

U.S. NUCLEAR REGULATORY COMMISSION
REGION V

Report No: 50-397/85-09

Docket No: 50-397

Licensee: Washington Public Power Supply System
P. O. Box 968
Richland, Wa. 99352

Facility Name: Washington Nuclear Project No. 2 (WNP-2)

Inspection at: WNP-2 Site near Richland, Washington

Inspection Conducted: January 31-February 15, 1985

Enforcement Conference Conducted: February 28, 1985, Region V Office

Inspectors: *P. H. Johnson* 3/8/85
for A. D. Toth, Senior Resident Inspector Date Signed

P. H. Johnson 3/8/85
for R. S. Waite, Resident Inspector Date Signed

Approved by: *P. H. Johnson* 3/8/85
P. H. Johnson, Chief Date Signed
Reactor Projects Section 3

Summary:

Inspection on January 31-February 15, 1985 (50-397/85-09)

Areas Inspected: Special, unannounced inspection by the resident inspectors of circumstances associated with the reactor scram of January 31, 1985 and reactor protective system activation on February 14. This inspection involved 24 inspection-hours onsite by two resident inspectors.

Results: Four violations were identified in the areas of system operability, procedures adequacy, procedures compliance, and NRC notifications. These will be the subject of separate correspondence.

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ENFORCEMENT CONFERENCE

February 28, 1985

1. Conference Attendees

Washington Public Power Supply System

D. W. Mazur, Managing Director
J. W. Shannon, Director, Power Generation
R. B. Glasscock, Director, Licensing and Assurance
J. D. Martin, WNP-2 Plant Manager
C. M. Powers, Assistant Plant Manager

NRC Region V

J. B. Martin, Regional Administrator
D. F. Kirsch, Director, Division of Reactor Safety and Projects
J. L. Crews, Technical Assistant to Regional Administrator
A. E. Chaffee, Chief, Reactor Projects Branch
A. D. Johnson, Enforcement Officer
P. H. Johnson, Chief, Reactor Projects Section 3
A. D. Toth, Senior Resident Inspector, WNP-2
D. J. Willett, Project Inspector

2. Conference Summary

The enforcement conference convened at 9:00 a.m. in the Region V conference room. Mr. Crews made opening remarks and discussed the purpose of the conference.

Mr. Toth then discussed the events of January 21 and 31 and February 14, 1985, and identified apparent violations of regulatory requirements which were related to the events.

Mr. Kirsch discussed NRC concerns related to the events and the licensee's actions. He and Mr. J. B. Martin also discussed the NRC's perceptions regarding causal factors related to the events and discussed other recent observations of NRC inspections at WNP-2.

Licensee personnel responded as appropriate at various times throughout the meeting. They also gave a presentation on the circumstances of the January 31, 1985 event and identified corrective and preventive measures taken or being taken by the Supply System in response to the events.

Mr. A. D. Johnson discussed the NRC enforcement policy, as provided in 10 CFR 2, Appendix C.

Mr. J. B. Martin presented closing remarks.



INSPECTION DETAILS

1. Persons Contacted

Washington Public Power Supply System

#*C. Powers, Assistant Plant Manager
*J. Martin, Plant Manager
*N. Hancock, Shift Manager
*J. Peters, Plant Administration Manager
*K. Cowan, Plant Technical Manager
*V. Shockley, HP/Chemistry Supervisor
*R. Koenigs, Compliance Engineer
*J. Harmon, Instrumentation Maintenance Supervisor
*J. Massey, Electrical Maintenance Supervisor
*S. Davidson, Plant Engineering Supervisor
*D. Kidder, Mechanical Engineering Supervisor
*D. Feldman, Plant Quality Assurance Manager
M. Wuestefeld, Plant Engineering Supervisor
R. Lemon, System Engineer

* Present at the exit meeting on February 15, 1985.

Present at the exit meeting on February 12, 1985.

The inspectors also interviewed other licensee personnel, including shift managers, control room supervisors, reactor operators, equipment operators, and plant electricians.

2. General

Regional office management personnel (D. Kirsch, A. Chaffee and A. Johnson) were onsite February 11-12 to review the inspection findings and inspect the plant facilities. They attended the exit meeting on February 12.

3. Reactor Scram on January 31, 1985 and Subsequent Activities

The inspectors interviewed personnel and examined records and equipment associated with the inadvertent generator load rejection and reactor scram which occurred at 7:57 a.m. on January 31, 1985. This event was initiated by an apparent inadvertent actuation of a protective relay, which also resulted in failure of the startup transformers to assume the plant electrical loads as designed. For 14 minutes the safeguards buses remained on the 115 KV backup power supply transformer. The emergency diesel generators (DG-1 and DG-2) started, but were not called upon to close onto the safeguard buses. The sequence of events was as follows:

7:57 a.m.	Protective relay no. 86X1U tripped (cause unidentified).
1/31/85	This connected the startup transformer to the 4160 and 6900 volt in-plant electrical buses, and disconnected the main transformer and generator from the off-site

distribution system. (This resulted in a turbine trip and reactor scram).

- 7:57 a.m. For about 4 seconds an abnormal system lineup existed, with the main generator connected to the 230 Kilovolt off-site grid via the unit auxiliary transformer, the inplant 4160 and 6900 volt switchgear, and the startup transformer. During this period, the main generator went into and out of synchronization with the 230 kilovolt grid several times.
- 7:57 a.m. After 4 seconds, the off-site 230 Kilovolt transformer primary circuit breakers tripped, disconnecting the in-plant switchgear from normal off-site power. In-plant switchgear connected the 115 kilovolt backup transformer to the class 1E safeguards buses (SM-7 and SM-8). At this time diesel generators no. 1 and no. 2 started, but were not called upon to auto-connect to the class 1E safeguards buses. The high pressure core spray (HPCS) diesel generator also started and provided power to the HPCS system.
- 7:57 a.m. During the initial transient, power to the process computer was affected, resulting in loss of data and a need to subsequently re-initialize monitoring of several parameters.
- 7:57 a.m. During the initial transient, the high pressure core spray system actuated on low reactor vessel water level and injected coolant to the reactor vessel to control water level. The main steam isolation valves closed. Reactor vessel pressure and level were controlled during the event without difficulty.
- 8:13 a.m. The operations staff reconnected principal 4160 and 6900 volt electrical buses to the startup transformer, except the Division 1 (SM-1) bus, which appeared to have a fault.
- 8:30 a.m.
(approx.) The diesel generator system engineer, who came to the diesel building after hearing the diesels start, noted that the voltage shown on the local panels for diesel generators DG-1 and DG-2 was about 3700 volts rather than the expected 4160 volt (this rendered the two diesel generators incapable of automatic operation, since the output breakers will not close unless generator voltage is greater than 3910 volts). He called the control room and advised a reactor operator. The operator confirmed that the indicated generator voltage was slightly below the green band (3750-4300 volts) on the meters and adjusted the voltage regulator of each of the two diesel-generators until about 4160 volts was shown. The operator did not log this situation or corrective action.

9:01 a.m. After determining that they would not be needed, the operators stopped both diesel generators and placed them in standby mode.

9:06 a.m. The operators secured the high pressure core spray pump.

9:25 a.m.
(approx.) The Shift Manager advised the resident inspector in the control room that the HPCS actuation had not been reported to the NRC Operations Center within one hour as required by 10 CFR 50.72. The inspector stated that the NRC Operations Center should be notified.

9:35 a.m. The operators returned the high pressure core spray system electrical power to the normal power source (bus SM-2) and put the diesel-generator into standby mode.

10:07 a.m. The NRC Operations Center received notification from the Supply System that the HPCS had been actuated at 7:57 a.m.

12:15 p.m. The reactor operator who had corrected the diesel generator voltage output completed his Plant Personnel statement regarding the reactor scram. He made no mention of the diesel generator voltage condition.

9:35 p.m. The Engineering Supervisor approved, via telephone, a priority 1 hand-carried Maintenance Work Request (MWR-AW-6886). This MWR modified the DG-1 and DG-2 voltage regulator controls so that voltage cannot be adjusted unless the diesel generator is operating (and indicating voltage).

10:00 p.m. The Shift Manager approved a Field Change Record originated by the diesel generator system engineer. This change prescribed electric circuit modifications to prevent adjustment of DG-1 and DG-2 output voltage when the diesels are not running. This provided details for work of MWR-AW-6886.

8:00 a.m.
2/1/85 Plant Management approved the Field Change Record for the diesel generator voltage regulator circuit changes.

10:00 a.m. The diesel generator System Engineer recorded completion of work and operability checks for circuit modifications for DG-1 and DG-2.

5:07 p.m. The Shift Manager notified the NRC operations center that the diesel generators had been inoperable due to the 3700 volt condition, since relays will not permit connection of the generators to the safeguards electrical buses unless voltage is at least 3910 volts (94% of normal voltage).

6:43 p.m. The Shift Manager approved Procedure Deviation forms



which assure that voltage regulators are set at 4200 volts following surveillance tests, prior to shutdown of the diesels.

4. Inoperability of Diesel Generators DG-1 and DG-2

Investigation of the low voltage condition observed on DG-1 and DG-2 following the January 31 scram indicated that this condition had apparently existed since January 21, 1985. On that date, a control room licensed reactor operator was asked by a trainee why the diesel generator DG-1 low-limit light was energized at the voltage regulator control in the control room. The operator manipulated the voltage regulator controls for DG-1 and DG-2, apparently without fully understanding the affect of these actions, to check the performance of the indicating lights and found that the light for DG-1 extinguished but would not reenergize. Discussion with the control room supervisor and shift manager led to dispatch of an equipment operator and electrician to check the motor driven potentiometers at the local diesel generator control panels.

The electrician made slight adjustments to the cams which actuate the limit switches for the indicating lights, under the supervision of the equipment operator. The electrician considered the cam configuration to be improper for adjustment in response to the request of the reactor operators, who ran the potentiometer through its range of movement via the control room remote control. The electrician set the limit switches to points deemed acceptable by the control room operators, who left the potentiometer at what they believed was the low limit. These manipulations apparently left the voltage regulators set at or near the low limit such that the diesel generators' output was only 3700 volts when called upon to operate on January 31, 1985.

The electrician advised the control room supervisor of the questionable cams for the limit switch, suggested a maintenance work request for further investigation, and entered this in the electrician's log. The control room supervisor did not initiate a maintenance work request.

The operators and shift management subsequently stated to the NRC inspectors that they did not believe that any of their manipulations could in any way have affected the operability of the diesel generator system. They believed that the voltage regulation system included a feature which automatically resets the voltage to 4160 volts upon starting, as is provided for the HPCS diesel generator. Neither the plant procedures nor training reference material included any instructions, prohibition, or caution associated with manipulations of the voltage regulator controls, nor did these references suggest automatic voltage reset capabilities.

After investigation of the voltage condition observed on January 31, the system engineer and plant management took immediate corrective action. They initiated a Field Change Request and Maintenance Work Request to modify the voltage regulator system such that changes to the voltage setting cannot be made unless the diesel generator is operating (and thus indicating generator voltage at the local and control room panels).

Procedure deviations were also initiated to ensure that the diesel generator voltage settings are left at 4200 volts following routine surveillance tests.

5. NRC Conclusions Regarding Diesel Generator Inoperability

The resident inspectors and regional management personnel examined the results of the licensee's investigation into the January 31, 1985 scram and related events. The NRC representatives also examined pertinent records and equipment and interviewed cognizant licensee personnel. These inspection activities led to the following findings:

a. Inoperable Emergency Electrical System

During the period between January 21 and the reactor scram on January 31, 1985, the voltage regulators for the Class 1E Division I and II diesel generators were set such that the generators were capable of automatically producing only 3700 Volts. As discussed in Section 8.3 of the Final Safety Analysis Report (FSAR), protective relays are set by design such that the generators' circuit breakers will not close onto the safeguards buses (SM-7 and SM-8) unless the generator voltage is at least 3910 Volts (94% of rated). These emergency electrical power sources were thus inoperable, since they were not automatically available and able to perform their safety function of automatic connection to and acceptance of engineered safeguards electrical loads. The plant was operated at above 85% power for the period January 21-31, except for the scram/recovery period January 25-26. The inoperability of the emergency power system appears to be a violation of the technical specifications. (85-09-01).

b. Omission of Procedures/Training for Voltage Regulation

The diesel generator voltage regulator controls allowed adjustment of the generator output voltage setting with the diesel generator not running. Manipulation of a control knob in the control room activated a motor driven rheostat in the remote panel. There was no position indication in the control room, other than a lower limit stop and an upper limit stop. These had been set to correspond to the end-of-range motor cutoff switches on the voltage regulator motors. With the diesel generators not running, there was no voltage indication to reflect the effects of the control knob manipulations.

The plant procedure 2.7.2 Revision 5, for operation of the diesel generators, mentioned that the diesel generators will not connect to the electrical buses if the voltage is less than 97% of rated. However, the procedure did not include any instructions, limitations, precautions, or other criteria relevant to manipulation of the voltage regulator controls. Surveillance procedure 7.4.8.1.1.2.1 Revision 4 (Monthly Operability Test) instructed in the performance of voltage and loading tests, but did not provide for final setting of the voltage or prevent a subsequent change of that setting by manipulation of the control switch.



Examination of the circumstances of the event established that licensed operations personnel did not adequately understand how the DG-1 and DG-2 voltage regulators worked. They incorrectly believed that generator voltage would automatically reset to 4160 volts upon receipt of a start signal, which is the case for the HPCS diesel generator. This incorrect understanding of system operation led to manipulation of voltage regulator controls without adequate preplanning, control, or post-work functional testing. The training manuals, which were based upon plant configuration and procedures, did not include any instructions relative to manipulation of the voltage regulators, and did not suggest any difference in the controls of the HPCS versus the DG-1 and DG-2 systems.

The absence of appropriate instructions and acceptance criteria to assure proper setting and maintenance of the diesel generators voltage levels appears to be a violation of 10 CFR 50 quality assurance criteria regarding the use of appropriate acceptance criteria in procedures (85-09-02).

c. Records of Abnormal Plant Behavior

Following the reactor scram on January 31, the control room operators did not recognize that the diesel generators' output voltage was insufficient to permit the generator breakers to close onto the safeguards buses if required. An operator was made aware of this at about 8:30 a.m. by a telephone call from a system engineer. The operator then observed that the indicated voltage was "slightly below the green band" on the control room indicator, and he then adjusted the voltage regulator to raise the generator voltage. This action was significant, since the relay logic requires a generator output of 3910 volts as a prerequisite for the generator breakers to close onto the safeguards buses. The system operating procedures contained a note that 97% (4035 volts) was necessary in order for the switching to occur.

The operator did not advise the shift manager of the diesel generator undervoltage discrepancy, nor enter it into the control room log, nor identify it on his 12:15 p.m. written personal statement regarding the reactor trip event. The eventual management cognizance of this matter, and the resultant corrective actions, appeared to be due solely to the initiative of the system engineer who recognized the matter. The operator's failure to record this significant event appears contrary to the plant administrative procedures which are intended to assure that significant deficiencies are brought to proper levels of management attention. This is a violation of technical specification administrative requirements (85-09-03).

d. Notification of Degraded Principal Safety Barrier

The existing undervoltage condition was known by a reactor operator at about 8:30 a.m. on January 31, 1985, when he received a telephone call from the responsible system engineer at the diesel engine area. The operator apparently was not at the time conscious of the note in

system operating procedure 2.7.2, which states that the DG#1 (#2) at rated speed and at 97% of rated voltage were permissives which need be met for the diesel generator circuit breaker to "close in and re-energize its respective bus." The condition was apparently known by a shift manager by 10:00 p.m. on January 31, 1985 at the time he approved Field Change Request 85-022, which noted that "The motor operated potentiometer for DG-DEN-1A,1B voltage regulators is always energized which allows the voltage regulator to be adjusted without the diesel running. Then if the diesel is started the output voltage may be outside the allowable limits." The shift manager also may not have been conscious of the system operating procedure note regarding the interlock associated with generator output voltage. Notification to the NRC was not made until 5:07 p.m. on February 1, 1985, more than 33 hours after identification of the deficient conditions to licensed personnel, and more than 19 hours after a licensed SRO should have been aware. This was a violation of the 10 CFR 50.72 4-hour notification rule. (85-09-04).

e. Notification of ECCS Injection

During the January 31 reactor scram event the high pressure core spray system (HPCS) responded, with injection of emergency core cooling water commencing at about 8:00 a.m. At approximately 9:25 a.m., the shift manager advised the resident inspector in the control room that this matter had not yet been reported to NRC. Although the resident inspector advised the licensee to make the report promptly, this matter was not reported to the NRC Emergency Operations Center until 10:07 a.m. This was a violation of the 10 CFR 50.72 1-hour notification rule. (85-09-05).

6. Reactor Scram on February 13

A reactor scram occurred at 3:59 p.m. February 13, 1985. This included water injection from the high pressure core spray system. The event was caused by technician error in the manipulation of valves on instrument lines for sensors of reactor water level. The technician apparently introduced a perturbation into the common reference leg of several water level sensors.

a. Technician Manipulating Reactor Controls During Shutdown

Subsequent to the scram, while the plant was still shut down, an inadvertent actuation of the reactor protection system occurred at 4:20 a.m. on February 14 due to operator error. An instrument technician was performing pre-startup surveillances of average power range monitor (APRM) channel D. Procedure 7.4.3.6.3.4, Step 6 states "Have the Reactor Operator reset the 1/2 scram." This reset would give an acknowledgeable alarm and clear an annunciator, but apparently was not done successfully, since the reactor tripped when the APRM-E surveillance was started.

The operators' log showed that the APRM-D test commenced at 4:01 a.m. and completed at 4:11 a.m. The APRM-E test commenced at 4:14 a.m., followed by a reactor scram at 4:20 a.m. The inspector

interviewed the reactor operator on duty at the time, who stated that when the reactor was in the shutdown mode it was common practice to allow the technicians themselves to reset the scram logic from the main control panel, but that this would not be allowed during power operation. This manipulation of controls by the technician was not consistent with the governing procedure or with management's expectations. The failure of the licensed reactor operator to properly supervise this activity, and his failure to verify the acceptable condition of the plant prior to authorizing commencement of work on the APRM-E, was considered to be another instance of weakness in operator attentiveness, referred to in NRC inspection reports 84-15, 84-31, 84-37, and 85-02. (85-09-06)

b. Notification of Reactor Protective System Activation

The reactor protection system actuation of February 14 occurred at 4:20 a.m. The shift manager did not notify NRC until 8:35 a.m. This was a violation of the 10 CFR 50.72 4-hour notification rule. (85-09-07).

5. Management Meetings

On February 12 the inspector and Region V management representatives met with the assistant plant manager to briefly discuss the inspection findings relating to the diesel generator undervoltage condition. The NRC representatives stated that the inspection findings would be examined further by regional management.

On February 15 the inspector met with the plant manager and members of his staff to discuss the potential enforcement matters described in this report. Attendees at the meeting are noted in paragraph 1. Special topics discussed included:

- a. The inspector stated that operator attentiveness and system procedures adequacy were matters of concern for which the inspectors have not seen effective initiative or corrective action plans and progress, and that dialogue on these matters with NRC regional office management should be anticipated.
- b. In response to the inspector's comments, licensee management stated that:
 - ° With regard to the circumstances of the RPS trip of February 14, it was not management's intent that technicians be allowed to reset reactor protection logic. He stated that practices in this area would be reviewed and necessary policy clarifications issued.
 - ° A need was recognized for improvements in the area of event reportability, and actions would be taken to define management's expectations to the plant staff.
 - ° It was management's perception that the diesel generator inoperability was reported to NRC within a half hour of the



time that the technical support organization made a positive determination of reportability. The inspector clarified his concern that the reportability problem was due to the failure of responsible plant staff to promptly recognize that the diesels were inoperable.

