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SUBJECT: LER 89-001-01:on 890112,unanalyzed failure modes for containment nitrogen sys caused by inadequate DP.
W/8 ltr.

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	NSIC MURPHY,G.A	1	1			

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NRC Form 366
(9 83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

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 6

TITLE (4) Unanalyzed Failure Modes for Containment Nitrogen System Caused By Inadequate Design Procedures

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 1	1 2	8 9	8 9	0 0 1	0 1	0 3	2 7	8 9		0 5 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 6 1	20.405(a)(1)(i)	50.36(c)(1)	X 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)	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
W.S. Davison, Compliance Engineer	5 1 0 9 3 7 1 7 1 - 1 2 1 5 1 0 1 1 X 2726

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

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 January 12, 1989, during an engineering evaluation of the Containment Nitrogen Inerting (CN) System, four new unanalyzed failure modes were discovered. These failure modes all have the potential to impact safety related equipment required to attain safe shutdown of the reactor.

A summary of the failure modes is as follows: 1) Failure Mode 1 - Loss of auxiliary steam or pressure control to the "high flow" nitrogen line, 2) Failure Mode 2 - A break in the "low flow" nitrogen line or loss of electric heater on the "low flow" line 3) Failure Mode 3 - A tornado missile causes failure of liquid nitrogen storage tank and/or associated piping 4) Failure Mode 4 - Non-mechanistic rupture of liquid nitrogen storage tank or liquid lines beneath the tank. Failure Modes 1 and 2 involve potential damage to safety related components due to contact with liquid nitrogen and/or low temperatures. Failure Modes 3 and 4 involve the potential for oxygen starvation of all three divisions of emergency diesel generators under certain low probability conditions. Immediate corrective action was to modify procedures to require additional operator coverage and provide specific guidance to ensure correct response to failure mode conditions. The root cause of the event was determined to be inadequate design procedures in effect at the time that this system was originally designed. An engineering review will be completed to determine design changes required to the CN System. This event posed no threat to the health and safety of either the public or Plant personnel.

IE22

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Washington Nuclear Plant - Unit 2	0 5 0 0 0 3 9 7	8 9	— 0 0 1	— 0 1	0 2 OF 0 6

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

Plant Conditions

a) Power Level - 61%
b) Plant Mode - 1 (Power Operation)

Event Description

On January 12, 1989 as a result of an engineering evaluation of the Containment Nitrogen Inerting (CN) system, four new failure modes of this non-safety related system were identified. This condition was discovered during performance of corrective action for the event reported in LER 88-034-00 "Pipe Failure Caused by Introduction of Liquid Nitrogen into the Primary Containment Supply Purge Piping Due to Personnel/Design/Maintenance Problems". An engineering review of the CN System design, being performed to investigate potential failure modes, found four new failure modes which could result in the degradation of safety related equipment as summarized below (see attached diagram Figure 1):

a) Failure Mode 1 - Loss of auxiliary steam or nitrogen pressure control (failure of high N2 flow pressure control valve CN-PCV-6) resulting in liquid nitrogen being introduced into the "high flow" inerting header. This header is not capable of withstanding cryogenic temperatures.

b) Failure Mode 2 - A break in the "low flow" line or loss of electric heater on the "low flow" line when this line is supplied from the bottom of the Liquid Nitrogen Tank CN-TK-1. Again, liquid nitrogen is introduced into piping not designed for cryogenic temperatures.

c) Failure Mode 3 - A tornado missile that causes failure of the exposed CN-TK-1 and associated piping outside the buildings that results in release of large quantities of liquid nitrogen which might starve the emergency diesel generators of oxygen.

d) Failure Mode 4 - Non-mechanistic rupture of the Liquid Nitrogen Storage Tank CN-TK-1 or the liquid lines beneath the tank that might result in oxygen starvation of the emergency diesel generators.

At 1500 hours, these new failure modes were identified as conditions which alone could have prevented the fulfillment of the safety function of the Emergency AC Electrical Power Distribution System. At 1701 hours, the NRC Operations Center was notified via the Emergency Notification System that this condition was reportable under the four hour report requirement of 10CFR50.72(b)(2)(iii).

Immediate Corrective Action

As a result of actions taken during the previous CN System event reported in LER 88-034-00, the system operating procedure had been modified to require an operator to be stationed at the CN System skid whenever high volume containment inerting was being performed. Guidance was given to the operators via night orders that the only duty of this additional operator was to isolate the nitrogen supply line if nitrogen effluent temperature dropped to 30°F. This action was to limit entry of liquid nitrogen into piping not designed for extreme low temperature use in response to Failure Modes 1 and 2.

Additionally, a night order was issued which requires an alarming oxygen monitor to be used whenever taking suction with the Control Room Ventilation system from the remote air intake nearest the CN skid without use of the normal system intakes. This measure was taken to mitigate the effects of possible reduction in oxygen content of control room air due to induction of nitrogen which potentially could be released in large quantity as a result of CN System failure in response to Failure Mode 4.

Further Evaluation and Corrective Action

Further Evaluation

1. This event is being reported as an event or condition which alone could have prevented the fulfillment of the safety function of structures or systems that are needed to : (A) Shut down the reactor an maintain it in a safe shutdown condition per the requirements of 10CFR50.73(a)(2)(V).

2. The root cause of this event was determined to be inadequate design procedures which were in existence at the time that the Containment Nitrogen Inerting System was originally designed. During intial plant construction and startup, the design procedures then in effect did not cause single failure analyses or break pipe analyses to be performed on these types of non-safety related systems. The CN System was not reviewed as a system which supported safety related equipment. Also, at that time, no piping outside the "Power Block" was considered for analysis.

   Based on this root cause, no additional corrective action is necessary. In light of the improvements to the design procedures which have been made since that time, the probability for recurrence has already been significantly minimized. The self-initiated Safety System Functional Inspection being performed by the Supply System Engineering Assurance Group will continue to attempt to discover additional system design deficiencies of a similar nature. Therefore, no additional corrective action is needed to examine other systems.

3. The potential for the four unanalyzed failure modes and the compensatory measures presenting an unreviewed safety question was recognized. An analysis per 10CFR50.59 was completed which concluded that an unreviewed safety question did not exist.

4. There were no structures, components or systems that were inoperable at the start of the event that contributed to the event.

Further Corrective Action

1. An evaluation will be completed to determine the need for design changes to the CN System.

Safety Significance

Any potential for adverse safety consequences as a result of this event occurred during the time between initial startup of the CN System and the time compensatory measures were implemented. If the low probability condition posed by Failure Modes 1 or 2 had occurred during this period in conjuction with a Design Basis Loss of Coolant Accident (itself a low probability event), it is possible that the ability to shut down the reactor and maintain it in a safe shutdown condition could have been compromised. Neither Failure Mode 3 nor Failure Mode 4 represents a credible event which could have occurred during this period. Since the postulated CN System failure modes did not occur, no adverse safety significant consequences actually resulted.

The following is a summary of the safety significance for each postulated failure mode:

- Failure Modes 1 and 2 - Both failure modes potentially could have caused piping breaks within the various rooms in the Diesel Generator and Reactor Buildings through which these lines are routed. Consequently, the safety related equipment in these rooms (primarily emergency diesel generators and related components) could have been exposed to liquid nitrogen resulting in conditions beyond the design capabilities of this equipment. Without compensatory measures applied to avert these failure modes, the resultant impact on safety related equipment could have compromised the ability of the equipment to achieve its design function.

- Failure Mode 3 - A tornado which produces a missile sufficient to topple and/or rupture the CN Liquid Nitrogen Storage Tank and associated piping would include enough wind to provide mixing and dilution to the point that the emergency diesel generators would not be starved for oxygen. The ability of the reactor to achieve safe shutdown is not compromised in this failure mode.

- Failure Mode 4 - In this failure mode, all three emergency diesel generators would be inoperable due to oxygen starvation for a maximum of 137 minutes if absolute calm weather conditions existed. Evaluation shows that sixty seven minutes would be available for operators to initiate alternate nitrogen supply to avert loss of nitrogen to safety related equipment. Testing has demonstrated than actual time available before the nitrogen system losses adequate pressure is 110 minutes. Shifting to an alternate supply would prevent closure of the Inboard Main Steam Isolation Valves (MSIV) and subsequent turbine trip with reactor scram. Under these conditions, a controlled safe shutdown of the reactor is not compromised. This failure mode could only occur if the following combination of conditions existed:

1) a random pipe break in the nitrogen piping system and,

2) absolute calm meterological conditions with the only means of nitrogen dispersal being the diesel generator HVAC system and,

3) no operator action for 67 minutes after event initiation resulting in MSIV closure and turbine trip and,

4) an unrelated loss of offsite electrical power and,

5) failure of the Reactor Core Isolation Cooling (RCIC) System, which provides Station Blackout alternate water injection capability.

The probability of this combination of events occurring to cause this failure mode is very small. With operator action to prevent MSIV closure, this failure mode does not compromise the ability to shutdown the reactor and maintain it in a safe shutdown condition.

This event posed no threat to the health and safety of either the public or Plant personnel.

Similar Events

None

EIIS Information

Text Reference	EIIS Reference	
	System	Component
Containment Nitrogen Inerting System	LK	- - - - -
Emergency AC Electrical Power System	ED	- - - - -
Nitrogen Supply Line	LK	- - - - -
Oxygen Monitor	--	45
CN-PCV-6	LK	PCV
Electric Heater	LK	EHTR
CN-TK-1	LK	TK
MSIV	SB	ISV
Emergency Diesel Generators	ED	DG
Diesel Generator HVAC System	TG	- - - - -
Turbine	SB	TRB
RCIC	BN	- - - - -
Reactor	SB	- - - - -
Control Room Ventilation System	VH	- - - - -

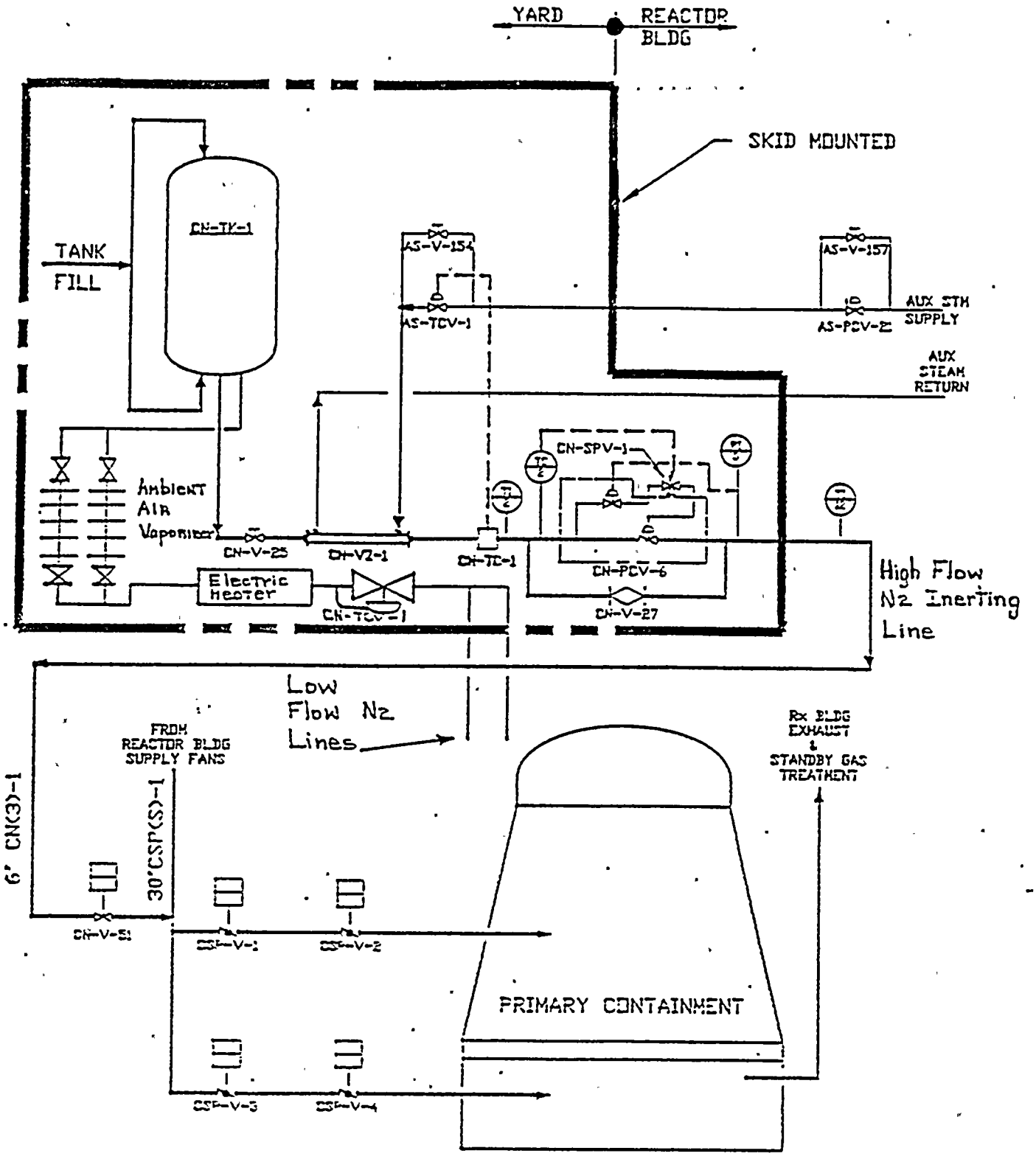

FIGURE 1 CONTAINMENT NITROGEN INERTING

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

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

Docket No. 50-397

March 27, 1989

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

Subject: NUCLEAR PLANT NO. 2
LICENSEE EVENT REPORT NO. 89-001-01

Dear Sir:

Transmitted herewith is Licensee Event Report No. 89-001-01 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 (M/D 927M)
WNP-2 Plant Manager

CMP:lg

Enclosure:
Licensee Event Report No. 89-001-01

cc: Mr. John B. Martin, NRC - Region V
Mr. C.J. Bosted, NRC Site (M/D 901A)
INPO Records Center - Atlanta, GA
Ms. Dottie Sherman, ANI
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IE22
1/1