CP&L

Carolina Power & Light Company

MAR 01 1985

SERIAL: NLS-85-063

Director of Nuclear Reactor Regulation
Attention: Mr. D. B. Vassallo, Chief
Operating Reactors Branch No. 2
Division of Licensing
United States Nuclear Regulatory Commission
Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 & 50-324/LICENSE NOS. DPR-71 & DPR-62
RECOMBINER CAPABILITY REQUIREMENTS

Dear Mr. Vassallo:

This letter responds to the request for additional information regarding compliance of the Brunswick Steam Electric Plant, Unit Nos. 1 and 2 with the intent of Recombiner Capability Requirements contained in Generic Letter 84-09. Detailed response to the two questions raised in the NRC letter of January 15, 1985 are attached.

We feel that the modifications being performed on the instrument air system meet the intent of all three criteria of Generic Letter 84-09 based on the following:

1) Brunswick has technical specifications limiting oxygen content in containment to four percent when the containment is required to be inerted.

2) Nitrogen will be the only pneumatic source within primary containment post DBE.

3) There will be no significant sources of oxygen in containment post DBE other than that resulting from radiolysis of the reactor coolant.

After installation of the Nitrogen Backup System, the Brunswick plant will be in direct compliance with criteria 1 and 2 of Generic Letter 84-09. Based on the BWR Owners' Group study, we feel that this modification will also place the Brunswick plant in compliance with the intent of criteria 3 of Generic Letter 84-09.

We hope that this and the accompanying detailed responses will answer your questions and allow completion of your review.

Should you have further questions, please contact Mr. John S. Dietrich at (919) 836-6154.

Yours very truly,

SR Zimmerman

S. R. Zimmerman
Manager
Nuclear Licensing Section

RWS/ccc (1189RWS)
Attachment

cc: Dr. J. Nelson Grace (NRC-RII)
Mr. D. O. Myers (NRC-BNP)
Mr. M. Grotenhuis (NRC)

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NRC Request No. 1

A detailed description of the planned modifications to the instrument air systems. The proposed post-accident switch-over from the normal air supply to an inert gas supply does not appear to meet the intent of the Generic Letter 84-09. (Provide further justification of this design considering the criteria of Generic Letter 84-09.) Discuss the operating principles of the system (e.g., initiation of switch-over), safety classification and qualification of components. Include consideration of single failure, signal delay, and system response in determining maximum air release.

CP&L Response

The instrument air system will be modified, during the Unit 1 outage beginning in April 1985, to add an environmentally qualified pneumatic supply, called the Nitrogen Backup System, for post accident operation of the automatic depressurization system (ADS) valves and the torus to reactor building vacuum breaker valves. The ADS and vacuum breaker valves are supplied by the Nitrogen Backup System because they are required per design to operate after a Design Basis Event (DBE). Other pneumatic valves required to operate per design after a DBE will be replaced with electrically operated valves during the same outage. This new system will be a subsystem of the existing Instrument Air System. It has been designed as a Q-List, Seismic Class I, safety related system. Essential electrical components installed in the Nitrogen Backup System will be 1-E and will meet the environmental qualification requirements of 10CFR50.49.

The Nitrogen Backup System consists of two (2) redundant, physically separated, nitrogen bottle racks in the reactor building, with capability for long term remote make up from outside the reactor building following an accident. The nitrogen bottles supply a header with pressure reduced via an ASME Class II pressure regulating valve.

Each division of the Nitrogen Backup System is continuously aligned to the corresponding ADS Reactor Non-Interruptible Instrument Air (RNA) header in primary containment, and the torus to reactor building vacuum breakers valves in the reactor building. The Nitrogen Backup System is separated from the RNA system by soft seated check valves and automatically supplies nitrogen to the headers upon loss of instrument air pressure, due to isolation of the RNA drywell supply valves, or a drop below 95 psig during normal operation. Isolation of the RNA drywell supply valves is initiated by a LOCA signal, defined as reactor water low level 3 (+45 inches, decreasing) or low reactor vessel pressure (410 psig, decreasing) in conjunction with high drywell pressure (1.8 psig, increasing).

For either division, when the bottle rack pressure drops below a pre-selected setpoint, a low pressure alarm is initiated in the control room. The alarm setpoint allows sufficient time for operator action to hook up an additional nitrogen source to the remote supply line. The remote supply line is provided to allow long term supply following an accident.

The Nitrogen Backup System has been designed to ensure that no single failure will prevent the system from performing its function. Each train of the Nitrogen Backup System is completely redundant. Redundancy of supply to the ADS valves is maintained by soft seated check valves in the RNA system. The Nitrogen Backup System drywell isolation valves are normally open, fail open, direct acting solenoid valves that have remote manual isolation capability from the control room. The existing motor operated RNA drywell isolation valves are being replaced with normally open, fail closed, direct acting solenoid valves. The LOCA signal that initiates isolation of these valves is tied in with the existing core spray logic. Both RNA drywell isolation valves will isolate if either a Division I or a Division II LOCA signal is generated.

Anticipated signal delay and system response times are considered to be insignificant due to the fact that these times are limited only by the operating times for the isolation logic relays and direct acting solenoid valves that typically require only thousandths or hundredths of a second to operate.

It is our position that this modification will place us in compliance with the intent of Generic Letter 84-09 based on the following:

1) Brunswick has technical specifications limiting the oxygen content in containment to 4% when the containment is required to be inerted.

2) No pneumatic source other than compressed nitrogen will be used for post DBE actuation of valves located within primary containment.

3) There are no credible sources contributing significant amounts of oxygen to primary containment post DBE other than that resulting from radiolysis of the reactor coolant. The amount of air contained in the RNA system inside containment after it is isolated post DBE, and the leakage past the RNA drywell isolation valves has been examined and found to be negligible. A discussion of our findings is contained in the accompanying response to NRC Request No. 2.

NRC Request No. 2

Provide a discussion of all potential oxygen/air sources within the containment. Especially address the ADS-MSIV accumulators and provide justification if a source is found negligible. Also provide values of volume of air/oxygen available, increase of O_2 concentration if released to the containment, etc., for all sources.

CP&L Response

The only potential Post DBE oxygen/air source within containment is the air in the Reactor Non-Interruptible Instrument Air System (RNA) downstream of the RNA drywell isolation valves. (The Reactor Non-Interruptible Instrument Air System includes the ADS and MSIV accumulators.) After installation of the Nitrogen Backup System, the RNA system will be isolated from primary containment post DBE, and pneumatic loads that are required to operate post DBE will be supplied by the Nitrogen Backup System.

This design will limit possible post DBE injection of air into primary containment, to the air that exists in the RNA piping at the time of isolation and any air that leaks by the RNA drywell isolation valves.

In determining the significance of the aforementioned oxygen sources, the following assumptions were made:

1. Uniform mixing of injected air with primary containment atmosphere.

2. Ideal gas behavior.

3. Inleakage past the two soft seated RNA drywell isolation valves is rated at 18 cc/hr each at 125 psig pressure differential. This is a conservative assumption since the RNA design pressure is only 125 psig and the higher primary containment pressure post DBE would tend to decrease leakage past these valves.

4. Total volume of air in the primary containment RNA piping is assumed to be released. This assumption is conservative since outleakage from the piping will only occur until RNA pressure equals primary containment atmospheric pressure.

5. Initial pressure of the RNA piping is 125 psig, the maximum rated pressure of the RNA system.

6. Initial percent oxygen in the drywell is assumed to be 4%, the drywell tech. spec. limit. This is a conservative assumption because Brunswick has tech. spec. limits of 4% oxygen in primary containment and operational procedures maintain oxygen percentages below 4% during normal operation.

7. The primary containment atmosphere is assumed to initially contain 289,000 cubic feet of gas at 125°F and 1.0 psig.

8. Air contained in the primary containment RNA system was assumed to be at 125 psig. This is a conservative assumption since 125 psig is the maximum RNA system pressure.

9. Air inleakage contains 21% oxygen.

10. Air in the RNA system undergoes an isothermal expansion.

11. Drywell pressure increase due to RNA release is negligible.

The volume of the primary containment RNA system was calculated as 53.2 $ft.^3$ (see Tables 1 and 2) at 125 psig or 473.4 cubic feet of air at 1.0 psig. Assuming total leakage of air from the RNA system in primary containment to the primary containment atmosphere and 4% initial oxygen content, the final oxygen percentage would be 4.03%.

Oxygen inleakage past the RNA drywell isolation valves is 18 cc/hr per valve or 36 cc/hr total for both valves. Based on this leakage, and initial release of the primary containment RNA system inventory, it would take 766.9 days for the percentage of oxygen in primary containment to reach 4.04%. Due to the 5% oxygen limit given in Regulatory Guide 1.7, the RNA system's contribution to oxygen in primary containment is considered to be negligible.

TABLE 1

INTERNAL VOLUME OF PIPE AND TUBING

2" Pipe	514'6" ft x 0.02050 ft^2 = 10.55 ft^3
1 1/2" Pipe	30'3" ft x 0.01225 ft^2 = 0.371 ft^3
1" Pipe	25'6" ft x 0.00499 ft^2 = 0.127 ft^3
3/4" Pipe	36 ft x 0.00300 ft^2 = 0.108 ft^3
1" Tube	571 ft x 0.00413 ft^2 = 2.358 ft^3
3/4" Tube	712 ft x 0.00219 ft^2 = 1.559 ft^3
1/2" Tube	380 ft x 0.00080 ft^2 = 0.304 ft^3

TOTAL VOLUME OF PIPE AND TUBING 15.377 ft^3

(1189RWS/ccc)

TABLE 2

INTERNAL VOLUME OF VALVE ACTUATORS/ACCUMULATORS

1-CAC-X18 A thru J (10 Valves) (Actuator Outer Dimensions 20" Long x 4" Dia.)	
Actuator Volume 0.145 ft^3 x 10 Valves =	1.450 ft^3
1-B32-V17, V14 and V19 (3 Valves)	
Actuator Volume 0.066 ft^3 x 3 Valves =	0.198 ft^3
1-RCC-V54 (1 Valve)	
Actuator Volume =	0.159 ft^3
1-RCC-FV654 thru FV661 (8 Valves)	
Actuator Volume 0.065 ft^3 x 8 Valves =	0.52 ft^3
1-RCC-V185 (1 Valve)	
Actuator Volume =	0.011 ft^3
Accumulator Volume =	0.765 ft^3
1-B21-F022 A thru D (4 Valves)	
Actuator Volume 0.182 ft^3 x 4 Valves =	0.728 ft^3
Accumulator Volume 7.993 ft^3 x 4 Valves =	31.972 ft^3
1-B21-F013 A thru L (11 Valves)	
Actuator Volume 0.014 ft^3 x 11 Valves =	0.154 ft^3
Accumulator Volume 0.157 ft^3 x 11 Valves =	1.727 ft^3
1-B21-F003 and F004 (2 Valves)	
Actuator Volume 0.066 ft^3 x 2 Valves =	0.132 ft^3
Total Volume of Accumulators and Actuators	37.816 ft^3
Total Volume of Pipe and Tube	15.377 ft^3
Total Volume of Non-Interruptible Air System Inside Primary Containment	53.193 ft^3
Non-Interruptible Air System Internal Volume Inside Primary Containment =	53.2 ft^3

(1189RWS/ccc)

Volume of Expanded Air When System Pressure is Decreased from Design Pressure to 1.0 psig

$$\frac{V_2}{V_2} = \frac{P_2}{P_1}$$

$$V_2 = \frac{V_1 P_1}{P_2}$$

$$V_2 = \frac{53.2\ ft^3\ (125\ psig + 14.7\ psig)}{(14.7\ psig + 1.0\ psig)}$$

$$V_2 = 473.4\ ft^3$$