TABLE 2.2-1

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

| FUNCTIONAL UNIT | TRIP SETPOINT | ALLOWABLE VALUES |
|---|---|---|
| 1. Manual Reactor Trip | Not Applicable | Not Applicable |
| 2. Power Range, Neutron Flux | Low Setpoint - ≤25% of RATED THERMAL POWER | Low Setpoint - ≤26% of RATED THERMAL POWER |
| | High Setpoint- ≤109% of RATED THERMAL POWER | High Setpoint - ≤110% of RATED THERMAL POWER |
| 3. Power Range, Neutron Flux, High Positive Rate | ≤5% of RATED THERMAL POWER with a time constant ≥2 seconds | ≤5.5% of RATED THERMAL POWER with a time constant ≥2 seconds |
| 4. Power Range, Neutron Flux, High Negative Rate | ≤5% of RATED THERMAL POWER with a time constant ≥2 seconds | ≤5.5% of RATED THERMAL POWER with a time constant ≥ 2 seconds |
| 5. Intermediate Range, Neutron Flux | $\leq 4 \times 10^{-4}$ amps | $\leq 5 \times 10^{-4}$ amps |
| 6. Source Range, Neutron Flux | $\leq 10^{5}$ counts per second | $\leq 1.3 \times 10^{5}$ counts per second |
| 7. Overtemperature ΔT | See Note 1 | See Note 3 |
| 8. Overpower ΔT | See Note 2 | See Note 3 |
| 9. Pressurizer Pressure-Low | ≥1870 psig | ≥1860 psig |
| 10. Pressurizer Pressure-High | ≤2385 psig | ≤2395 psig |
| 11. Pressurizer Water Level-High | ≤92% of instrument span | ≤93% of instrument span |
| 12. Loss of Flow | ≥90% of design flow per loop* | ≥89% of design flow per loop* |

*Design flow is 95,000 gpm per loop.



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The Power Range Negative Rate trip provides protection to ensure that the minimum DNBR is maintained above 1.30 for multiple control rod drop accidents. The analysis of a single control rod drop accident indicates a return to full power may be initiated by the automatic control system in response to a continued full power turbine load demand or by the negative moderator temperature feedback. This transient will not result in a DNBR of less than 1.30, therefore single rod drop protection is not required.

Intermediate and Source Range, Nuclear Flux

The Intermediate and Source Range, Nuclear Flux trips provide reactor core protection during reactor startup. These trips provide redundant protection to the low setpoint trip of the Power Range, Neutron Flux channels. The Source Range Channels will initiate a reactor trip at about $10^5$ counts per second unless manually blocked when P-6 becomes active. The Intermediate Range Channels will initiate a reactor trip at a current level of $4 \times 10^{-4}$ amps unless manually blocked when P-10 becomes active. No credit was taken for operation of the trips associated with either the Intermediate or Source Range Channels in the accident analyses; however, their functional capability at the specified trip settings is required by this specification to enhance the overall reliability of the Reactor Protection System.

Overtemperature ΔT

The Overtemperature ΔT trip provides core protection to prevent DNB for all combinations of pressure, power, coolant temperature, and axial power distribution, provided that the transient is slow with respect to piping transit delays from the core to the temperature detectors (about 4 seconds), and pressure is within the range between the High and Low Pressure reactor trips. This setpoint includes corrections for changes in density and heat capacity of water with temperature and dynamic compensation for piping delays from the core to the loop temperature detectors. With normal axial power distribution, this reactor trip limit is always below the core safety limit as shown in Figure 2.1-1. If axial peaks are greater than design, as indicated by the difference between top and bottom power range nuclear detectors, the reactor trip is automatically reduced according to the notations in Table 2.2-1.

ATTACHMENT 2

TABLE 2.2-1

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

| FUNCTIONAL UNIT | TRIP SETPOINT | ALLOWABLE VALUES |
|---|---|---|
| 1. Manual Reactor Trip | Not Applicable | Not Applicable |
| 2. Power Range, Neutron Flux | Low Setpoint - ≤25% of RATED THERMAL POWER | Low Setpoint - ≤26% of RATED THERMAL POWER |
| | High Setpoint- ≤109% of RATED THERMAL POWER | High Setpoint - ≤110% of RATED THERMAL POWER |
| 3. Power Range, Neutron Flux, High Positive Rate | ≤5% of RATED THERMAL POWER with a time constant ≥2 seconds | ≤5.5% of RATED THERMAL POWER with a time constant ≥2 seconds |
| 4. Power Range, Neutron Flux, High Negative Rate | ≤5% of RATED THERMAL POWER with a time constant ≥2 seconds | ≤5.5% of RATED THERMAL POWER with a time constant ≥ 2 seconds |
| 5. Intermediate Range, Neutron Flux | $\leq 4 \times 10^{-4}$ amps | $\leq 5 \times 10^{-4}$ amps |
| 6. Source Range, Neutron Flux | $\leq 10^{5}$ counts per second | $\leq 1.3 \times 10^{5}$ counts per second |
| 7. Overtemperature ΔT | See Note 1 | See Note 3 |
| 8. Overpower ΔT | See Note 2 | See Note 3 |
| 9. Pressurizer Pressure-Low | ≥1870 psig | ≥1860 psig |
| 10. Pressurizer Pressure-High | ≤2385 psig | ≤2395 psig |
| 11. Pressurizer Water Level-High | ≤92% of instrument span | ≤93% of instrument span |
| 12. Loss of Flow | ≥90% of design flow per loop* | ≥89% of design flow per loop* |

*Design flow is 92,800 gpm per loop.

Intermediate and Source Range, Nuclear Flux

The Intermediate and Source Range, Nuclear Flux Trips provide reactor core protection during reactor startup. These trips provide redundant protection to the low setpoint trip of the Power Range, Neutron Flux channels. The Source Range Channels will initiate a reactor trip at about $10^5$ counts per second unless manually blocked when P-6 becomes active. The Intermediate Range Channels will initiate a reactor trip at a current level of $4 \times 10^{-4}$ amps unless manually blocked when P-10 becomes active. No credit was taken for operation of the trips associated with either the Intermediate or Source Range Channels in the accident analyses; however, their functional capability at the specified trip settings is required by this specification to enhance the overall reliability of the Reactor Protection System.

Overtemperature Delta T

The Overtemperature Delta T trip provides core protection to prevent DNB for all combinations of pressure, power, coolant temperature, and axial power distribution, provided that the transient is slow with respect to piping transit delays from the core to the temperature detectors (about 4 seconds), and pressure is within the range between the High and Low Pressure reactor trips. This setpoint includes corrections for changes in density and heat capacity of water with temperature and dynamic compensation for piping delays from the core to the loop temperature detectors. With normal axial power distribution, this reactor trip limit is always below the core safety limit as shown in Figure 2.1-1. If axial peaks are greater than design, as indicated by the difference between top and bottom power range nuclear detectors, the reactor trip is automatically reduced according to the notations in Table 2.2-1.

Operation with a reactor coolant loop out of service below the 3 loop P-8 setpoint does not require reactor protection system setpoint modification because the P-8 setpoint and associated trip will prevent DNB during 2 loop operation exclusive of the Overtemperature Delta T setpoint. Two loop operation above the 3 loop P-8 setpoint is permissible after resetting the K1, K2 and K3 inputs to the Overtemperature Delta T channels and raising the P-8 setpoint to its 2 loop value. In this mode of operation, the P-8 interlock and trip functions as a High Neuron Flux trip at the reduced power level.

ATTACHMENT 3

# SAFETY EVALUATION OF FIXED CURRENT SETPOINTS FOR THE NORTH ANNA INTERMEDIATE RANGE FLUX TRIPS

The intermediate range (IR) high flux trip setpoints are defined in the current North Anna Technical Specifications in terms of a current equivalent to a specified percentage of rated thermal power. The current must be set by periodically calibrating the detectors against alternate measurements. Because the IR detectors are located outside the core, the IR signal has been shown historically to be sensitive to the core loading pattern in use. For example, the long-lived "low-leakage" core designs now used by Vepco give a different IR detector response than do the more traditional types of pattern represented by the initial North Anna core. In addition, the IR detector response is also sensitive to the core axial flux distribution, and can therefore be influenced by such variables as varying core burnup and control rod position.

As a result of this variability in detector response, an inordinate amount of attention has been payed by the operating staff to maintaining these channels in proper calibration. Therefore, Vepco has performed a review which justifies establishing a fixed-current setpoint of 0.40 milliamperes for all IR high flux trips (2 channels per unit). This change can be implemented with no adverse impact on plant safety analyses or any significant degradation in the redundancy and reliability of the reactor protection system. This conclusion is based on the following observations:

1. None of the accident analyses performed in the UFSAR assume operation of the IR high flux trips. The IR trips only provide backup protection to several other trips (e.g. high

positive flux rate or power range high flux (low setpoint).

2. A detailed evaluation of historical calibration data for these channels has shown that upon implementation of fixed current setpoints, the variability in detector response is such that the effective IR trip setpoints will be at most a few percentage points above the power-range low setpoint trip value assumed in the accident analyses in the UFSAR.
3. Sensitivity studies performed by Vepco with the RETRAN computer code have shown that the results of analyses of low-power reactivity excursion transients such as rod withdrawal from subcritical or rod ejection are insensitive to variations in high flux trip setpoint. As a result, the variability in the effective IR trip setpoint resulting from the proposed change will have no significant impact on the effectiveness of the IR trips to provide backup core protection against reactivity addition events.

In conclusion, the proposed change to the IR flux trip setpoints will not introduce an unreviewed safety question as defined in 10CFR 50.59 since:

1. No new potential accident types are introduced.
2. The severity of the accidents analyzed in the FSAR is not increased.
3. No reductions in plant safety margins result.