>McCormick Berger</u>	<u>OPS</u>	-----	
Responsible Inspector	Closed	Final Report	
<u>B. Wetzel</u>	<u>11128188</u>	<u>315/88026</u> <u>316/88030</u>	
Interim Insp. Reports	-----	-----	-----
Followup Date	-----	Remarks:	-----
<u>1-1</u>	-----	-----	-----
Status Code	-----	-----	-----
<u>C</u>	-----	-----	-----

TYPE CODE		FUNCTIONAL AREA	SECTION
AEO -	ABNORM. ENVIR. OCC.	1. OPERATIONS	EPS P1/
ALG -	ALLEGATION	2. RAD - CHEM	FRP P18
BUL -	BULLETIN	3. MAINTENANCE	MLS P2/
CAL -	CONFIR. ACTION LTR.	4. SURVEILLANCE	MOS P20
CIR -	CIRCULAR	5. EMERGENCY PREP	MPS P3A
DEV -	DEVIATION	6. SEC/SAFEGUARDS	MM1 P38
GLR -	GENERIC LETTER	7. OUTAGES	MM2 P35
IAL -	IMMEDIATE ACTION LETTER	8. TRAINING	OL1 REC
INF -	INFORMATION NOTICE	9. LICENSING	OL2 SC3
LER -	LICENSEE EVENT REPORT	10. QUALITY ASSURANCE	OPS T88
MC -	NON-COMPLIANCE (1-2-3-4-5)	11. OTHER	
NO -	NON-COMPLIANCE 10 CFR 2,	12. FIRE PROT/H-K	
NOV -	NON-COMPLIANCE 10 CFR 2,		
OPN -	OPEN ITEM		
ORD -	ORDERS TO LICENSEE		
OTH -	OTHER		
P20 -	10 CFR PART 20		
P21 -	10 CFR PART 21		
RJR -	REGION III REQUESTS		
REC -	RECOMMENDATIONS		
RIP -	REGULATORY IMPROVEMENT PROGRAM		
SEP -	SAFETY EVAL. PROGRAM		
SER -	SAFETY EVAL. REPORT		
SGR -	73.71 SAFEGUARDS REPORTS		
SSF -	SIGNIFICANT SAFETY FINDING		
TMI -	THREE-MILE ISLAND ACTION ITEMS		
UNR -	UNRESOLVED ITEMS		
WDN -	WITHDRAWN		
WEE -	10 CFR 50 RESOLV. ITEMS		

Attachment 1 - RP 1201
Revised 12/04/87

Sec. Chief Approval *[Signature]*

Date Entered

1-1-1

Func. Area

07

Type Code

NC5

Note

Resp. Sec.

OPS

Final Report

88026

Closed

11128188

Remarks:

B. Wetzel
702B-07 (Unit 1)
(Unit 2)

Inspector
Wetzel
Asst. Inspector
Wetzel

Area Insp. Reports

Followup Date

Status Code

TYPE CODE

ORD -
OTH -
P20 -

ORDERS TO LICENSEE
OTHER

10 CFR PART REQUESTS
10 CFR PART REQUESTS
REGION III REQUESTS

RECOMMENDATIONS
IMPROVEMENT PROGRAM

FUNCTIONAL AREA

1. OPERATIONS
2. RAD - CHEM
3. MAINTENANCE
4. SURVEILLANCE
5. EMERGENCY PREP
6. SEC/SAFEGUARDS
7. OUTAGES
8. TRAINING
9. LICENSING
10. QUALITY ASSURANCE
11. OTHER
12. FIRE PROT/H-K

REGION

- EPS
- FRP
- MLS
- MOS
- MPS
- MMI
- MMQ
- OL1
- OL2
- OPS
- P17
- P1F
- P27
- P29
- P3A
- P3B
- P3C
- RE1
- SC
- TF

Attachment 1 to RP 1201
12/04/87



DRAFT YELLOW/GRAY BOOK INPUT FORM

Facility: D. C. Cook Units 1 + 2

Report No: 50-315/88026 and 50-316/88030

OTHER SIGNIFICANT ITEMS

1. Systems and Components

~~N/A~~

2. Facility Items

~~N/A~~

3. Managerial Items

~~N/A~~

INSPECTION PLAN

FACILITY: D.C. Cook, Report # 50-315/88026 and 50-316/88030SCHEDULED DATE(s): November 7 thru 10, 1988INSPECTOR(s): B. A. Wetzel

MODULE NO.	% COMP	INSPECTION FOCUS	ASSIGNED TO
30703B		entrance / exit	
41400		Non-licensed Training (if appropriate)	
92701		Followup of the following:	
		- Open Item # 315, 316/86035-01 (Boron-10 depletion)	
		- Open Item # 315, 316/86006-03 (NRR clarification of QPTR Tech Spec)	
		- DRP requested followup of recurring problem meeting estimated critical position, most recently during startup on 9/15/88.	
		- new NI calibration procedure	
92702		Followup of Violation # 315, 316/ 87028-02 (Failure to follow procedure, ** 1 THP 6040 PER.352)	

PLAN PREPARED BY: Beth A. WetzelDATE: 10/31/88PLAN APPROVED BY: M. JordaDATE: 10/31/88PLAN REVIEWED BY: Bruce J. DuganDATE: 10/31/88

PROJECT SECTION CHIEF

USE ADDITIONAL SHEETS AS NECESSARY