ATTACHMENT 1

Proposed Technical Specification Changes

ΔT and Overtemperature ΔT trip settings shall be reduced by the equivalent of 2% power for ever 1% quadrant to average power tilt.

C. Inoperable Control Rods

1. A control rod assembly shall be considered inoperable if the assembly cannot be moved by the drive mechanism or the assembly remains misaligned from its group step demand position by more than ±24 steps during the "Thermal Soak" period, as defined in Section 3.12.E.1.b, or ±12 steps otherwise during power operation. No tolerance limit is required in the shutdown modes, but a rod shall be considered inoperable if the rod position indicators do not verify rod movement upon demand. Additionally, a full-length control rod shall be considered inoperable if its rod drop time is greater than 2.4 seconds to dashpot entry.
2. No more than one inoperable control rod assembly shall be permitted when the reactor is critical.
3. If more than one control rod assembly in a given bank is out of service because of a single failure external to the individual rod drive mechanism, (i.e. programming circuitry), the provisions of Specifications 3.12.C.1 and 3.12.C.2 shall not apply and the reactor may remain critical for a period not to exceed two hours provided immediate attention is directed toward making the necessary repairs. In the event the affected assemblies cannot be returned to service within this specified period, the reactor will be brought to hot shutdown conditions.
4. The provisions of Specifications 3.12.C.1 and 3.12.C.2 shall not apply during physics tests in which the assemblies are intentionally misaligned.
5. Power operation may continue with one rod inoperable provided that within one hour either:
   a. the rod is no longer inoperable as defined in Specification 3.12.C.1, or

5. If power has been reduced in accordance with Specification 3.12.C.5.b, power may be increased above 75% power provided that:
   a) an analysis has been performed to determine the hot channel factors and the resulting allowable power level based on the limits of Specification 3.12.B.1, and
   b) an evaluation of the effects of operating at the increased power level on the accident analyses of Table 3.12-1 has been completed.

D. Core Quadrant Power Balance:

1. If the reactor is operating above 75% of rated power with one excore nuclear channel out of service, the core quadrant power balance shall be determined:
   a. Once per day, and
   b. After a change in power level greater than 10% or more than 30 inches of control rod motion.
2. The core quadrant power balance shall be determined by one of the following methods:
   a. Movable detectors (at least two per quadrant)
   b. Core exit thermocouples (at least four per quadrant)

E. Rod Position Indicator Channels

1. Rod Position Indication shall be provided as follows:
   a. Above 50% power, the rod position indication system shall be operable and capable of determining the control rod positions to within ±12 steps of their respective group step demand counter indications.
   b. Between 0% and 50% power, the rod position indication system shall be operable and capable of determining the control rod positions to within ±24 steps of their respective group step demand counter indications for a maximum of one hour out of twenty-four, and to within ±12 steps otherwise. During the one-hour "Thermal Soak" period, the step demand counters shall be operable and capable of determining the group demand positions to within ±2 steps.

c. In hot, intermediate and cold shutdown conditions, the step demand counters shall be operable and capable of determining the group demand positions to within ±2 steps. At least two rod position indicators per group shall be available to verify rod movement upon demand.

2. If a rod position indicator channel is out of service, then:

a. For operation above 50% of rated power, the position of the RCC shall be checked indirectly using the movable incore detectors at least once per 8 hours and immediately after any motion of the non-indicating rod exceeding 24 steps, or

b. Reduce Power to less than 50% of rated power within 8 hours. During operations below 50% of rated power, no special monitoring is required.

3. If more than one rod position (RPI) indicator channel per group or two RPI channels per bank are operable, then the requirements of Specification 3.0.1 will be followed.

Basis

The reactivity control concept assumed for operation is that reactivity changes accompanying changes in reactor power are compensated by control rod assembly motion. Reactivity changes associated with xenon, samarium, fuel depletion, and large changes in reactor coolant temperature (operating temperature to cold shutdown) are compensated for by changes in the soluble boron concentration. During power operation, the shutdown groups are fully withdrawn and control of power is by the control groups. A reactor trip occurring during power operation will place the reactor into the hot shutdown condition. The control rod assembly insertion limits provide for achieving hot shutdown by reactor trip at any time, assuming the highest worth control rod assembly remains fully withdrawn, with sufficient margins to meet the assumptions used in the accident analysis. In addition, they provide a limit in service, the effects of malpositioned control rod assemblies are observable from nuclear and process information displayed in the Main Control Room and by core thermocouples and in-core movable detectors. Below 50% power, no special monitoring is required for malpositioned control rod assemblies with inoperable rod position indicators because, even with an unnoticed complete assembly misalignment (full length control rod assembly 12 feet out of alignment with its bank), operation at 50% steady state power does not result in exceeding core limits.

The "Thermal Soak" allowance below 50% power, during which the rod position indication system tolerance requirement is relaxed, provides time for the system to reach thermal equilibrium. A total of one hour in twenty-four is available for this allowance, which may be a continuous hour or may consist of discrete, shorter intervals. For such a short period of time, a misaligned rod does not pose an unacceptable risk. At these conditions, the rod position indicators should still be used to verify rod movement but not their exact location. The tolerance is tightened after one hour to ensure that the thermal overshoot does not conceal an actual rod misalignment.

The reliance upon the step demand counters at hot and cold shutdown conditions shifts the monitoring of rod position from the rod position indication system to the more reliable demand counters when RCS temperature is changing greatly but the core remains subcritical. The step demand counters also provide precise group demand positions during the thermal soak period.

The specified control rod assembly drop time is consistent with safety analyses that have been performed.

An inoperable control rod assembly imposes additional demands on the operators. The permissible number of inoperable control rod assemblies is limited to one in order to limit the magnitude of the operating burden, but such a failure would not prevent dropping of the operable control rod assemblies upon reactor trip.

Two criteria have been chosen as a design basis for fuel performance related to fission gas release, pellet temperature, and cladding mechanical properties. First, the peak value of fuel centerline temperature must not exceed 4700°F. Second, the minimum DNBR in the core must not be less than the applicable design limit in normal operation or in short term transients.

TABLE 4.1-1

MINIMUM FREQUENCIES FOR CHECK, CALIBRATIONS AND TEST OF INSTRUMENT CHANNELS

Channel Description	Check	Calibrate	Test	Remarks
1. Nuclear Power Range	S	D(1) Q(3) R(4)	M(2)	1) Against a heat balance standard 2) Signal at ΔT; bistable action (permissive, rod stop, trip) 3) Upper and lower chambers for symmetric offset by means of the movable incore detector system 4) Neutron detectors may be excluded from Channel Calibration
2. Nuclear Intermediate Range (below P-10 setpoint)	*S	R(2)	P(1)	1) Log level; bistable action (permissive, rod stop, trip) 2) Neutron detectors may be excluded from Channel Calibration
3. Nuclear Source Range (below P-6 setpoint)	*S	R(2)	P(1)	1) Bistable action (alarm, trip) 2) Neutron detectors may be excluded from Channel Calibration
4. Reactor Coolant Temperature	*S	R	M(1) M(2)	1) Overtemperature ΔT 2) Overpower ΔT
5. Reactor Coolant Flow	S	R	M	
6. Pressurizer Water Level	S	R	M	
7. Pressurizer Pressure (High & Low)	S	R	M	
8. 4 KV Voltage and Frequency	N.A.	R	M	
9. Analog Rod Position	*S(1,2) (4)	R	M(3)	1) With step counters 2) Each six inches of rod motion when data logger is out of service 3) Rod bottom bistable action 4) N.A. when reactor is in hot, intermediate or cold shutdown

TABLE 4.1-1 (Continued)

MINIMUM FREQUENCIES FOR CHECK, CALIBRATIONS AND TEST OF INSTRUMENT CHANNELS

Channel Description	Check	Calibrate	Test	Remarks
10. Rod Position Bank Counters	S(1,2) Q(3)	N.A.	N.A.	1) Each six inches of rod motion when data logger is out of service 2) With analog rod position 3) For the control banks, the benchboard indicators shall be checked against the output of the bank overlap unit.
11. Steam Generator Level	S	R	M	
12. Charging Flow	N.A.	R	N.A.	
13. Residual Heat Removal Pump Flow	N.A.	R	N.A.	
14. Boric Acid Tank Level	*D	R	N.A.	
15. Refueling Water Storage Tank Level	S	R	M	
16. Volume Control Tank Level	N.A.	R	N.A.	
17. Reactor Containment Pressure-CLS	*D	R	M(1)	1) Isolation valve signal and spray signal
18. Boric Acid Control	N.A.	R	N.A.	
19. Containment Sump Level	N.A.	R	N.A.	
20. Accumulator Level & Pressure	S	R	N.A.	
21. Containment Pressure-Vacuum Pump System	S	R	N.A.	
22. Steam Line Pressure	S	R	M	

ATTACHMENT 2

Safety Evaluation

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I. INTRODUCTION

Surry is one of several Westinghouse designed plants which have experienced difficulties with calibration and accuracy of the Individual Rod Position Indication System (IRPIS). The system consists of a set of linear variable transformers formed from primary and secondary coils alternately stacked on cylindrical stainless steel tubes. An extension shaft from the rod drive mechanism extends up into the tube and serves as a variable core for the transformer. Thus, with a constant a.c. current source applied to the primary side, movement of the rod drive extension shaft changes the primary to secondary coupling of the transformer and produces a secondary voltage that is directly related to rod position.

There are two basic deficiencies in the IRPIS performance, however. First, the instrumentation readout design is based on the assumption that secondary output voltage is a linear function of rod position. In fact, the steady-state calibration curve is an arc-shaped or even an S-shaped curve. This deviation from linearity is normally absorbed by a ±12 step Technical Specifications allowance for rod misalignment.

The second and more serious drawback is that the instrument response is highly temperature sensitive, and there is a transient (nonequilibrium) temperature response associated not only with RCS temperature changes but also with rod motion. On most plants the IRPIS for each individual rod is calibrated at hot operating temperatures at beginning of cycle. As the reactor is cooled to hot and cold shutdown the hot calibration curve becomes inaccurate and may be off by as much as 60 steps, or over one-quarter of the core height.[1]

The transient thermal response problem has been characterized as an "overshoot" for most plants. In other words, if a rod is withdrawn, the IRPIS will show greater withdrawal than actual for a period of time, and then as the system returns to thermal equilibrium the indication will settle back to the "true" calibrated value. Similarly, if the rod is inserted, the IRPIS will initially indicate a greater insertion than actual. Reference 2 indicates that the transient indication error is as high as 25 steps for some plants and tends to be worse near the fully withdrawn position. The "thermal soak" time, or the time for the IRPIS to reach equilibrium following rod motion, is reported to range between 20 and 45 minutes.

II. DISCUSSION AND EVALUATION

As a result of these difficulties, Virginia Electric and Power Company is proposing a set of changes to the Technical Specifications which shifts the emphasis from the IRPIS to the demand position indication system for providing detailed rod position information during the shutdown modes and during startup and shutdown operations. When independent verification of rod movement is required, the IRPIS will still be available to provide this information. The proposed changes are as follows:

1. The IRPIS operability requirements during shutdown conditions have been removed. These requirements have been replaced by a requirement for a ±2 step demand counter accuracy.

   While the IRPIS was originally not intended to be used in the shutdown modes, many plants have a specification requiring IRPIS indication during these modes as an intended means of providing added confidence to the shutdown reactivity margin calculations. The reality of the situation is that, due to the transient effects, it is not possible to use the system accurately in these modes and therefore the use of the IRPIS may create more problems than it solves.

   Concerning the issue of shutdown margin, the Technical Specifications require a minimum of 1.0% shutdown reactivity margin during shutdown (i.e., keff < 0.99), and station administrative procedures for determining the required shutdown boron concentrations in these modes already include conservative allowances for calculation and measurement uncertainties. Further, the demand position indicators have been highly reliable, not only at Surry but throughout the industry, and are demonstrably the most accurate means of determining bank position. This high level of reliability, combined with the requirement that keff < 0.99 in shutdown conditions, provides adequate protection against inadvertent criticality in the shutdown modes. As a result, the IRPIS is not needed to guarantee subcriticality and/or shutdown margin in these modes, and the use of the system could in fact be counterproductive to this end. Consistent with the Staff SER of Reference 1, we therefore propose the replacement of IRPIS tolerance requirements with step demand counter tolerance requirements during shutdown.

2. The second feature is the incorporation of a "soak time," of up to one hour in every twenty-four, below 50% power. The IRPIS channel tolerance may be relaxed for up to one hour following rod motion. During this hour, the step demand counters will serve as the primary indicators of rod position, with the IRPIS channels displaying general information regarding rod motion; i.e., they can still be used to verify that the rods are moving in or out on demand, but should not be relied on for precise position indication. We believe this proposal is sound from a safety standpoint due to the following considerations:

   a. The probability of a severe rod misalignment actually occurring is remote, because 1) the IRPIS tolerance remains at ±24 steps for only an hour before reducing to ±12 steps, 2) the step demand counter accuracy is excellent and 3) the IRPIS will be used to verify rod movement upon demand.

b. Rods which are misaligned by ±24 steps for up to an hour do not pose an unacceptable risk. We analyze the impact of statically misaligned or dropped rods on the core power distribution throughout core life for each reload core and demonstrate that the Condition II DNB limits are met for power levels up to and including hot full power. Further, the proposed one-hour relaxation would only apply at low power (<50%). The probability of experiencing a limiting Condition II event (i.e., uncontrolled rod withdrawal) during a one-hour interval is insignificant (on the order of 10^{-6}).

c. The "one hour in twenty-four" feature provides an acceptable upper limit on the frequency of "Thermal Soak" allowances. This feature ensures that the IRPIS is still used a minimum of 96% of the time (23/24) with ±12 step accuracy, even at low powers, while providing the plant operators with sufficient tolerance relief when it is needed. Sufficient rod position information is available both for a continuous one hour period or one consisting of several discrete intervals.

A detailed discussion and evaluation of the proposed Technical Specification changes, by each section, follows.

Technical Specification 3.12.C.1 - Inoperable Rod Definition

The definition of an inoperable control rod has been revised to be consistent with the one hour "Thermal Soak" allowance. Previously, a rod showing misalignment in excess of ±12 steps was to be declared inoperable;

now, the misalignment widens to ±24 steps during the "Thermal Soak" period, and remains at ±12 steps otherwise. In the shutdown modes, when the step demand counters are the primary source of rod position information, rods will be declared inoperable only when the IRPIS fails to show rod movement upon demand.

Technical Specification 3.12.E.1 - Rod Position Indication Requirements

The proposed Technical Specifications denote each operational mode and the rod position indication requirements for each mode. Those conditions are, respectively, power operation above 50% power; power operation between 0% and 50% power; and operation at shutdown conditions.

Above 50% power, there is no change to the current requirement that the IRPIS provide rod positions with an accuracy of ±12 steps.

Between zero and 50% power, the ±12 step IRPIS tolerance requirement remains, except for the one hour "Thermal Soak" period, at which time the tolerance doubles to ±24 steps to allow for the thermal nonequilibrium effects. During this "Thermal Soak" allowance, the step demand counters must indicate rod locations with an accuracy of ±2 steps. The one hour period may be continuous or may consist of several discrete intervals, but the "Thermal Soak" allowance may be employed for a total of no more than one hour in twenty-four.

In the shutdown conditions, responsibility for rod position indication shifts to the step demand counters, which are required to be accurate to ±2 steps. This change reflects the excellent performance of the counters and the unimpressive IRPIS performance in these modes. The IRPIS remains available to verify the occurrence and direction of rod movement, however.

Technical Specification 3.12.E.2.a - IRPIS Inoperability

The references to the excore detectors and the incore thermocouples have been deleted as available instruments for rod position indication when an IRPIS is out of service. Neither instrument is well suited for this task, and in practice neither has been used to determine rod locations. In contrast, the incore detectors are very well suited for individual rod position indication, and remain the primary backup for this function.

Technical Specification 3.12 - Basis Section

A discussion has been added to the Basis section which addresses the "Thermal Soak" allowance for nonequilibrium effects, noting its justification and limitations. The shift of responsibility for rod position indication to the step demand counters during the shutdown modes is also described.

Technical Specification Table 4.1-1 - Surveillance Requirements

Item #9 of this table specifies the surveillance requirements for the Analog Rod Position system. Previously, the plant staff was not required to perform channel checks when the plant was in cold shutdown; with the switch to the step demand counters for rod position indication in the shutdown modes, the plant staff will be required to perform channel checks during power operation only.

Item #9 of this table specifies the surveillance requirements for the Analog Rod Position system. Previously, the plant staff was allowed to forego the requirements when the plant was in cold shutdown; with the switch to the step demand counters for rod position indication in the shutdown modes, the Table 4.1-1 exclusion has been re-written to be applicable in hot, intermediate and cold shutdown.

To support the increased emphasis on the step demand counters, a new requirement for quarterly testing of the control bank counters has been added to Item #10 ("Rod Position Bank Counters") of Table 4.1-1.

III. 10 CFR 50.59 SAFETY EVALUATION

The proposed changes have been determined not to pose an unreviewed safety question as defined in 10 CFR 50.59. The basis of this determination is as follows:

- The proposed changes will increase neither the probability of occurrence of any of the UFSAR accidents nor their potential consequences. No new or unique accident precursors are introduced by reliance upon the demand counters for rod position indication. Likewise the consequences of any accident will not increase. The risk of a potentially misaligned rod not being detected during the one-hour thermal soak time is inconsequential, especially in light of the fact that even during this hour the IRPIS will be available for verification that the rods are moving on demand.
- No new or unique accident precursors are introduced by the proposed changes since no physical plant changes are involved. Thus, the possibility of an accident of a type different from those already considered in the UFSAR is not created.
- The margin of safety is not reduced. Since the results of the UFSAR accident analyses will continue to bound operation under the proposed changes, the existing safety limits remain inviolate and as such, there is no safety margin reduction.

IV. SUMMARY AND CONCLUSIONS

Virginia Power has developed a proposed set of Technical Specifications changes for Surry Units 1 and 2 which are intended to improve operational flexibility by accounting for known inaccuracies in the Individual Rod Position Indication System.

The basic thrust of the proposed changes is to shift the emphasis from the IRPIS to the demand position indicators as the primary source of rod position indication during shutdown conditions and for one hour following rod motion at low power. The IRPIS still serves as a backup system and can always be used to verify the occurrence and direction of rod motion upon demand. There is no change to the current IRPIS tolerance requirement above 50% of rated thermal power.

REFERENCES

1. NRC Safety Evaluation Report (SER), "Westinghouse Analog Rod Position Indication for Shutdown Modes," transmitted by letter from S. A. Varga (NRC) to G. W. Giesler (Wisconsin Public Service Corporation), March 24, 1983. See also the letter from Mr. Varga to R. E. Uhrig, "Requirements for Analog Position Instruments In Shutdown Modes-Turkey Point Units 3 and 4," March 15, 1982.

2. NRC Safety Evaluation, "Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Amendment No. 51 to Facility Operating License No. DPR-66, Duquesne Light Company/Ohio Edison Company/ Pennsylvania Power Company, Beaver Valley Power Station, Unit No. 1, Docket No. 50-334," transmitted by Letter from P. S. Tam (USNRC) to J. J. Carey (Duquesne Light), June 14, 1982.

ATTACHMENT 3

10 CFR 50.92 Evaluation

10 CFR 50.92 SIGNIFICANT HAZARDS CONSIDERATION

Virginia Power has proposed changes to the Surry Power Station Technical Specifications which shift responsibility for tracking control rod position from the individual rod position indication system to the step demand counters. It has been determined that the proposed changes do not involve a significant hazards consideration as defined in 10 CFR 50.92. The basis for this determination may be stated as follows.

- The proposed changes will increase neither the probability of occurrence of any of the UFSAR accidents nor their potential consequences. The probability of a misaligned rod remaining undetected is exceedingly small, because of the tolerance requirement and the historically excellent performance of the step demand counters, and because of the availability of the IRPIS to verify the occurrence and direction of rod movement upon demand. Further, since the proposed changes shift rod tracking responsibility to the step demand counters when the IRPIS is least reliable, rod control will be more precise and accident probability will if anything be reduced.

  Neither will the potential consequences of any postulated accident increase. Peaking factors which occur as a consequence of severely misaligned or dropped rods are verified on a reload basis as not resulting in a violation of any safety limit; the assumed misalignments easily bound any potential misalignment under the proposed Technical Specifications, so that these changes cannot result in an increase in an accident consequence.

- No new or unique accident precursors are introduced by the proposed changes since no physical plant changes are involved. The procedural change is a move from less precise plant control to more precise control, without an attendant increase in procedural complexity or a change in hardware. Thus, the possibility of an accident of a type different from those already considered in the UFSAR is not created.

- The margin of safety is not reduced. The results of the UFSAR accident analyses will continue to bound operation under the proposed changes, so that the existing safety limits remain inviolate. Specifically, the peaking factor criteria during potential misaligned and dropped rod events will continue to be verified on a reload basis. As such, there is no safety margin reduction.

ATTACHMENT 4

Application Fee