

# ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9012070244 DOC.DATE: 90/11/26 NOTARIZED: NO DOCKET #  
 FACIL:50-397 WPPSS Nuclear Project, Unit 2, Washington Public Powe 05000397  
 AUTH.NAME AUTHOR AFFILIATION  
 POWELL,P.L. Washington Public Power Supply System  
 BAKER,J.W. Washington Public Power Supply System  
 RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 90-024-00:on 900907,voluntary rept of diesel generator.  
 start on undervoltage due to voltage disturbances.

DISTRIBUTION CODE: IE22T COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 6  
 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

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	AEOD/ROAB/DSP	2 2	NRR/DET/ECMB 9H	1 1
	NRR/DET/EMEB 7E	1 1	NRR/DLPQ/LHFB11	1 1
	NRR/DLPQ/LPEB10	1 1	NRR/DOEA/OEAB	1 1
	NRR/DREP/PRPB11	2 2	NRR/DST/SELB 8D	1 1
	NRR/DST/SICB 7E	1 1	NRR/DST/SPLB8D1	1 1
	NRR/DST/SRXB 8E	1 1	<del>REG FILE</del> 02	1 1
	RES/DSIR/EIB	1 1	RGN5 FILE 01	1 1
EXTERNAL:	EG&G BRYCE,J.H	3 3	L ST LOBBY WARD	1 1
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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

P.O. Box 968 • 3000 George Washington Way • Richland, Washington 99352

Docket No. 50-397

November 27, 1990  
G02-90-193

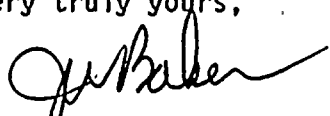
Document Control Desk  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Subject: NUCLEAR PLANT NO. 2  
LICENSEE EVENT REPORT NO. 90-024

Dear Sir:

Transmitted herewith is Licensee Event Report No. 90-024 for the WNP-2 Plant.  
This report is submitted on a voluntary basis.

Very truly yours,

  
J. W. Baker (M/D 927M)  
WNP-2 Plant Manager

JWB:lr

Enclosure:  
Licensee Event Report No. 90-024

cc: Mr. John B. Martin, NRC - Region V  
Mr. C. Sorensen, NRC Resident Inspector (M/D 901A)  
INPO Records Center - Atlanta, GA  
Mr. D. L. Williams, BPA (M/D 399)  
NRC Resident Inspector - walk over copy

## LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 60.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Washington Nuclear Plant - Unit 2										DOCKET NUMBER (2) 0 5 0 0 0 3 9 7 1				PAGE (3) 1 OF 0 5									
TITLE (4) Voluntary Report of Diesel Generator Start on Undervoltage due to Voltage and Frequency Disturbances on 500 KV Electrical Grid																							
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	9	0	7	9	0	0	2	4	0	0	1	1	2	6	9	0	0	5	0	0	0	0	0
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)																					
1		20.402(b)				20.405(c)				50.73(a)(2)(iv)				73.71(b)									
POWER LEVEL (10)		0 9 2				20.405(a)(1)(i)				50.73(a)(2)(v)				73.71(c)									
		20.405(a)(1)(ii)				50.36(c)(1)				50.73(a)(2)(vi)				X OTHER (Specify in Abstract below and in Text, NRC Form 366A)									
		20.405(a)(1)(iii)				50.36(c)(2)				50.73(a)(2)(vii)													
		20.405(a)(1)(iv)				50.73(a)(2)(i)				50.73(a)(2)(viii)(A)													
		20.405(a)(1)(v)				50.73(a)(2)(ii)				50.73(a)(2)(viii)(B)													
		20.405(a)(1)(vi)				50.73(a)(2)(iii)				50.73(a)(2)(ix)				Voluntary									
LICENSEE CONTACT FOR THIS LER (12)																							
NAME P. L. Powell, Lic. Eng.										TELEPHONE NUMBER 5 0 1 9 3 7 7 - 1 2 2 9 1 8													
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																							
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC													
SUPPLEMENTAL REPORT EXPECTED (14)												EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR							
YES (If yes, complete EXPECTED SUBMISSION DATE)												X NO											

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On September 7, 1990 at 1420 hours, one of three WNP-2 Emergency Diesel Generators (the Division 2 Diesel Generator (DG-2)) automatically started on an undervoltage signal due to voltage disturbances on the 500 KV Bonneville Power Authority (BPA) grid. The disturbances were caused by an electrical storm moving through the area. The disturbances were not of sufficient duration and magnitude to cause the Plant to shut down. The cause of the DG-2 start was a combination of equipment loads, voltage and current swings, and resultant motor response on AC Electrical Division 2 that was sufficient for the undervoltage (UV) sensing circuitry for DG-2 to initiate a start signal. DG-2 started as designed, but because Critical Bus SM-8 remained powered from the normal power supply, closing logic was not satisfied and DG-2 did not load to SM-8. Random trips of other Plant equipment occurred but had minimal effect on Plant operations. The cause of the random trips was due to motor contactors dropping out due to the voltage disturbance being accentuated through the stepdown transformers to the various loads. The Plant was restored to the pre-event condition within 30 minutes. No corrective actions are planned.

There is no safety significance associated with this event since Plant systems responded as designed.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

Plant Conditions

Power Level - 92%

Plant Mode - 1 (Power Operation)

Event Description

On September 7, 1990 at 1420 hours, one of three WNP-2 Emergency Diesel Generators (the Division 2 Diesel Generator (DG-2)) automatically started on an undervoltage signal due to voltage and frequency disturbances on the 500 KV grid. At the time a major electrical storm was moving through the Pacific Northwest affecting the Bonneville Power Authority (BPA) system, which was receiving power from WNP-2. BPA records indicate a power surge on the grid occurred at the same time a circuit breaker failed (at a substation 30 miles north of WNP-2, after opening on, and attempting to re-close on, a fault) and a BPA transformer adjacent to the Supply System's Hanford Generating Plant (HGP) caught on fire after apparently being struck by lightning. BPA oscillograph traces from various generators on line at the time of the storm, track the progress of the storm and confirm the disturbances on the grid.

The disturbances on the grid caused the WNP-2 main turbine generator to respond with voltage and current swings, over a 15 second duration, between 22.8 to 26.8 KV and 19 to 39 K amps. The disturbances were not of sufficient duration and/or magnitude to cause a generator trip.

At WNP-2 there are three AC Electrical Divisions each backed by a diesel generator. Each diesel generator will start on a sensed undervoltage condition; however, for this event only the Division 2 diesel generator (DG-2) started. At the time of the event, Division 2 was more heavily loaded than either Division 1 or 3. Specifically, there were two large pumps (Circulating Water pumps CW-P-1B and 1C) on Division 2 power versus no equivalently large loads on Division 1. Division 3 supports the High Pressure Core Spray (HPCS) system and was not heavily loaded at the time of the event. The DG-2 start did cause Standby Service Water Pump SW-P-1B to start.

Other Plant equipment did trip, however, it is believed that these trips were a result of the combination of voltage and current swings and operating equipment response to the disturbances as discussed further. The random equipment trips did not effect Plant response to the event. These trips included Reactor Water Cleanup Pump RWCU-P-1B, Turbine Building ventilation, and Service Building ventilation. No safety-related equipment was tripped.

Immediate Corrective Action

Plant Operators responded by returning DG-2 to standby and returning all systems to pre-event lineup status within 30 minutes.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
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TEXT (If more space is required, use additional NRC Form 366A's) (17)

Further Evaluation and Corrective ActionA. Further Evaluation

1. The event was reported on September 7, 1990 at 1450 hours as an ESF actuation (automatic start of an Emergency Diesel Generator) under 10CFR50.72(b)(2)(ii). However, it was later determined during a review of the Final Safety Analysis Report (FSAR) that a DG start on undervoltage is not an Engineered Safety Feature actuation. However, this LER is being submitted as a voluntary report.
2. There were no structures, systems or components that were inoperable at the start of the event that contributed to the event.
3. The major cause of this event (after the grid disturbances) was that two 5060 hp pumps (Circulating Water pumps CW-P-1B and 1C) were being powered through the X winding of TR-N1, the 25Kv/4160v transformer powering Plant loads from the generator. The UV condition for Division 2 is sensed from Critical Bus SM-8 which is normally powered from the X windings of TR-N1. The X winding provides power to Noncritical Buses SM-2 and 3 and Critical Buses 4 and 8, while the Y winding powers Noncritical Bus SM-1 and Critical Bus SM-7. As stated above, at the time of the event, the majority of large equipment loads was powered from the X winding through various breakers and transformers. When voltage swung low on the grid the winding with the higher load would have a greater voltage drop as the running loads attempted to recover speed following the voltage dip. As a result, it is believed that the large load response magnified the effect of the voltage swings such that an instantaneous undervoltage signal was sensed on SM-8, while SM-7 did not sense the same magnitude of voltage swing and undervoltage. As a result, the UV signal would occur on SM-8 with no corresponding signal on SM-7. The UV signal for DG-3 is sensed from SM-4, also powered from the X winding; however, there is a three-second delay in the starting logic for DG-3 which was not satisfied by the transient condition.

The UV signal also causes load shedding for the associated critical bus so that when the DG does come on line it powers only essential equipment. A DG start will also commence a sequence of equipment starts so that starting currents do not occur at once and overload the DG. In this event, load shedding did not occur because there is a two-second time delay in the shedding initiation logic that was not satisfied. The DG-2 start did cause Standby Service Water Pump SW-P-1B to start to provide cooling water to DG-2 associated heat exchangers.



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TEXT (If more space is required, use additional NRC Form 368A's) (17)

Other random equipment trips occurred; however, it is surmised that the voltage swing on the X winding was further accentuated through transformer losses in the 4160Kv/480Kv transformers fed by the X winding such that voltage drops in the nominal 55% range could have occurred. This would be sufficient to allow ITE motor contactors to begin dropping out and cause random equipment trips. The voltage on these busses is not recorded and the short duration of the transient did not provide measured data to confirm this supposition.

4. The generator monitoring systems were reviewed and no significant deviations were observed that indicate any adverse effect on the generator.
5. Review of Plant systems at the time of the event indicated no other adverse effects due to the transient.

**B. Corrective Actions**

No corrective actions are planned as a result of this event.

**Safety Significance**

There is no safety significance associated with this event. Plant components and systems responded as designed. The DG-2 started on an instantaneous UV signal but did not power the bus as the short duration of the transient and time delays in initiation logic for other Plant systems kept the bus powered from the normal supply. Accordingly, this event posed no threat to the health and safety of the public or Plant personnel.

**Similar Events**

LER 88-013, "NSSS Shutoff Isolations Caused by EPA Breaker Undervoltage Trips Due to Lightning Strikes While Reactor Protection System on Alternate Power". The similarity is due to the lightning strike initiation.



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TEXT (If more space is required, use additional NRC Form 366A's) (17)

EIIS InformationText ReferenceEIIS Reference

System Component

Emergency Diesel Generators  
Division 2 Diesel Generator (DG-2)  
AC Electrical Divisions (Div 1,2, or 3)  
Critical Bus (SM-4,7 & 8)  
Main Turbine Generator  
Service Water System  
High Pressure Core Spray  
Diesel Generator  
Standby Service Water Pump (SW-P-1B)  
Plant AC Distribution System  
Generator Output Power System  
Turbine Building HVAC  
Service Building HVAC  
Reactor Water Cleanup Pump (RWCU-P-1B)  
Circulating Water Pumps (CW-P-1B and 1C)  
Transformer TR-N1

EK --  
EK DG  
EA --  
EB BU  
TA TRB  
KG P  
EK DG  
  
BS P  
EA --  
EL --  
VK --  
UC --  
CE P  
KE P  
EA XFMR