



Commonwealth Edison
Byron Nuclear Station
4450 North German Church Road
Byron, Illinois 61010

July 21, 1992

Ltr: BYRON 92-0492

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Dear Sir:

The enclosed Licensee Event Report from Byron Generating Station is being transmitted to you in accordance with the requirements of 10CFR50.73(a)(2)(v).

This report is number 92-004; Docket No. 50-454.

Sincerely,

R. Plenicic
Station Manager
Byron Nuclear Power Station

RP/CW/mw

Enclosure: Licensee Event Report No. 92-004

cc: A. Bert Davis, NRC Region III Administrator
W. Kropp, NRC Senior Resident Inspector
INPO Record Center
CECo Distribution List

(0941R/VS)

9207290381 920721
PDR ADOCK 05000454
S PDR

DEVIATION REPORT

DVR NO. 06 - 01 - 92 - 032
 STA UNIT YEAR MO.

Form Rev 2.0

PART 1 | TITLE OF DEVIATION OCCURRED * 07/01/92 1505
 Operability Determination of Source Range Nuclear Instrumentation DATE TIME
 SYSTEM AFFECTED PLANT STATUS AT TIME OF EVENT TESTING
 MODE H1=M H2=M POWER(%) 100% N/A WORK REQUEST NO. YES NO
 YES NO

DESCRIPTION OF EVENT

Byron Station received an EMC QE-40.1 on 07/01/92 regarding an operability assessment of the Boron Dilution Protection System (BDPS). Certain conditions exist when the BDPS subsystem may not be capable of performing its intended function. Byron On-Site Review 92-089 documents the findings and recommendations of the operability evaluation.

POTENTIALLY PART 21 YES* *FORWARD TO THE NUCLEAR ENGINEERING MANAGER
 NO FOR AN EXPANDED REVIEW
 POTENTIALLY SIGNIFICANT EVENT PER NRC DIRECTIVE OP.10 YES NO

10CFR50.72 NRC RED PHONE 1 HOUR
 NOTIFICATION MADE 4 HOUR 1642 NO TIME RESPONSIBLE SUPERVISOR D. Fair DATE 07/01/92

PART 2 | OPERATING ENGINEER'S COMMENTS

Special operating order SO-U1/U2-19 has been revised.

NON REPORTABLE EVENT
 30 DAY REPORTABLE/10CFR 50.72.b.2
 ANNUAL/SPECIAL REPORT REQUIRED

NOTIFICATION	REGION III	DATE	TIME
Office of M. Wallace		07/02/92	1116
HSD		DATE	TIME

CECO CORPORATE NOTIFICATION MADE IF ABOVE NOTIFICATION IS PER 10CFR21

A.I.R. # _____
 L.E.R. # 92-004

TELECOPY _____
 CECO CORPORATE OFFICER _____ DATE _____ TIME _____

PRELIMINARY REPORT COMPLETED AND REVIEWED W. Kouba 07/02/92
 OPERATING ENGINEER DATE

INVESTIGATION REPORT & RESOLUTION ACCEPTED BY STATION REVIEW [Signature] 7/5/92

RESOLUTION APPROVED AND AUTHORIZED FOR DISTRIBUTION [Signature] 7/21/92
 STATION MANAGER DATE

4-5176 (Form 15-52-1) 4/12/90

DOCUMENT ID

(0941R/VS-1)

LICENSEE EVENT REPORT (LER)

Form Rev 2.0

Facility Name (1) Byron, Unit 1	Docket Number (2) 0 5 0 0 0 4 5 4	Page (3) 1 of 0 6
Title (4)		

Operability Determination of Source Range Nuclear Instrumentation

Event Date (5)				LER Number (6)			Report Date (7)			Other Facilities Involved (8)	
Month	Day	Year	Year	Sequential Number	Revision Number	Month	Day	Year	Facility Names	Docket Number(s)	
0 7	0 1	9 2	9 2	0 0 4	0 0	0 7	2 1	9 2	Byron, Unit 2	0 5 0 0 0 4 5 5	
										0 5 0 0 0 1 1	

OPERATING MODE (9)

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)

POWER LEVEL (10) 1 0 0	<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(c)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)
	<input type="checkbox"/> 20.405(a)(1)(i)	<input type="checkbox"/> 50.36(c)(1)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 73.71(c)
	<input type="checkbox"/> 20.405(a)(1)(ii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> Other (Specify
	<input type="checkbox"/> 20.405(a)(1)(iii)	<input type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	in Abstract
	<input type="checkbox"/> 20.405(a)(1)(iv)	<input type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	below and in
	<input type="checkbox"/> 20.405(a)(1)(v)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)	Text)

LICENSEE CONTACT FOR THIS LER (12)

Name	K. Elam, Lead Nuclear Engineer	Ext. 2247	TELEPHONE NUMBER
	D. Farr, Station Reactor Engineer	Ext. 2249	AREA CODE 8 1 5 2 3 4 - 5 4 4

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRPDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRPDS
B				N					

SUPPLEMENTAL REPORT EXPECTED (14)

<input checked="" type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)	<input type="checkbox"/> NO	Expected Submission Date (15) 0 7 0 1 9 2
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ABSTRACT (Limit to 1400 spaces, i.e. approximately fifteen single-space typewritten lines) (16)

At 1505 on 07/01/92, Byron Station received an operability assessment, ENC-QE-40.1, regarding the Boron Dilution Protection System (BDPS) (NR) [IG]. The operability assessment was precipitated by the discovery of two non-conservative assumptions in the safety analysis for the system. On-Site Review 92-089 was immediately convened that concurred with the determination that BDPS is to be considered operable under a certain set of conditions. However, when the plant is outside of these conditions, the BDPS subsystem may not be capable of performing its intended safety function. Special Operating Order SO-U1/U2-19 was revised to implement the findings and recommendations of the operability assessment by detailing the conditions necessary for BDPS operability. This Special Operating Order will remain in effect until further safety analysis can be performed that will provide permanent resolution of this issue.

This event is reportable pursuant to 10CFR50.73(a)(2)(v), any event or condition that alone could have prevented the fulfillment of the safety function to structures or systems that are needed to mitigate the consequences of an accident.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

A. PLANT CONDITIONS PRIOR TO EVENT:Event Date/Time 07/01/92 / 1505Unit 1 MODE 1 - Operations Rx Power 100% RCS [AB] Temperature/Pressure 580°F/2235 psigUnit 2 MODE 1 - Operations Rx Power 100% RCS [AB] Temperature/Pressure 579°F/2238 psigB. DESCRIPTION OF EVENT:

At 1505 on 07/01/92, Byron Station received an operability assessment, ENC-OE-40.1, regarding the Boron Dilution Protection System (BDPS) (NR) [IG]. On-Site Review 92-0d9 was immediately convened that concurred with the determination that BDPS is to be considered operable under a certain set of conditions. However, when the plant is outside of these conditions, the BDPS subsystem may not be capable of performing its intended safety function. Special Operating Order SO-U1/J2-19 was revised to implement the findings and recommendations of the operability assessment by detailing the conditions necessary for BDPS operability. This Special Operating Order will remain in effect until further safety analysis can be performed that will provide permanent resolution of this issue.

On March 4, 1992, Westinghouse issued a Potential Issue (PI) on the operability of the Boron Dilution Protection System. This PI was issued because two potential non-conservatisms were identified in the original Safety Analysis for this system:

1. The assumed Inverse Constrate Ratio (ICRR) curve in the analysis was found to be non-conservative at another Westinghouse plant.
2. The setpoint for the flux doubling did not include an uncertainty analysis.

At the time the PI was received from Westinghouse, insufficient information was available to determine operability of the system. Pursuant to the PI issued by Westinghouse, Byron Station, in concert with Nuclear Fuel Services (NFS), Nuclear Licensing (NLA), and Braidwood Station agreed on the conservative compensatory actions included in OSR 92-032. These actions mitigated the probability and consequences of a dilution accident by maintaining a high shutdown margin and administratively controlling the valves capable of contributing to an inadvertent dilution. These actions were:

Whenever either unit was in Modes 3, 4, or 5:

1. The required shutdown margin was increased to a minimum of 1.65% (from 1.0%) when in Mode 5.
2. Normal shutdown operating practice was to maintain charging flow less than 130 gpm. If charging flow was to be maintained at greater than 130 gpm, the shutdown margin was increased to:
 - Mode 4: 1.45%
 - Mode 5: 1.84%
3. Manual valve BR7004 to the primary water system was locked closed.
4. Administrative controls were implemented that required the possible dilution paths be isolated (valves CV8428, CV8435, CV8441, CV8439 locked closed and verified closed and air or electrical power removed from CV111B) before draining the pressurizer level below the bottom of the indicated range while in Mode 5.

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TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

B. DESCRIPTION OF EVENT: (continued)

- Administrative controls were implemented that required the Boron Thermal Regeneration System (BTRS) be isolated prior to draining the pressurizer level below the bottom of the indicated range while in Mode 5, and that the demineralizer water supply valve for the demineralizer flush be locked closed. Also that demineralizer flush operations performed while in Mode 5 only be performed under strict administrative procedure such that additional valves be closed and written verification & independent check be obtained that the valves to the primary water system or demineralized water supply were reshut and locked after flushing operations. (_BR7052, _BR7053, _BR7054, _CV8542)
- Flushing the emergency boration line with primary water was strictly controlled and only when the charging rate was monitored and controlled to less than 130 gpm.
- The outlet valves from the Boric Acid Storage Tanks were verified open after any maintenance activities. (_ABB461)

Since that time, Nuclear Fuel Services (NFS) and Engineering and Nuclear Construction (ENC) have pursued evaluating the operability of the system, and concluded that the generic concerns for the BDPS system are applicable to Byron:

- The assumed ICRR curve does not bound the Byron and Braidwood sites. It was found that the curve from Braidwood Unit 1 Cycle 3 has been the most bounding thus far, and that it will likely remain bounding.
- A sensitivity analysis had not been performed for the Byron and Braidwood sites. Although it has not been possible to provide a quantitative uncertainty for the circuitry at this time, a best estimate of the uncertainty for the doubling setpoint is 30%, thus making the analysis setpoint 2.6.

Through the performance of specialized safety analysis cases, Nuclear Fuel Services (NFS) concluded that BDPS remains OPERABLE in certain conditions. However, the analysis failed to demonstrate operability for all conditions. If all of these conditions are not met, the system is to be considered INOPERABLE. The conditions are:

- The Shutdown Margin must be at least 1300 pcm in Modes 3, 4, and 5.
- All Loop Stop Isolation Valves must be open.
- At least 1 Reactor Coolant Pump must be operating.
- The Source Range Nuclear Instrumentation Count Rate must be at least 10 counts per second.

With the preceding conditions not being met, both trains of BDPS shall be declared inoperable and the appropriate Technical Specification actions taken.

This issue is reportable under Title 10, Code of Federal Regulations, Part 50, Section 73, (a)(2)(v), any 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.

C. CAUSE OF EVENT:

The cause for this event was inadequate safety analysis and subsequent review for the Boron Dilution Protection System.

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TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

C. CAUSE OF EVENT: (continued)

At the time of the original analysis, Westinghouse used the most limiting ICRR available from the industry in the input assumptions to the postulated accidents. However, development of new low leakage loading patterns and neutron source positions have rendered that ICRR non-bounding.

It is not known exactly why an instrument uncertainty analysis was not included in the design of the BDPS setpoint. However, it is believed that the fact that BOPS was not a part of the original design of the plant and that BOPS does not have its own Limiting Condition for Operability in the Byron/Braidwood Technical Specifications contributed to this oversight.

D. SAFETY ANALYSIS:

It has been concluded that BDPS may be incapable of performing its intended safety function in the event of a boron dilution accident under certain plant conditions. However, the safety analysis performed merely failed to demonstrate acceptable performance for all conditions using the present analysis method. After implementing possible improvements to the method of analysis, a wider spectrum of conditions may be acceptable for BDPS operability.

Had certain plant conditions existed where the BDPS system was inoperable and a dilution accident was initiated, two other sources for indication of the decrease in shutdown margin were available to alert the operator. During shutdown conditions, the Source Range indication is broadcast audibly in the control room and containment. Also, the High Flux at shutdown annunciator, which is intended to notify personnel of an inadvertent criticality during fuel load and is set to actuate at an instantaneous indication of 5 times the background countrate, is available in Modes 3 through 6.

Furthermore, the consequences of an unmitigated dilution accident do not pose a substantial safety hazard. Analysis performed by Los Alamos National Laboratory (LANL) for the NRC has concluded that an unmitigated dilution of a PWR in a shutdown Mode would result in a return to power and may result in an increase in reactor coolant system pressure and some fuel damage. LANL further concluded that the return to power transient would be self limiting by virtue of the inherent negative feedback of the reactor. The self limiting return to power would also limit fuel damage and repressurization.

E. CORRECTIVE ACTIONS:

Upon the notification of this concern to Byron, the compensatory actions documented under OSR 92-032 were promptly implemented.

Upon the receipt of the Operability Assessment from NFS specifying the conditions necessary for BDPS operability, Byron Station immediately implemented the following actions:

1. The special Operating Order (SO Unit 1/Unit 2 92-019) was revised to implement the four conditions for operability.
2. The station's Nuclear Regulatory Commission Resident Inspector was notified of this condition.
3. The station made the required Emergency Notification System phone call within the required 4 hours.

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TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]

E. CORRECTIVE ACTIONS: (continued)

Future actions will be necessary to resolve this issue for the long-term. A LER supplement will be issued when the long-term resolution is completed (NTS #454200920320051). A synopsis of the necessary actions may include the following:

1. ENC will quantify the uncertainty of the doubling setpoint that will be used in future analysis. (NTS #4542009203200-01)
2. Byron Station will determine the maximum primary flow rate through flow orifice 1CV17M. The analysis may benefit from a lower flow rate. (NTS #4542009203200-02)
3. NFS will continue the investigation to attempt to demonstrate a wider array of operable conditions. (NTS #4542009203200-03)
4. Consideration will be given to initiating a Technical Specification change that will break BDPS out into its own LCO. This LCO will establish the conditions for operability with the appropriate action statement. (NTS #4542009203200-04)

F. RECURRING EVENTS SEARCH AND ANALYSIS:

a) EVENT SEARCH (DIR, LER)

There have been no previous occurrences of a DVR caused by improper analysis of the BDPS system, although non-conservatism in the analysis of this system have occurred in the past.

b) INDUSTRY SEARCH (OPEX's NPRDS)

NPRDS is not applicable for this event, however, this event was initiated by a discovery at Comanche Peak. The other stations directly affected by the BDPS analysis are Braidwood, Callaway, and Wolf Creek.

OPEX: Plant Status Report (PS)#2607.

c) NWR

Not applicable.

d) ANALYSIS

No trend identified.

G. COMPONENT FAILURE DATA:

<u>MANUFACTURER</u>	<u>NOMENCLATURE</u>	<u>MODEL NUMBER</u>	<u>MFG PART NUMBER</u>
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No equipment failed during this event.

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H. OTHER RELATED DOCUMENTS:

- ENC-QE-40.1, Operability Determination Checklist
- OSR 92-032, Precautionary Measures Taken for BDPS Potential Issue
- OSR 92-089, Review of ENC-QE-40.1 for BDPS Operability

I. EFFECTIVENESS REVIEW:

Not applicable.

J. ADDITIONAL DATA:

- a) Affected Technical Specification: 3/4.3.1.1, Functional Unit 6
- b) Procedures: Not applicable
- c) Cause Code: BD2.6
- d) Equipment Involved: Boron Dilution Protection System of the Source Range Instrumentation
- e) Other: BDPS, Source Range, Westinghouse Analysis