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 AUTH. NAME AUTHOR AFFILIATION
 FULLER, R.E. Washington Public Power Supply System
 BAKER, J.W. Washington Public Power Supply System
 RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 92-041-00: on 921027, determined that past low grid voltage conditions caused offsite power source to be inoperable. Caused by inaccurate procedures. TS procedure have been changed to incorporate offsite power. W/921125 ltr.

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

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November 25, 1992
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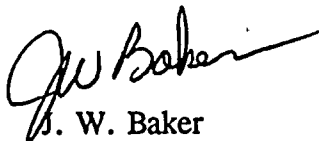
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**SUBJECT: NUCLEAR PLANT WNP-2, OPERATING LICENSE NPF-21
LICENSEE EVENT REPORT NO. 92-041**

Transmitted herewith is Licensee Event Report No. 92-041 for the WNP-2 Plant. This report is submitted in response to the report requirements of 10CFR50.73 and discusses the items of reportability, corrective action taken, and action taken to preclude recurrence.

Sincerely,



J. W. Baker
WNP-2 Plant Manager (Mail Drop 927M)

JWB/REF/lr
Enclosure

cc: Mr. J. B. Martin, NRC - Region V
Mr. W. Ang, NRC Resident Inspector (Mail Drop 901A, 2 Copies)
INPO Records Center - Atlanta, GA
Mr. D. L. Williams, BPA (Mail Drop 399)

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)

Washington Nuclear Plant - Unit 2

DOCKET NUMBER (2)

0 5 0 0 0 3 9 7

PAGE (3)

1 OF 7

TITLE (4)

**PAST LOW 230KV GRID VOLTAGE CONDITIONS CAUSED
THE OFFSITE POWER SOURCE TO BE INOPERABLE MULTIPLE TIMES**

| 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 NUMBERS(S) | |
| 1 | 0 | 2 | 7 | 9 | 2 | 9 | 2 | 0 | 4 | 1 | 0 | 0 |
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OPERATING MODE (9) THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

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| POWER LEVEL (10) | 1 | 0 | 0 | 20.402(b) | 20.405(C) | 50.73(a)(2)(iv) | 77.71(b) |
| | | | | 20.405(a)(1)(i) | 50.36(c)(1) | 50.73(a)(2)(v) | 73.73(c) |
| | | | | 20.405(a)(1)(ii) | 50.36(c)(2) | 50.73(a)(2)(vii) | OTHER (Specify in Abstract below and in Text, NRC Form 366A) |
| | | | | 20.405(a)(1)(iii) | X 50.73(a)(2)(i) | 50.73(a)(2)(viii)(A) | |
| | | | | 20.405(a)(1)(iv) | 50.73(a)(2)(ii) | 50.73(a)(2)(viii)(B) | |
| | | | 20.405(a)(1)(v) | 50.73(a)(2)(iii) | 50.73(a)(2)(x) | | |

LICENSEE CONTACT FOR THIS LER (12)

| | |
|---------------------------------|-----------------------|
| NAME | TELEPHONE NUMBER |
| R.E. Fuller, Licensing Engineer | |
| | AREA CODE |
| | 5 0 9 3 7 7 - 4 1 4 8 |

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

| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NPRDS | CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NPRDS |
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ABSTRACT (16)

On October 27, 1992, a System Engineer determined that, due to past low grid voltage conditions, one offsite power source would have been unable to operate the design basis loads from that source. During specific periods of low voltage conditions, the offsite power source should have been considered inoperable and the appropriate Technical Specification Action Statement (TSAS) entered.

No immediate corrective actions were required because the current offsite grid voltages were well above the minimum acceptable values.

The root causes of the TS violations were inaccurate procedures, equipment limitations, and less than adequate management methods to ensure use of a correct low grid voltage acceptance criteria to determine the availability of the offsite power sources.

The corrective actions taken include changing the surveillance procedure to incorporate the correct minimum acceptable grid voltages and provide continuous monitoring of the offsite power sources. Further corrective actions include formalizing the process for the development of TS surveillance acceptance criteria and installing Control Room alarms for low grid voltage conditions.

The safety significance of this condition is negligible. The probability of design basis conditions occurring coincident with the periods of low grid voltage is extremely low. This condition posed no threat to the health and safety of Plant personnel or the public.

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| LICENSEE EVENT REPORT (LER) TEXT CONTINUATION | | | | | | | | | | | | | | | | | | | |
| FACILITY NAME (1) | | DOCKET NUMBER (2) | | | | | LER NUMBER (8) | | | PAGE (3) | | | | | | | | | |
| Washington Nuclear Plant - Unit 2 | | 0 | 5 | 0 | 0 | 0 | 3 | 9 | 7 | Year | Number | Rev. No. | | | | | | | |
| | | | | | | | | | | 9 | 2 | 0 | 4 | 1 | 0 | 0 | 2 | OF | 7 |
| TITLE (4) | | PAST LOW 230KV GRID VOLTAGE CONDITIONS CAUSED THE OFFSITE POWER SOURCE TO BE INOPERABLE MULTIPLE TIMES | | | | | | | | | | | | | | | | | |

Plant Conditions

Power Level - 100%

Plant Mode - 1 (Power Operation)

Event Description

On October 27, 1992, a System Engineer determined that, due to past low grid voltage conditions, the Startup transformer (TR-S) would have been unable to operate the design basis loads. The unacceptable low voltage conditions occurred three times during 1988 and twice during 1990. During the period of low voltage conditions, TR-S should have been considered inoperable and the appropriate Technical Specification Action Statement (TSAS) entered.

WNP-2 has two independent offsite power circuits. They consist of a 230KV line supplied from the Bonneville Power Administration (BPA) Ashe substation to TR-S and a 115KV line supplied from Benton substation to the WNP-2 backup transformer (TR-B).

During the Electrical Distribution System Functional Inspection (EDSFI) in March 1992, the System Engineer provided the NRC with five years of voltage data for 230KV offsite power source per their request. The NRC reviewed 2 years of the data and identified a minimum low voltage condition of 228KV. This was satisfactory to the inspectors and no further action was required. However, in parallel, the System Engineer independently reviewed the five years of data dating from July 1987 to January 1992. The data indicated one instance when grid voltage had dropped to 226KV while the Plant was shutdown. The minimum acceptable grid voltage at that time was 226.2KV. Since only one offsite power source is required by Technical Specifications (TS), the identified low voltage condition did not represent a TS violation. However, the System Engineer alerted BPA that they could cause WNP-2 to shutdown by allowing the grid voltage to drop below the minimum acceptable value. In August 1992, the degraded voltage relay setpoint calculations were revised. In October 1992, the System Engineer realized that the revised calculations implied the minimum acceptable 230KV grid voltage was 230KV and not 226.2KV. The implication was that the grid voltage had to be above the corresponding degraded voltage relay maximum reset value to assure availability of the offsite source. Based upon the earlier review of the grid voltage history, the System Engineer initiated a Problem Evaluation Request (PER) to document the discrepancy. After initiating the PER, the System Engineer reviewed the grid voltage history again and determined that the 230KV source had dropped below 230KV a total of 23 times between 1987 and 1991. The low voltage conditions occurred during the July and August time frame, when the summer peak loads occur.

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From surveillance data, the System Engineer determined the actual reset values of the degraded voltage relays for the 23 low voltage periods. Out of the 23 low voltage periods, the System Engineer identified five times during Plant operation when two offsite power sources were required to be operable and the supply voltage to TR-S was below the minimum operable voltage. Had the design basis loads sequenced onto TR-S, the degraded voltage relays would have tripped and not reset. This would have resulted in a transfer of the loads to the backup source for Divisions 1 and 2 and the respective diesel-generator (DG) for the High Pressure Core Spray (HPCS) System. The low voltage conditions occurred on July 21, August 23 and August 24, 1988 for 2, 6 and 5 hours, respectively, and August 6 and August 9, 1990 for 2 hours each.

Immediate Corrective Action

No immediate corrective actions were identified. The minimum acceptable grid voltage values for TR-S and TR-B are 230KV and 111.3KV, respectively. The supply voltages to TR-S and TR-B were well above the minimum acceptable values and the season for peak demand had past when the low grid voltage conditions to TR-S were identified as having occurred. Therefore, WNP-2 is currently in compliance with the Technical Specifications (TS).

Further Evaluation and Corrective Action

A. Further Evaluation

1. This event is considered reportable per 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by the Plant's Technical Specifications. The Plant Technical Specification Section 3.8.1.1 requires "As a minimum, the following A.C. electrical power sources shall be OPERABLE: a. Two physically independent circuits between the offsite transmission network and the onsite Class 1E distribution system..."

The current draw from starting the design basis loads could cause the bus voltage to drop below the dropout trip point of the degraded bus voltage relays. A degraded voltage relay trip initiates an 8-second time delay timer. As the sequenced motor accelerates, the voltage will recover. If the bus voltage has not been restored to or above the reset voltage trip point within 8 seconds, which is higher than the dropout trip point, the bus loads are transferred to the alternate supply (TR-B, if available, or Division 1 and 2 DGs, and the Division 3 HPCS DG). The grid voltage to TR-S during the five low voltage periods described above corresponded to bus voltages that would have been below the actual reset voltage value for the degraded bus voltage relays with all design basis loads operating. Therefore, the TR-S offsite power source is considered to have been inoperable during these periods because the degraded voltage relays would not have reset to support design basis loads.

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The TSAS was not entered during any of the above described low voltage periods as required by the TS. The voltage was never measured below 230KV for TR-S during performance of the TS surveillance procedure, PPM 7.4.8.1.1.1.1. Plant personnel were unaware of the low voltage conditions because the TS requires the offsite power sources to be monitored only once per seven days. This is too infrequent to detect the low voltage conditions. There is no other Plant procedure that requires more frequent monitoring of the offsite power sources. Although there is a voltmeter for each offsite source in the Control Room, there is no alarm function provided if it goes below the minimum acceptable value. In addition, the accuracy and resolution of the existing voltmeter does not allow for this measurement.

Prior to June 1991, the acceptance criteria for operability of the offsite power sources in PPM 7.4.8.1.1.1.1 had been inappropriately based on whether the grid was energized or not. Operability of an offsite power source cannot be established without a minimum acceptable voltage criteria. It had been assumed that BPA would maintain the grid voltage at the levels advertised in their annual voltage schedule. This did not occur. This deficiency in prior revisions to the surveillance procedure was first identified during the root cause evaluation of this LER.

In May 1991, a Plant Operations Engineer requested that the System Engineer determine the minimum acceptable grid voltage for TR-S and TR-B for inclusion in the above procedure. Based on an informal evaluation by the Design Engineer, the minimum supply voltage acceptance criteria for operability of TR-S was determined to be 226.2KV. This value inappropriately corresponded to the degraded voltage relay minimum analytical dropout setpoint value. This acceptance criteria was included in the June 1991 revision (Revision 6) of PPM 7.4.8.1.1.1.1.

The degraded voltage relay setpoint calculations were revised in August 1992. The revised calculations changed the dropout setpoints. The Design Engineer reviewed the evaluation for the minimum grid voltage acceptance criteria of 226.2KV. The Design Engineer determined the minimum acceptable grid voltage criteria established in June 1991 was inappropriately based on the degraded voltage relay minimum analytical dropout setpoint value. The relay dropout trip point will normally be reached on a motor start. However, the steady-state bus voltage must return, with all design basis loads operating, to a value higher than the maximum reset trip point to ensure an inadvertent transfer to the alternate source does not occur. Therefore, the minimum acceptable grid voltage should have been based on the degraded voltage relay maximum reset voltage trip point.

2. A preliminary evaluation determined the root causes of the TS violations were: 1) inaccurate procedures, 2) equipment limitations, and 3) less than adequate management methods. With respect to the first root cause, early revisions of the surveillance procedure were inaccurate because they did not contain adequately specified acceptance criteria to detect an inoperable condition of the offsite power sources. For the second root cause, equipment limitations did not allow continuous monitoring of the grid voltage nor was the accuracy and resolution of the instrumentation adequate

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to measure the grid voltage. Therefore, periods of potentially inoperable conditions went undetected between surveillance periods. The third root cause was use of an incorrect and non-conservative minimum acceptable grid voltage value for TR-S in the surveillance procedure. The criteria may have allowed an inoperable condition to be accepted had low voltage conditions been observed. Less than adequate management methods did not provide a formalized process to ensure all acceptance criteria in TS surveillance procedures were based on a referenceable document. The informal evaluation lacked a clear description of the purpose for the evaluation, documentation of the assumptions made in the evaluation, and an independent peer review. Incorporation of one or more of these elements of a formal evaluation could have precluded use of an incorrect and nonconservative acceptance criteria.

3. A review was performed of the instrumentation used in the above TS surveillance procedure to measure the voltage of the respective offsite power sources. The results indicated that the accuracy of the Control Room metering for the 230KV grid is inadequate to assure the operability of the offsite power source.
4. There were no other structures, components, or systems inoperable prior to the event which contributed to the event. In addition, five years of data for the 115KV system were examined and the grid voltage to TR-B was found to have been above the minimum acceptable value when TR-B was considered operable. Also, the data indicated that grid voltage fluctuations to TR-B were not sensitive to seasonal peak demands. Therefore, it is believed that there were no inoperable periods of low voltage conditions to TR-B and no further investigations were performed in this area.

B. Further Corrective Action Taken

1. The TS surveillance procedure PPM 7.4.8.1.1.1.1 has been changed to incorporate the correct acceptance criteria for operability of the two offsite power sources.
2. An agreement has been made between the Supply System and BPA for the appropriate BPA load dispatcher to immediately notify the WNP-2 Control Room if the grid voltage to either TR-S or TR-B goes below the minimum allowable values of 232KV and 112KV, respectively. These values was based upon a 1% accuracy error of the instrumentation used to monitor the grid voltage.
3. The TS surveillance procedure PPM 7.4.8.1.1.1.1 has been changed to require the voltage readings for the offsite power sources be obtained from more accurate voltmeters at BPA.
4. The Engineering Department has implemented a formal process by which responses to Operations requests will be referenceable.

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5. The Technical Specification Improvement Project will review TS surveillance acceptance criteria for a referenceable technical bases. A technical basis will be identified or developed for those criteria identified as having no technical bases.

C. Further Corrective Action

1. The root cause analysis will be completed, and, if there is a significant change in the root causes or corrective actions planned to be taken, a supplemental LER will be submitted by December 27, 1992.
2. Plant procedure PPM 1.5.1, Technical Specification Surveillance Testing Program, will be changed by December 31, 1992 to require a referenceable technical bases for all future new or revised acceptance criteria used in TS surveillance procedures.
3. A microwave alarm system from the Ashe Substation will be installed by June 1, 1993 to provide Control Room annunciation of a low grid voltage condition to TR-S.
4. The Supply System and BPA will develop an agreement on an acceptable voltage schedule to minimize the occurrence of unacceptable low grid voltages.

Safety Significance

There is no safety significance associated with this condition. The backup offsite power source, TR-B, was always available during the low grid voltage periods to TR-S. The TS requires the HPCS DG to be operable when HPCS is required to be operable. Also, TR-S would have still remained available for use if the loads had been transferred to TR-B. Transfer would have occurred as a result of load starting. Once the loads were started, the Reactor Operators could have transferred the loads back to TR-S. In addition, a transfer during the low grid voltage conditions would have only occurred in response to a LOCA, which results in the highest load demand on TR-S. The probability of a LOCA occurring during one of the five low voltage periods is negligibly small. This condition posed no threat to the health and safety of Plant personnel or the public.

Similar Events

LER 85-63 documents a momentary fault on the grid feeding TR-S on December 7, 1985 when TR-S was supplying power to the Class 1E buses. The low grid voltage condition caused primary undervoltage relays on the buses to trip which caused the Division 1 and 2 diesel-generators to automatically start. However, there is a 2 second time delay initiated by the primary undervoltage relay before the transfer to an alternate source is made. Since the fault was momentary, the 2-second timer had not timed out before the voltage was restored and a transfer of the loads to the backup transformer, TR-B, did not occur. This event differs

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from the low grid voltage conditions described above in that TR-S was in standby and was not supplying power to the Class 1E buses. Also, the event described in LER 85-63 involved the primary undervoltage relays as opposed to the degraded voltage relays. In addition, the degraded voltage relays would not have tripped at the low grid voltage conditions under non-LOCA conditions because the bus voltages would have remained above the maximum dropout trip point.

EIIS Information

Text Reference

EIIS Reference

| <u>System</u> | <u>Component</u> |
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Annunciator System
Plant AC Distribution System
Class 1E Power System
(Degraded Voltage and Undervoltage Relay)
High Pressure Core Spray System
Emergency Power For HPCS

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| EA | |
| EB | RLY |
| BG | |
| EK | |