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ARBUCKLE,J.D. Washington Public Power Supply System
POWERS,C.M. Washington Public Power Supply System
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SUBJECT: LER 89-040-01:on 890919,standby gas treatment sys capability not within license basis consideration.
W/9 ltr.

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

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

Docket No. 50-397

June 19, 1990

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

Subject: NUCLEAR PLANT NO. 2
LICENSEE EVENT REPORT NO. 89-040-01

Dear Sir:

Transmitted herewith is Licensee Event Report No. 89-040-01 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.

Very truly yours,

C M Powers

C. M. Powers (M/D 927M)
WNP-2 Plant Manager

CMP:lr

Enclosure:
Licensee Event Report No. 89-040-01

cc: Mr. John B. Martin, NRC - Region V
Mr. C. J. Bosted, NRC Site (M/D 901A)
INPO Records Center - Atlanta, GA
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NRC FORM 366 (6-89) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104
EXPIRES: 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WTH THIS INFORMATION COLLECTION REQUEST: 50.0 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.

# LICENSEE EVENT REPORT (LER)

| FACILITY NAME (1) | DOCKET NUMBER (2) | PAGE (3) |
|---|---|---|
| Washington Nuclear Plant - Unit 2 | 0 5 0 0 0 3 9 7 | 1 OF 0 8 |

TITLE (4) Standby Gas Treatment System Capability Not Within License Basis Consideration for Secondary Containment Performance Under Certain Conditions Due to Design

| 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 5 0 0 0 |
| 0 9 | 1 9 | 8 9 | 8 9 | 0 4 0 | 0 1 | 0 6 | 1 9 | 9 0 | | 0 5 0 0 0 |

| OPERATING MODE (9) | 1 | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11) | | | |
|---|---|---|---|---|---|
| POWER LEVEL (10) | 1 0 0 | 20.402(b) | 20.405(c) | 50.73(a)(2)(iv) | 73.71(b) |
| | | 20.405(a)(1)(i) | 50.36(c)(1) | 50.73(a)(2)(v) | 73.71(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) | 50.73(a)(2)(i) | 50.73(a)(2)(viii)(A) | |
| | | 20.405(a)(1)(iv) | X 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 |
|---|---|
| | AREA CODE |
| J. D. Arbuckle, Compliance Engineer | 5 0 9 3 7 7 - 2 1 1 5 |

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SUPPLEMENTAL REPORT EXPECTED (14)

☐ YES (If yes, complete EXPECTED SUBMISSION DATE) ☒ NO

EXPECTED SUBMISSION DATE (15): MONTH | DAY | YEAR

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


On September 19, 1989 it was determined by Engineering analysis that under certain meteorological conditions (moderate wind and low temperature), coincident with a DBA LOCA and assumed failure of one train of the Standby Gas Treatment (SGT) system, a situation would be created that is not within the licensing basis consideration for Secondary Containment performance. The Engineering analysis was performed as a further corrective action for LER 88-023.

The WNP-2 FSAR states that the Secondary Containment will be maintained at minimum differential pressure of -0.25" W.G. following a postulated LOCA, and that this differential will be established within two minutes following the accident. Recent analysis, based upon Standby Gas Treatment, Secondary Containment, Standby Service Water and weather modeling, shows that during post-LOCA, or adverse weather, differential pressure of the Secondary Containment may not always meet the FSAR commitments. Certain combinations of post-LOCA single active failures and winter conditions adversely affect Secondary Containment and, as a result, increase Secondary Containment leakage.

On January 8, 1990, as a result of in-depth reviews of calculations pertinent to secondary containment accident performance, a problem with the meteorology data presented in FSAR Amendment 36 was discovered. It was determined that the values for the source term dispersion pattern relative concentration factor, X/Q, were specified incorrectly in FSAR Amendment 36.

As an immediate corrective action, a Justification for Continued Operation (JCO) was performed and concluded that operation of the Plant can continue while final resolution of this issue is achieved. In addition, this situation was reviewed relative to the requirements of 10CFR50.59 and it was determined that it represents an unreviewed safety question. Accordingly, the NRC was formally notified of this determination.

As a further corrective action, a test was run to confirm the leakage value used for the JCO. In addition, Design Basis changes will be evaluated to provide an SGT system that allows for adequate filtering of Secondary Containment for applicable meteorological conditions, and system draw down time, so as to meet 10CFR100 and GDC 19 limits, while taking credit for suppression pool scrubbing as allowed by Standard Review Plan 6.5.5.

This event did not affect the health and safety of either the public or Plant personnel.

## Plant Conditions

Power Level - 100%
Plant Mode - 1 (Power Operation)

## Event Description

On September 19, 1989, it was determined by Engineering analysis that under certain meteorological conditions (moderate wind and low temperature), coincident with a DBA LOCA and assumed failure of one train of the Standby Gas Treatment (SGT) System, a situation would be created that is not within the licensing basis consideration for Secondary Containment performance. The Engineering analysis was performed as a further corrective action for LER 88-023, "Technical Specifiation Violation of Secondary Containment to Outside Differential Pressure Caused by Design due to Programmatic Errors."

The WNP-2 FSAR states that the Secondary Containment will be maintained at minimum differential pressure of -0.25" W.G. following a postulated LOCA, and that this differential will be established within two minutes following the accident. Recent analysis, based upon Standby Gas Treatment, Secondary Containment, Standby Service Water (SSW), and weather modeling, shows that during post-LOCA, or adverse weather, differential pressure of the Secondary Containment may not always meet the FSAR commitments. Certain combinations of post-LOCA single active failures and winter conditions adversely affect Secondary Containment and, as a result, increase Secondary Containment leakage.

The analysis uses the lowest monthly average temperature for January of 12/F in combination with the highest average monthly wind for January of 10.3 mph. On the average, temperature is below 12/F approximately 1.6% of the calendar year, and below 0/F approximately 0.1% of the calendar year. Wind conditions above 10.3 mph will probably provide sufficient dispersion to preclude the need for maintaining the -0.25" differential and; therefore, negates designing the SGT for worst case wind conditions.

Wind increases the demand on the SGT to hold the leeward side and roof of the Reactor Building sufficiently negative while simultaneously increasing the differential pressure and, thus, the inleakage on the windward side of the building. Differen- tial temperature between the inside and outside of the building creates a differential pressure gradient from the bottom to the top of the Secondary Containment due to the density difference of the air inside and outside the building during cold outside conditions. As a result, the lower portion of the building must be held at a high differential pressure (up to -0.75") to assure that a -0.25" differential exists at the building roofline. This overall greater differential pressure proportionally increases building inleakage. The effects of wind and winter temperatures result in the inability to hold the upper portion of the Secondary Containment at a -0.25" differential in cold and mildly windy weather, and lengthens the time required to reach -0.25" differential in warmer and less windy weather.

Analysis shows that the time required to reach the steady state condition is a function of the assumed meteorological conditions at the time of a postulated LOCA, type of single active failure coincident with the LOCA, and the Standby Service Water (SSW) temperature. The transient analysis clearly indicates that the limiting single active failure is the assumed loss of one SGT train. Based upon single train design basis SGT flow and maximum Technical Specification allowable Secondary Containment leakage, the uppermost inside surface areas of the Reactor Building cannot be maintained at a -0.25" W.G. with respect to atmospheric pressure during low temperature and high wind conditions. High SSW water temperature acts to extend the time required to reach a steady state condition, but does not effect the final steady state differential pressure.

With two fans redundantly powered in each train, the SGT is not susceptible to many of the single active failures that have a higher probability of occurrence relative to other events, e.g., failure of an emergency diesel generator to start. If one train does fail to start automatically, remote manual initiation and process monitoring can occur through the control room. A design review of the system to determine the susceptibility of an SGT train to single failure has not been performed. Until that occurs, the likelihood of failure, or what would be necessary to remedy failure susceptibilities, is not known. (Local control is not possible due to the post-LOCA radiation fields that are postulated to be present in the vicinity of the SGT trains.) From a failure analysis perspective, the SGT train design at WNP-2 does have features that provide more reliable operation than are dictated by the minimum design requirements that allow for satisfying single failure criterion by the existence of a redundant train.

Testing conducted during the past calendar year of SGT flow/differential pressure capability, and testing of Secondary Containment integrity show that the SGT is capable of performance beyond design basis requirements, and that the Secondary Containment is significantly more leak-tight than required by Technical Specifications. Actions have been taken over the past twelve months to further tighten the Secondary Containment boundary against leakage, e.g., Reactor Building Exhaust and Outside Air (REA and ROA) isolation valve seals have been replaced and the railroad bay door seals have been adjusted. Reanalysis using documented actual performance values for SGT flow capability and Secondary Containment leakage shows that post-LOCA pressure stabilizes at -0.32" with an outside temperature of 12/F with a coincident 10.3 mph wind, which is well below the required -0.25". However, the -0.25" level is not reached for approximately 3.5 minutes after the accident. Additional margin to the design basis requirements is also available from the actual leakage performance of the Primary Containment. Table 1 outlines the results of analysis based upon licensing basis SGT and Secondary Containment performance followed by reanalysis results based on realistic SGT and Secondary Containment performance.

Table 1 also demonstrates that the plant can be maintained at the required negative pressures (albeit the time is greater than two minutes) with the current leak-tightness of the Secondary Containment and SGT capability at very low winter temperatures, i.e., -8/F with a 10 mph wind, and -23/F without wind. This is obtained provided that the leak-tightness of Secondary Containment and/or the flow capability of SGT do not degrade by more than 5%, a differential of -0.25" can be maintained at 12/F with a 10 mph wind. Requirements for residence time in the SGT charcoal filters is met with at the 5600 cfm flowrate for design basis active and passive failure scenarios.

Provided that the SGT set point pressure is sufficiently negative, the existing SGT pressure control loop instrumentation will assure that the SGT trains operate at 5600 cfm flow as required during all meteorological conditions. Exisitng loop instrumentation controls Secondary Containment pressure during windy conditions up to existing REA or SGT capacity.

Table 1

Parametric Evaluation of Secondary Containment/SGT Performance

| Evaluation Description | Outside Temp (°F) | Wind Speed (mph) | SGT Flow (cfm) | Sec. Cont. Leakage (cfm) | Roof Line Stdy State Pressure ("$H_2O$) | Time To Reach -0.25" (minutes) |
|---|---|---|---|---|---|---|
| Design Basis Performance of SGT and Secondary Containment | 12 | 10.3 | 4460 | 2240 | -0.02 | Never |
| Realistic Secondary Containment Leakage, Design Basis SGT Flow | 12 | 10.3 | 4460 | 1475 | -0.156 | Never |
| Design Basis Sec. Cont. Leakage, Realistic SGT Capability | 12 | 10.3 | 5600 | 2240 | -0.12 | Never |
| Realistic Sec. Containment and Realistic SGT Capability | 12 | 10.3 | 5600 | 1475 | -0.323 | 3.5 |
| Reanalysis For Coldest Temperature Capability | | | | | | |
| Realistic Sec. Containment and Realistic SGT Capability | -23 | 0 | 5600 | 1475 | -0.25 | 10 |
| Realistic Sec. Containment and Realistic SGT Capability | -8 | 10.3 | 5600 | 1475 | -0.25 | 10 |
| Reanalysis With 5% Margin | | | | | | |
| Realistic Sec. Containment and Realistic SGT Capability | 12 | 10.3 | 5320 | 1475 | -0.282 | 4 |
| Realistic Sec. Containment and Realistic SGT Capability | 12 | 10.3 | 5600 | 1549 | -0.295 | 3.6 |

On January 8, 1990, as a result of in-depth reviews of previous calculations pertinent to secondary containment accident performance, a problem with the meteorology data presented in FSAR Amendment 36 was discovered. It was determined that the values for the source term dispersion pattern relative concentration factor, X/Q, were specified incorrectly in FSAR Amendment 36. The error occurred as a result of incorrect input data used when the atmospheric dispersion calculation model was changed to comply with NRC Regulatory Guide 1.145.

A review of the previosly completed JCO was conducted which resulted in the conclusion that, even with the correct X/Q values inserted, both offsite and onsite post accident doses remain below 10CFR100 limits. Although this discovery does not present any new instance of reportability, this information is being provided on a voluntary basis as an update on the WNP2 Secondary Containment Performance problem originally reported in this LER. This information was also made available during a recent presentation made by Sypply System Generation Engineering to the Nuclear Regulatory Commission NRR Branch on January 16, 1990.

Immediate Corrective Action

A Justification for Continued Operation (JCO) was performed for WNP-2. The conclusion of the JCO is that operation of the Plant can continue while final resolution of this issue is achieved.

On January 10, 1990, the previously prepared JCO was revised to include the effects of the corrected X/Q values. The conclusion of this revised JCO remains that the the operation of the Plant can continue while final resolution is achieved.

Further Evaluation and Corrective Action

A. Further Evaluation

1. This event is reportable under 10CFR50.73(a)(2)(ii)(B) as a condition outside of the Plant design basis.

2. The cause of this event is design related in that inadequate design criteria were used by the Architect/Engineer (Burns and Roe, Inc.) to determine SGT draw down time.

3. Current NRC requirements for radiological analysis do not allow SGT credit until a full -0.25" differential pressure is established at all Secondary Containment boundary surfaces. A review of existing radiological anlayses indicates that both the post-LOCA offsite and control room doses will increase as a result of delayed reestablishment (beyond two minutes) of the -0.25" differential. However, reanalysis using current rules (Standard Review Plan 6.5.5) that allow credit for iodine scrubbing within the suppression pool are expected to result in offsite doses equivalent to those outlined by the FSAR assuming a ten minute "no SGT credit" period to reestablish the full -0.25". The current condition of the SGT and Secondary Containment do not meet the FSAR description under all reasonable environmental conditions; however, the resultant doses are within the 10CFR100 and GDC 19 requirements.

4. Although there were no structures, components or systems inoperable prior to the event which contributed to the event, the equipment affected by this problem are SGT system filter trains SGT-FU-1A and SGT-FU-1B.

B. Further Corrective Action

1. This situation was reviewed relative to the requirements of 10CFR50.59 and it was determined that it represents an unreviewed safety question. Accordingly, the NRC was formally notified of this determination.

2. To confirm that the aforementioned actual Secondary Containment leakage value has remained representative of the Plant condition, a test was run on September 26, 1989. The leakage was found to be 1228 cfm; thus, confirming the 1475 cfm value used for the JCO.

3. Design Basis changes will be evaluated to provide an SGT system that allows for adequate filtering of Secondary Containment for applicable meteorological conditions, and system draw down time, so as to meet 10CFR100 and GDC 19 limits, while taking credit for suppression pool scrubbing as allowed by SRP 6.5.5.

4. Current system testing will be maintained to ensure Secondary Containment leakage and SGT flow capabilities are within the JCO analysis.

5. The WNP-2 FSAR will be revised to show the correct X/Q values.

Safety Significance

Given the current state of Secondary Containment integrity, the SGT can provide adequate differential pressure control with an adequate margin applied for variations in Secondary Containment leak-tightness and SGT flow performance. Based upon actual Plant conditions and system performance, the Secondary Containment pressure differential will remain greater than -0.25" during severely cold winter conditions; with temperatures as low as -23/F without wind and -8/F with a coincident 10 mph wind. Although formal calculations have not been prepared, preliminary calculations show that both offsite post accident doses remain well below 10CFR100 limits and, with credit for suppression pool scrubbing, not significantly different than the results now documented in the FSAR.

In light of the X/Q input errors discovered on January 8, 1990, the Unreviewed Safety Question Analysis originally prepared was reviewed and revised. Although the errors in FSAR methodology compound the offsite dose consequences, the study calculations performed to assess the impact of this discovery continue to support the conclusions of the original analysis. The conclusion remains that both the offsite and onsite post accident doses are within the 10CFR100 limits using the correct X/Q values in the atmospheric dispersion model.

## Similar Events

LER 88-023

## EIIS Information

| Text Reference | EIIS Reference System | EIIS Reference Component |
|---|---|---|
| Standby Gas Treatment (SGT) System | BH | --- |
| Secondary Containment | NG | --- |
| Standby Service Water (SSW) | BS | --- |
| Emergency Diesel Generator | EK | GEN |
| Reactor Building Exhaust and Outside Air (REA and ROA) Isolation Valves | VA | ISV |
| SGT-FU-1A and SGT-FU-1B | BH | FLT |