CP&L

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United States Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 & 50-324/LICENSE NOS. DPR-71 & DPR-62
LLRT OF ISOLATION VALVES IN THE NON-LOCA DIRECTION

Gentlemen:

On October 17, 1985, the NRC issued Inspection Report 85-31 for the Brunswick Steam Electric Plant Unit Nos. 1 and 2 regarding inspections performed on September 9 - 13 and September 23 - 26, 1985. During the course of these inspections, the Appendix J Type C test procedures were reviewed to determine which valves were tested in the reverse (non-LOCA) direction. As a result of the inspection, Carolina Power & Light Company committed to submit a report to the NRR which would include justification and evaluation of testing isolation valves in the reverse direction. This report was submitted on August 13, 1987.

The NRC Staff is currently reviewing this report and requested the Company to update the information to reflect the current plant testing configuration. In a letter dated November 16, 1989, CP&L committed to provide an updated report by January 26, 1990. The revised report, superseding our submittal of August 13, 1987, is attached.

Please refer any questions regarding this submittal to Mr. M. R. Oates at (919) 546-6063.

Yours very truly,

A. B Cutter

ABC/MAT

Enclosure

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LOCAL LEAK RATE TESTING OF VALVES IN THE NON-LOCA DIRECTION

The requirements for local leak rate testing of containment isolation valves are located in 10 CFR 50, Appendix J. Appendix J states, in part, "the pressure shall be applied in the same direction as that when the valve would be required to perform it's safety function, unless it can be determined that the results from the tests for a pressure applied in a different direction will provide equivalent or more conservative results." The Brunswick plant was designed prior to the current Appendix J criteria, thus, manual test block valves and test connections are not always available for testing with pressure applied from the containment direction. This report evaluates local leak rate testing at Brunswick and justifies the local leak rate testing of certain valves with pressure applied from the non-LOCA direction.

There are a total of 27 valves on Brunswick-1 and 24 valves on Brunswick-2 that are local leak rate tested for 10 CFR 50, Appendix J requirements with test pressure applied to the valve in a direction which is not the same as would be exerted during post-LOCA containment pressurization. The following table summarizes the types of valves and testing conditions involved. The table in Attachment 1 summarizes the sizes and locations of the valves being reverse tested at Brunswick.

Valve Type	Brunswick-1	Brunswick-2
Gate Valve	9	8
Globe Valve (pressure applied below the seat)	8	8
Globe Valve (pressure applied above the seat)	2	0
Solenoid Valves	2	2
Butterfly Valves	6	6
Total	27	24

Gate Valves

The following table specifies the gate valves which are currently being tested by reverse direction LLRT at Brunswick. In this table, and subsequent tables,

valves which apply only to one unit are indicated with a unit designation. Valves with no unit designation are common to both units.

B21-F016* (Unit 1)	E51-F007* (Unit 1)
B32-V22	E51-F066 (Unit 2)
E11-F009	G16-F003
E11-F022	G16-F019
E41-F002*	G31-F001* (Unit 1)
E41-F079 (Unit 2)	

* These valves will be tested in the LOCA direction after modifications to be performed during Reload 7 for Brunswick-1 and Reload 9 for Brunswick-2.

These valves incorporate a wedge-shaped disk which seats on both seating surfaces simultaneously. For motor-operated valves, the valve actuator exerts a closing thrust which is many times greater than that placed on the valve as a result of the containment test pressure of 49 psig. The following table summarizes the closing thrust to test pressure ratios:

Valve	Size	Closing Thrust (lbs)	Test Pressure (lbs)	Ratio
B21-F016	3"	4691	332	14.1
B32-V22	3/4"	1246	26	47.9
E11-F009	20"	41760	10797.3	3.87
E41-F002	10"	27266	3204.4	8.5
E41-F079	2"	1605	164.6	9.75
E51-F007	3"	4626	332	13.9
E51-F066	2"	1605	164.6	9.75
G31-FC01	6"	14079	1356.9	10.4

As shown above, the minimum ratio of stem closing thrust versus disk force applied by the test pressure is 3.87. Thus, due to the wedge design of the gate disk and the fact that the actuator exerts a force several times greater than that exerted on the disk by test pressure, two seating surfaces are maintained regardless of the direction in which the test pressure is applied.

For valves G16-F003 and G16-F019, a piping section was located which can be removed for installation of a test flange to allow testing from the LOCA direction. Action items have been established to revise the local leak rate testing procedure to implement testing in this new manner during the 1990 Reload 7 outage on Brunswick-1 and the 1991 Reload 9 outage on Brunswick-2.

Also, valves B21-F016, E51-F007, and G31-F001 will be replaced on Brunswick-1 in the upcoming 1990 Reload 7 outage. In conjunction with the valve replacement, test connections are being added to allow testing from the containment direction. These modifications were completed for Brunswick-2 during the current Reload 8 outage. Test connections will also be added to valve E41-F002 during the 1990 Reload 7 outage on Brunswick-1 and the 1991 Reload 9 outage on Brunswick-2.

Valve E11-F022 and t associated piping is no longer used. The valve has been de-energized and s under clearance in the closed position. The pipe still penetrates the containment wall (E11-F022 is in the drywell), but the pipe has been disconnected from the reactor coolant pressure boundary and has a blind flange downstream of the valve. The valve must still be tested because it contains gaskets or packing which are potential leak paths into the pipe. Since the system is never used and the valve is not stroked, leakage through this path is not likely. The system will also be subject to Integrated Leak Rate Testing. Thus, the likelihood for leakage is small and present testing should be adequate to preclude future leakage. Also, a recommendation is currently being reviewed to remove the valve and associated piping and cap the drywell penetration.

The only remaining leakage path to be addressed for the gate valves is through the packing. Normally, the containment side disk of the gate should prevent the packing from being exposed to accident pressure. Under post-accident conditions, the valve packing will only be challenged in the unlikely event that the disk closest to containment is not leak tight and the disk furthest from containment is leak tight. The following three categories address this potential.

Category A: Valves located inside containment.

B21-F016 (Unit 1)	E41-F002
E11-F009	E51-F007 (Unit 1)
E11-F022	G31-F001 (Unit 1)

Any leakage from the system to atmosphere through the packing would remain inside containment. Leakage from containment into the system through the packing would not bypass the valve since the only case in which the packing is not tested during LLRT is when the outboard seating surface is leak tight.

Category B: Recirculation Pump Seal Valve

B32-V22

This valve is located on a 3/4 inch line which connects to the reactor recirculation pump seals and is pressurized in excess of 1000 psig while at power. The stem is only 3/8 inch and, thus, a severe packing leak would create only a very small leakage path. The valve is located on the 20 foot elevation which is the entrance level to the building. As such, packing leakage would readily be evident to operations personnel during shift plant inspections.

Category C: HPCI/RCIC Turbine Exhaust Vacuum Breaker Lines

E41-F079 (Unit 2)	E51-F066 (Unit 2)

These are the first valves off the torus. No platform exists to access these penetrations inside the torus for testing. They are normally open and isolated from steam flow from the turbines by double check valves. Thus, they

are normally exposed only to torus atmosphere and typically only stroked for quarterly testing. As such, packing wear should be minimal. In addition, the valves have historically exhibited satisfactory results during integrated leak rate testing.

Globe Valves (tested from beneath the seat)

The following globe valves are currently being tested by reverse direction LLRT and with test pressure applied beneath the seat:

B21-F022A	B32-F019
B21-F022B	B32-V30
B21-F022C	E11-F027A
B21-F022D	E11-F027B

Testing these globe valves from the non-LOCA direction is more conservative because the test pressure attempts to lift the disc from its seat rather than compress it into the seat. Therefore, leakage measured during testing is likely of greater magnitude than that which would occur during a LOCA. However, testing from beneath the seat isolates the packing from test pressure. Further justification for any packing leakage is provided below.

The following globe valves are inside the drywell:

B21-F022A	B21-F022D
B21-F022B	B32-F019
B21-F022C	

Any packing leakage would remain inside the primary containment. Therefore, the LLRT, as presently performed, verifies the integrity of the possible containment leak paths for these valves.

Two valves are located on the torus spray header:

E11-F027A	E11-F027B

The spray header contains multiple nozzles, as such, these valves cannot be tested in the LOCA direction. The packing has exhibited satisfactory results during integrated leak rate testing. The valves are only stroked for testing and the packing is isolated from the RHR system by the disk when the RHR system is used. Thus, severe packing failure is unlikely.

The remaining globe valve is a recirculation pump seal valve located on the seal injection line to the recirculation pump:

B32-V30

The valve is located on a 3/4 inch line which connect to the reactor recirculation pump seals and is pressurized in excess of 1000 psig while at

power. The stem is only 5/8 inch and, thus, a severe packing leak would create only a very small leakage path. The valve is located on the 20 foot elevation which is the entrance level to the building. As such, packing leakage would readily be evident to operations personnel during shift plant inspections.

Globe Valves (tested from above the seat)

E41-F079 (Unit 1) E51-F066 (Unit 1)

These globe valves are pressurized from above the disk during the local leak rate test. Although test pressure does not tend to unseat the disc, the test does verify the disc-to-seat seal and the valve packing. As such, testing in this manner is preferred for this application. These valves are on the HPCI/RCIC turbine exhaust vacuum breaker lines. The configuration of the vacuum breaker lines is such that they tie into the turbine exhaust lines between the torus penetration and the containment isolation valves for the exhaust lines and for RHR drain lines. The exhaust lines and RHR drain lines' containment isolation valves are also leak tested with water per ASME Section XI criteria. Thus, leakage past the referenced valve seats will be bound by the second valve on the vacuum breaker line as well as the containment isolation valves on the turbine exhaust and RHR drain lines. Therefore, at least three barriers exist for LOCA pressure at the vacuum breaker line. Hence, packing integrity of these valves is of more consequence than leakage past the valve seat. The LLRT, as presently performed, does verify packing integrity and is the most appropriate test for this application.

Solenoid Valves

RNA-SV-5261 RNA-SV-5262

These are non-interruptible instrument air supply containment isolation valves to the drywell. Testing from the containment direction would involve using the entire instrument air system inside the drywell as a test boundary. Such a test is impractical. These valves have a one piece seal welded bonnet and thus have no leakage paths around the stems. Valve stroking occurs electrically through the bonnet. The only leakage path which exists is by the seat. However, these solenoid valves have a plug type disk which is designed for 125 psig in the post-accident direction (i.e. under seat). Peak accident pressure is only 49 psig. The current LLRT verifies the leak integrity of the seat.

Butterfly Valves

CAC-V5	CAC-V9
CAC-V6	CAC-V16
CAC-V7	CAC-V17

These butterfly valves have an offset disc-stem arrangement which places the packing on the opposite side of the seating surface from that which LOCA pressure would apply. Therefore, the packing is verified by the LLRT each refueling outage. Since these butterfly valves are bi-directional, seal leakage can be tested from either direction.

Attachment 1
Summary of Valves
Tested in the Non-LOCA Direction

Valve	Size	Location
B21-F016	3"	Main Steam Line Drain Inboard Isolation Valve
B21-F022A	24"	Inboard MSIV
B21-F022B	24"	Inboard MSIV
B21-F022C	24"	Inboard MSIV
B21-F022D	24"	Inboard MSIV
B32-F019	3/4"	Recirculation Sample Line Inboard Isolation Valve
B32-V22	3/4"	Recirculation Pump A Seal Injection Valve
B32-V30	3/4"	Recirculation Pump B Seal Injection Valve
CAC-V5	20"	Suppression Pool Nitrogen Inlet Valve
CAC-V6	18"	Drywell Nitrogen Inlet Valve
CAC-V7	20"	Inboard Suppression Pool Purge Exhaust Valve
CAC-V9	18"	Inboard Drywell Purge Exhaust Valve
CAC-V16	20"	Reactor Building to Suppression Pool Vacuum Breaker Valve
CAC-V17	20"	Reactor Building to Suppression Pool Vacuum Breaker Valve
E11-F009	20"	RHR Shutdown Cooling Inboard Suction Throttle Valve
E11-F022	4"	RHR Reactor Vessel Head Spray Inboard Isolation Valve
E11-F027A	6"	RHR Suppression Pool Spray Isolation Valve
E11-F027B	6"	RHR Suppression Pool Spray Isolation Valve
E41-F002	10"	HPCI Steam Supply Inboard Isolation Valve
E41-F079	2"	HICI Turbine Exhaust Vacuum Breaker Valve
E51-F007	3"	RCIC Steam Supply Inboard Isolation Valve
E51-F066	2"	RCIC Turbine Exhaust Vacuum Breaker Valve

Attachment 1
Summary of Valves
Tested in the Non-LOCA Direction

Valve	Size	Location
G16-F003	3"	Drywell Floor Drain Inboard Isolation Valve
G16-F019	3"	Drywell Equipment Drain Inboard Isolation Valve
G31-F001	6"	RWCU Inlet Inboard Isolation Valve
RNA-SV-5261	2"	Non Interruptible Reactor Instrument Air Isolation Valve
RNA-SV-5262	2"	Non Interruptible Reactor Instrument Air Isolation Valve