VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

February 22, 2001

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

Serial No.	01-076
NL&OS/ETS	R1'
Docket Nos.	50-280
	50-281
License Nos.	DPR-32
	DPR-37

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
PROPOSED TECHNICAL SPECIFICATION CHANGES
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
REACTIVITY CONTROLS – RETURN OF ISOLATED RCS LOOPS TO SERVICE

In a December 12, 2000 letter (Serial No. 00-624), Virginia Electric and Power Company (Dominion) requested changes to the Technical Specifications (TS) to accommodate a vacuum-assisted fill technique for backfilling isolated loops from the active volume of the Reactor Coolant System. In a February 1, 2001 telephone conference call, the NRC staff requested additional information regarding reactivity controls and overpressure protection during the loop backfill evolution. The attachment to this letter provides the response to the NRC request.

If you have any further questions or require additional information, please contact us.

Very truly yours,

William R. Matthews
Vice President - Nuclear Operations

Attachment

Commitments made in this letter: None

A001

cc: U.S. Nuclear Regulatory Commission
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Mr. R. A. Musser
NRC Senior Resident Inspector
Surry Power Station

Commissioner
Bureau of Radiological Health
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COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by William R. Matthews, who is Vice President - Nuclear Operations, of Virginia Electric and Power Company. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that Company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 22nd day of February, 2001.

My Commission Expires: 3-31-04.

Maggie McGuire
Notary Public

(SEAL)

Attachment

Additional Information to Support the Proposed Technical Specification Change for RCS Loop Backfill

Surry Power Station
Units 1 and 2
Virginia Electric and Power Company
(Dominion)

Surry Power Station
Request for Additional Information
Proposed Technical Specification RCS Loop Backfill

NRC Question

The TS as proposed allows indefinite running of the RC pump seal injection (~5 gpm) prior to opening the cold leg isolation valves. If seal injection is run for an extended period prior to opening the isolation valves, can seal injection fill the isolated loop?

If seal injection fills the isolated loop, what is to prevent overpressurization?

What pressure could be expected in the isolated portion of the loop?

Would the differential pressure interfere with opening the loop stop valve?

Response

Filling an entire isolated RCS loop with seal injection is considered highly unlikely because of the large available volume and the low seal injection rate. It would take multiple shifts (on the order of 30 hours) of unattended seal injection to fill the entire loop. Since the loop backfill is a controlled evolution that is expected to occur within one shift, unmonitored seal injection over an extended duration is not considered credible. Therefore, the most credible scenario is for the loop stop valves to be opened well before seal injection could fill a loop.

The purpose of establishing seal injection is to perform a vacuum-assisted loop backfill. Therefore, the next most likely overflow path for excess seal injection would be to the vacuum assist device itself.

The cold leg stop valve bypass line is a 2" line that allows mixing of the fluid of an isolated loop with the active portion of the RCS prior to returning an isolated and filled loop to service. This line is opened prior to initiating the backfill evolution and establishing seal injection. The major hydraulic resistance in the line is a flow element rated at 1000 inches H_2O (about 36 psid) for 200 gpm of flow. So in the unlikely event that the loop fills and seal injection relief occurs through this bypass line instead of the vacuum assist device, for 15 gpm of seal injection, the differential pressure between the loop and active portion of the RCS would not be expected to exceed 1 psi.

There is an additional relief path. The loop stop valves are comprised of the following major sections: the valve body, the stem and gate assembly, the bonnet and stuffing box assembly, the yoke, and the valve operator. The valve body is made of 316 stainless steel and has two major auxiliary penetrations. One of the penetrations is used for a 0.75-inch relief line penetration. The 0.75-inch relief line connects the cavity between the valve discs and piping on the reactor side of the valve. If pressure in an isolated loop increases, the increased force causes the loop side disc to move inward, passing coolant to the cavity between the discs. The other penetration is used for the two-inch bypass line, discussed previously.

Both relief lines pass the coolant to the reactor side, where overpressure protection is available. Therefore, while pressurization of an isolated loop by seal injection is not considered credible for reasons discussed above, a conservative upper limit of the achievable loop pressure is the reactor coolant system pressure plus a negligible differential pressure (<1 psi) across the relief line. The reactor coolant system is protected from overpressure by a low temperature overpressure protection system. The nominal relief setpoint for the condition applicable here is 390 psig.

The loop stop valves are designed to stroke with up to 200 psi of differential pressure across the valve. Because of the relief line operation, pressurization of the isolated loop side of the valve to a pressure high enough to interfere with valve operation via a small seal injection flow is not possible.

NRC Question

Page 3 of the TS submittal states "Additionally, conservatively bounding analyses demonstrate that the reactivity effects of temperature differences between the isolated loop and non-isolated portions of the RCS will not result in a significant reactivity insertion." Please provide the analysis or identify the reference where it can be located.

Response

The analysis of reactivity addition due to temperature differential was performed to support the RCS loop backfill Technical Specifications submitted in December 1992 (Reference: Letter Serial No. 92-672, dated December 11, 1992). However, only a statement of conclusion was provided. Details of the analysis were not given. These details are provided below.

A bounding analysis was performed, based on following conservative assumptions:

- A maximum temperature differential between the isolated loop and active portion of the RCS was assumed. The RCS temperature was assumed to be 200°F (the maximum allowable for the cold shutdown condition) and the isolated loop temperature was assumed to be 50°F (bounding low).
- The initial core K_{eff} was assumed to be 0.99, the maximum allowable value for the cold shutdown condition.
- No mixing was assumed between the residual heat removal flow and the flow from the isolated loop. In other words, the flow from the isolated loop was assumed to enter the core as a slug.
- End-of-operating-cycle conditions were assumed, consistent with the largest negative moderator temperature coefficient at cold shutdown conditions. This is the least likely time in life for isolated loop restoration. If a forced cold shutdown outage were to occur at or near end of core life, the most likely decision would be to proceed with refueling.

Even with these conservative assumptions, the assessment results showed that criticality would not occur following a loop startup. More than one half of the available subcriticality margin of 1.0 % $\Delta k/k$ is retained.