VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

February 27, 1995

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555

Serial No.	95-036
NA&F/WMO-CGL	R2'
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
CORE UPRATE - ELECTRICAL ENGINEERING BRANCH
REQUEST FOR ADDITIONAL INFORMATION

The Surry Core Uprate Technical Specification change request was submitted for NRC review by an August 30, 1994 letter (Serial No. 94-509). Following telephone conference calls with the NRC, on December 2, 1994 we received a request for additional information from the Electrical Engineering Branch (EELB) of NRR regarding our core uprate submittal. Specifically, the questions address the reanalysis of the Loss of Reactor Coolant Flow Incident included in the Surry Core Uprate Licensing Report. The questions and our responses are documented in Attachment 1.

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

Very truly yours,

James P. O'Hanlon

James P. O'Hanlon
Senior Vice President - Nuclear

Attachment 1- Responses to EELB Request for Additional Information - Surry Power Station Units 1 and 2 - Proposed Technical Specification Changes to Accommodate Core Uprating

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ATTACHMENT 1

Responses to
EELB Request for Additional Information -
Surry Power Station Units 1 and 2 -
Proposed Technical Specification Changes
to Accommodate Core Uprating

NRC COMMENT

Loss of Reactor Coolant Flow Incident

A loss of reactor coolant flow incident can result from a mechanical or electrical failure in a reactor coolant pump or from an interruption in the power supply to these pumps. If the reactor is at power at the time of the incident, the immediate effect is a rapid increase in coolant temperature. This increase could result in DNB with subsequent fuel damage if the reactor is not tripped promptly.

The protection implemented for the loss of coolant flow incident, as documented in Section 14.2.9.1 of the Surry Power Stations (SPS) Updated Final Safety Evaluation Report (UFSAR), include the following reactor trip circuits:

1. Low voltage or frequency on the reactor coolant pump power supply busses.
2. Reactor coolant pump power supply circuit breaker opening.
3. Low reactor coolant flow.

To accommodate core uprating, the protection implemented for the loss of coolant flow incident was revised, as documented in Section 3.5.6 of the Surry Core Uprate Licensing Report transmitted by letter dated August 30, 1994, to include the following reactor trip circuits:

1. Low reactor coolant flow.
2. Reactor coolant pump motor circuit breaker opening.
3. Low voltage on pump power supply busses.
4. Low frequency on pump power supply busses (opens RCP supply breakers).

   Of these, only the low reactor coolant flow reactor trip is assumed in the analysis. The low frequency and low voltage signals are not credited for reactor protection, but are assumed to trip the reactor coolant pumps at the appropriate setpoints.

In addition, the licensee documented, on page 2.3-7 of the Surry Power Station Proposed Technical Specification Changes (also transmitted by letter dated August 30, l994), that the low flow reactor trip protects the core against DNB in the event of a sudden loss of power to one or more reactor coolant pumps. The accident analysis conservatively ignores the undervoltage and underfrequency reactor trips and assumes reactor protection is provided by the low flow reactor trip. The undervoltage and underfrequency reactor trips are retained as back-up protection.

Based on the above information and telephone discussions with the licensee on November 1, 1994, the staff understood the following:

1. The original circuitry design for reactor trip on low voltage, low frequency, opening of the reactor coolant pump motor circuit breaker, and low reactor coolant flow meets the IEEE-279 criteria and thus the single failure criterion. The design will continue to meet these requirements following core uprating. Technical Specification requirements for the design will also continue in force.

2. New circuitry will be added as part of core uprating to trip reactor coolant pumps on detection of undervoltage on the reactor coolant busses.

3. Existing circuitry for tripping the reactor coolant pumps on underfrequency, new circuitry for tripping the reactor coolant pumps on undervoltage, and the reactor coolant pump breakers will meet IEEE-279 criteria and thus the single failure criterion.

REQUEST FOR ADDITIONAL INFORMATION

1. **Confirm the above staff understanding.**

2. **Provide a documented commitment that the circuitry design for tripping the reactor coolant pump breakers and the reactor coolant pumps meet IEEE-279 requirements and thus the single failure criterion.**

3. **Provide a description and analysis of the circuit design for tripping the reactor coolant pump power supply breakers on underfrequency and undervoltage which demonstrates compliance with the requirements of IEEE-279.**

4. **Describe how reactor coolant pump power supply breakers meet IEEE-279 requirements.**

5. **Provide proposed technical specification requirements for underfrequency and undervoltage sensing devices and trip of reactor coolant pump breakers.**

6. **Describe from where the energy will be derived and how it will be delivered to the reactor coolant pumps to assure forced reactor flow as shown for the first 5 seconds on Figure 3.5.6-1 of Attachment 3, Surry Power Station Surry Core Uprate Licensing Report, transmitted by letter dated August 30, 1994.**

RESPONSE

The following information is presented in response to the request for additional information (RAI) regarding the reanalysis of the Loss of Reactor Coolant Flow Incident for core uprating:

RAI Item 1

The staff understanding reflected in the above comments is not correct. The following clarification is provided.

The existing Loss of Reactor Coolant Flow analysis of record does not credit the undervoltage (UV) or underfrequency (UF) reactor trips for reactor protection. Prior Loss of Reactor Coolant Flow Incident analyses had assumed reactor trip due to UV or UF signals. These trips will occur prior to a low flow signal trip in the accident sequence for a UV/UF event. Although the UV and UF reactor trip circuits do not fully meet IEEE-279, a recent review concluded that the UV/UF reactor trips as installed meet the existing (and original) licensing basis. The licensing basis is defined by the responses to NRC Questions 7.1 and 7.2 associated with the original Surry FSAR review addressing the reactor protection system and the subsequent NRC's Safety Evaluation Report (SER) for Surry, issued on February 23, 1971. The NRC's SER addressed this subject in Section 3.2.4.1 and indicated that no deficiencies were observed. Nonetheless, we conservatively chose to reanalyze the Loss of Reactor Coolant Flow Incident crediting only the low flow reactor trip signal for reactor protection. This reactor trip circuit is fully IEEE-279 qualified. No physical changes to the plant (hardware, instrumentation, setpoints, etc.) are involved in the change of this analysis assumption, since only the assumed reactor trip in the Loss of Reactor Coolant Flow Incident accident analysis is being changed. Crediting the low flow reactor trip versus the UV/UF-generated trips produces a more limiting accident scenario, but the acceptance criteria continue to be met.

With regard to the reactor coolant pump (RCP) breaker trip, no change has been made in the revised analysis assumptions from those of the existing (and original) licensing basis. Although not shown on UFSAR Figure 7.2-3, the existing (and original) system design produces an individual RCP trip directly from an UV signal on its respective bus. This is not included in UFSAR Figure 7.2-3 because the figure is devoted to the reactor protection system, not RCP trips. Additionally, all three RCPs trip on an UF signal from 2 out of 3 busses. A UF trip signal will be generated following an UV condition (as the pump slows to approximately 95% of initial speed) and serves as a diverse RCP breaker trip signal for an UV condition on all three busses. Additionally, the station service supply and feeder breakers will trip on an UV signal, isolating the RCPs from the station service bus loads.

For the UV case, first a direct pump trip on UV would be expected, and secondly, as 2 out of 3 pumps slowed to approximately 95% speed, a direct trip of all RCPs would be generated by the associated UF signal. (Refer to RAI Item 6 and Response.)

In conclusion, no physical changes are being made to the plant with regard to the revised Loss of Reactor Coolant Flow Incident analysis. The change in the assumption of UV/UF reactor trip initiation to the low flow reactor trip initiation for Loss of Reactor Coolant Flow Incident protection is conservative and results in a more limiting accident scenario from an analysis perspective.

RAI Items 2 through 4

As described in the above response to RAI Item 1, the manner in which the existing (and original) system design meets the requirements of IEEE-279 was approved in the NRC SER issued for Surry on February 23, 1971. Furthermore, no physical changes are proposed or required for the revised accident analysis assumption.

Items 2 through 4 relate to aspects of the existing (and original) design which remain unaffected by the proposed uprating. As stated in Section 2.3 (page 25) of the Surry Core Uprate Licensing Report, this license amendment request employs the principle that uprating impact is verified for compliance with respect to existing plant licensing basis. This is the approach outlined in WCAP-10263, "A Review Plan for Uprating the Licensed Power of a Pressurized Water Reactor Power Plant," January 1983, which was applied in the North Anna core uprating. Therefore, RAI Items 2 through 4 have not been evaluated beyond the standards used in the existing licensing basis.

RAI Item 5

As previously stated, no physical changes are being made to the plant as a result of the revised Loss of Reactor Coolant Flow Incident analysis. Based on the current plant configuration, Surry Technical Specification Table 3.7-1 Items 10, 13, and 14 identify the operating conditions for the low flow, UF, and UV reactor trips, respectively. The UV/UF inputs to the RCP trips are not included in the Surry Technical Specifications, nor are they included in Standard Technical Specifications. Therefore, they were not included in the proposed Technical Specification revision for Surry core uprate.

RAI Item 6

Westinghouse Technical Bulletin NSD-TB-92-03 describes a "back EMF"-related inherent time delay associated with instantaneous UV on the RCP electrical supply bus. In particular, for an instantaneous loss of voltage, the "back EMF" from the untripped RCPs will hold bus voltage above the UV setpoint for some period of time.

We have determined that the RCPs will provide 98% flow for bus voltages as low as the UV trip setpoint. Therefore, for the analysis, reactor coolant system flow is assumed to take a prompt drop to 98% flow prior to the UV trip. Five seconds is selected to bound the time that the bus voltage would remain above the UV trip setpoint (~70% voltage) and, therefore, account for any flow degradation from the onset of the UV condition until the UV trip.

In summary, the five seconds of powered RCP operation, as shown on Figure 3.5.6-1 of the Surry Core Uprate Licensing Report, is used to accommodate the "back-EMF" phenomenon described in Westinghouse Technical Bulletin NSD-TB-92-03. For the UV cases, the "back-EMF" phenomenon is accommodated by an initial prompt drop in flow to 98% nominal. The time of RCP trip following the drop was examined in several sensitivities and found to be limiting at longer time values. Five seconds was selected as the upper bound on the UV condition prior to RCP trip.