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SUBJECT: Forwards comments on SER accompanying 910423 amends to Licenses DPR-31 & DPR-41 re RTD bypass elimination project, per 900913 application for amends to licenses.

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

Gentlemen:

Re: Turkey Point Units 3 and 4
Docket No. 50-250 and 50-251
Resistance Temperature Detector Bypass Elimination Project

By letter L-90-68A, dated September 13, 1990, Florida Power and Light (FPL) submitted a request to amend the Turkey Point Technical Specifications by eliminating the Resistance Temperature Detector (RTD) Bypass. By letter dated April 23, 1991, the NRC approved Technical Specification changes associated with the elimination of the RTD Bypass, and issued a Safety Evaluation Report (SER) supporting the changes. Attachment 1 to this letter provides FPLs comments on the SER and the bases for the comments. Attachment 2 is a mark-up of the SER reflecting FPLs comments. Some minor typographical or editorial mark-ups which are not discussed in Attachment 1 are included in Attachment 2.

Should there be any questions, please contact us.

Very truly yours,

J. Hosmer for W. H. Bohlke

W. H. Bohlke
Vice President
Nuclear Engineering and Licensing

WHB/GS

enclosure

cc: Stewart D. Ebneter, Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant
Mr. Jacob Daniel Nash, Florida Department of Health and Rehabilitative Services.

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ATTACHMENT 1

p. 3 Paragraph 5: Replace "Model 7100 process control bistables" with "Eagle-21 comparators."

Basis: The OPDT and OTDT protection channels utilize Eagle-21 comparators as opposed to Model 7100 process control bistables.

p. 3 Section 2.2: Delete "by scoop mixing."

Basis: The system installed at Turkey Point does not use scoop mixing.

p. 4 Section 2.2.1: Add "(nominal)" to the RTD Response Time(sec) and Electronics Delay (sec) listed in the Fast Response Thermowell RTD System column; and add "maximum" to the Total Response Time (sec) listed in the Fast Response Thermowell RTD System column.

Basis: The Total Response Time of 6.0 sec is the controlling value.

p. 4 Section 2.2.1: Delete "The Technical Specification limit is 6.0 seconds."

Basis: The RTD response time limit is not discussed in the Technical Specifications.

p. 4 Section 2.2.2: Replace "flow with a dual-element Weed RTD" with "temperature with three dual-element Weed RTDs"

Basis: Clarification of previous FPL submittals.

p. 5 Section 2.2.3: Replace "two RTDs" with "RTD"

Basis: There is only one RTD on each cold leg.

ATTACHMENT 1 (Continued)

p. 6 & 10 Replace "Beaver Valley Unit 2" with "H. B. Robinson Unit 2."

Basis: The staff has approved a Median Signal Selector similar to the type Turkey Point is using, at H. B. Robinson 2, and not at Beaver Valley.

p. 6 Section 2.2.4: Delete "loss of flow"

Basis: Clarification of previous FPL submittals.

Note 1 to Table 2.2-1: Replace $f_2(\Delta I)$ with $f_1(\Delta I)$

Basis: Typographical error.

ATTACHMENT 2

Safety Evaluation Report Mark-Up

readings from each coolant loop are used for protection and control system inputs. The RTD bypass system was designed to address temperature streaming (non-uniform stratified flow in the cross-section) in the hot legs and, by use of shutoff valves, to allow replacement of the direct immersion narrow-range RTDs without draindown of the Reactor Coolant System (RCS). For increased accuracy in measuring the hot leg temperatures, sampling scoops were placed in each hot leg at three locations of a cross-section, 120 degrees apart. Each scoop has five orifices which sample the hot leg flow along the leading edge of the scoop. The flow from the scoops is piped to a manifold where a direct immersion RTD measures the average hot leg temperature of the flow from the three scoops in each hot leg. This bypass flow is routed back downstream of the steam generator. The cold leg temperature is measured in a similar manner except that no scoops are used, as temperature streaming is not a problem due to the mixing action of the RCS pump.

2.1.2 Proposed System

The licensee will replace the direct-immersion RTDs with Weed Instrument Co., Inc. dual-element RTDs mounted in thermowells. ~~The spare element in each RTD assembly will be terminated at the containment penetration.~~ The spare RTD is terminated in a junction box outside the containment penetration. Editorial
The licensee proposes to remove all the bypass piping and associated valves and hangers. The bypass connections that return RCS coolant back to the cold leg crossover piping will be capped. Where possible, the scoops in the hot legs will be modified to accept RTD thermowells, which will allow RTD replacement without requiring draindown of the RCS. If structural components interfere with the placement of a thermowell in an existing scoop or nozzle, the licensee will cap the scoop or nozzle and prepare an alternate penetration to accommodate an RTD thermowell. The Turkey Point units are 3-loop Westinghouse plants, and this work will affect all three loops of each unit.

The hot leg RTDs (three in each hot leg) and the cold leg RTDs (one in each cold leg) will be connected to a newly installed Westinghouse Eagle 21 Temperature Averaging System (TAS). In this system, for each loop, each hot leg temperature signal, T(hot), is first subjected to a range check. Then an estimated average hot leg temperature, T(est,j), is derived from each T(hot) by applying a temperature streaming correction bias, S(j). The TAS then uses the resulting T(est,j) signals to calculate an estimated average hot leg temperature for the corresponding loop, T(est,ave). The three T(est,j)s are then compared to this T(est,ave) to determine whether they agree within a specified temperature range (±DELTAH). If the T(est,j) signals agree within ±DELTAH of T(est,ave), the group quality is set to GOOD, and the loop average hot leg temperature, T(hot,ave), is set to the average of the three estimated average hot leg temperatures.

If a T(est,j) signal does not agree within ±DELTAH of T(est,ave), the signal value with the greatest deviation from T(est,ave) is deleted and the quality of the deleted signal is set to POOR. The remaining signals are then checked for consistency (±DELTAH). If the two signals pass the consistency check (within ±DELTAH), the group value, T(hot, ave), is set to the average of the two signals, and the group quality is set to POOR. If the two remaining signals are not consistent, the T(hot,ave) value is set to the average of the two signals, and the group quality is set to BAD. Additionally, the quality of the individual signals is set to POOR.

The cold leg temperature input signals from the dual-element RTD in each cold leg are also subjected to range and consistency checks, and then averaged to provide a group value for T(cold). If these signals agree within an acceptable interval (±DELTAC), the group quality is set to GOOD. If the signals do not agree within ±DELTAC, the group quality is set to BAD and the individual input signal qualities are set to POOR. One cold leg temperature input signal per loop may be deleted manually. The remaining T(cold) input signals will provide the loop T(cold) temperature signal. Typo.

For each loop, the TAS processes the T(hot,ave) and the T(cold) to produce a loop average temperature, T(avg), and a loop differential temperature (Delta T). The resulting signals are converted from digital to analog signals, then used to provide inputs to the plant computer, control system, and indication devices. The protection grade channels are isolated from the control systems with the same model of isolators used in the Sequoyah Eagle 21 system.

The hot leg temperature DELTAH criterion for each loop is an input parameter based upon temperature distribution tests within the hot leg, and is entered via a portable Man-Machine Interface (MMI). The cold leg temperature DELTAC criterion for each loop is an input parameter based upon operating experience, and is also entered via the MMI. One DELTAH and one DELTAC is required for each coolant loop.

A "Trouble" alarm and annunciator window common to all three loops will be added. This alarm is actuated when the T(hot,ave) value for a coolant loop is set to POOR. An "RTD Failure" alarm and annunciator is actuated when the T(cold) or T(hot,ave) group value for a coolant loop is set to BAD as described above. This alarm and annunciator informs the operator that there is an invalid T(cold) or T(hot,ave) group value for a loop. When the group quality is set to BAD, the channel status is changed to INOPERABLE, and the channel is placed in a tripped state.

The effect of the RTD channels on the Reactor Protection System will remain the same as previously utilized. For example, two-out-of-three voting logic channels continue to be utilized with the Model 7100 process control bistables continuing to operate on a "de-energize to actuate" principle. Eagle-21 comparators

The licensee requested a quarterly surveillance interval and a 4-hour period during which a channel may be placed in bypass for testing for the racks being upgraded with the Eagle-21 process protection equipment.

2.2 Analysis

The licensee presented information regarding the response time of the new RTD measurement system and also the accuracy of the new method for measuring the hot leg temperature by scoop mixing as designed by Westinghouse. The response time and accuracy affect the accident analyses.

2.2.1 RTD Response Time

As shown in the tabulation below, the response time for OTdT for the proposed system has some gains and losses compared to the existing RTD bypass system, but the total response time of the proposed system remains the same as for the existing system (6.0 sec).

RESPONSE TIME PARAMETERS FOR RCS TEMPERATURE MEASUREMENT

	RTD Bypass System	Fast Response Thermowell RTD System
RTD Bypass Piping and Thermal Lag (sec)	2.0	N/A
RTD Response Time (sec)	2.5	4.0 (NOMINAL)
Electronics Delay (sec)	1.5	2.0 (NOMINAL)
Total Response Time (sec)	6.0 sec	6.0 sec (MAXIMUM)

~~The Technical Specification limit is 6.0 seconds.~~ Delete

The licensee states that the increase in the electronics time delay is conservative because the actual electronics time delay is significantly less then the 2.0 seconds claimed in the licensee's submittal. The staff finds the licensee's conservative value for electronics time delay to be acceptable.

NUREG-0809, "Resistance Temperature Detector Time Response Characteristics," points out that RTD response times have been known to degrade and that the loop current step response (LCSR) methodology is the recommended on-site method for checking RTD response times. Turkey Point Units 3 and 4 have upgraded custom Technical Specifications (TSs) which do not include a section for checking the RTD response time. However, the licensee has stated in a letter dated December 13, 1990, that they will perform RTD response time testing using the recommended LCSR method for checking the RTD response time. The on-site response time testing of the RTDs will be performed once every three refueling cycles (a refueling cycle is 18 months), on a staggered test basis, with one channel being tested each refueling cycle.

Based on the above information, the staff finds that the RTD response time has been addressed in an acceptable manner.

2.2.2 RTD Installation

Editorial

The new method of measuring each hot leg temperature with three thermowell RTDs, used in place of the RTD bypass system with three scoops, has been analyzed to be at least as effective as the RTDs in the existing bypass system. The scoops ~~are~~ were used to obtain a sampling of the flow at three 120-degree sectors in each of the hot legs in order to obtain a more accurate hot leg average temperature that accounts for the non-uniform temperature streaming. Formerly the RTD bypass system took the sampled flows from the scoops and made an external RTD temperature measurement in a plenum section. The new method with the RTD bypass system removed will measure coolant ~~flow with a dual-element Weed RTD~~ mounted in a thermowell. The Weed RTD is mounted to line up with the center hole of the five holes in the scoop. There are several locations where there is structural interference which prevents putting the new Weed RTDs in the scoops. In these cases new penetrations will be made and the Weed RTDs will be inserted to the same depth as those in the scoops, which is the center hole depth.

Replace with.

temperature with three dual element Weed RTDs

The RTD thermowells have been manufactured under Section III of the ASME Boiler and Pressure Vessel Code. Other piping modifications have been designed and fabricated consistent with the original design code, B31.1 (1955). Welding and inspections are consistent with Section XI of the ASME Code. Use of these codes in design, fabrication, and inspection of the RTD thermowells is appropriate and acceptable.

2.2.3 RTD Uncertainty and Calibration

The dual-element Weed RTD has improved accuracy over the existing RTDs. The total uncertainty includes a value for drift in addition to the normal accuracy (includes hysteresis and repeatability). This has been appropriately incorporated in the setpoint analysis.

The licensee committed, in a letter dated January 28, 1991, to obtain confirmatory information on the mixed mean temperature accuracy. This will be done by comparing pre-installation and post-installation calorimetric data from the RTD temperature measurements in the Turkey Point plants. The differences will be reconciled and the licensee will make this data available to the staff.

Because three RTDs are used to measure each hot leg temperature instead of the former single measurement, the error associated with the hot leg measurement is reduced to one over the square root of three compared to a single RTD. The uncertainty impact of the additional electronics needed for the two additional hot leg RTDs per loop has been evaluated by the licensee to be minimal.

The three signals are averaged to obtain the loop's T_{hot} value. The existing overall channel functional checks and calibration accuracy requirements are to be maintained. The impact of the rack drift has been considered in the evaluation.

The only change to the cold leg electronics is the averaging of two readings of the ~~two RTDs~~ in each leg. Therefore, there is no impact to the cold leg reading other than the increase in accuracy from the average of two RTD readings.

Replace with RTD

The net result of the proposed RTD bypass system modification is a slight improvement in the accuracy of the temperature-related functions over the accuracy now achievable with the existing RTDs in the bypass system. The licensee has reviewed the impact of the proposed modifications against the Turkey Point setpoint study to verify that the accuracy of the temperature-related functions are met.

A flow measurement uncertainty analysis, which considered the new RTD temperature measurement system, resulted in a calculated value of 3.4% (3.5% including a 0.1% fouling penalty). Turkey Point presently assumes a 3.5% uncertainty in primary flow determination, which will remain. The licensee stated in a letter dated December 13, 1990, that they will perform a cross-calibration of all RTDs during each refueling cycle by comparing the installed RTDs to each other. This will ensure the proper applicability of the temperature parameter as presented in the flow measurement uncertainty analysis.

By letter dated December 13, 1990, the licensee stated that RTD calibrations will consist of using the average of the RTD indicated temperatures as the reference temperature for cross-calibration purposes. The staff is concerned that using an average RTD signal as the reference signal for the RTDs, without an independent verification of the actual coolant temperature, may lead to a net drift of average value of the temperature indicated by the RTDs after several refueling outages. A licensee review of Weed RTD drift data indicated that the Weed RTD drift is random (does not consistently trend up or down) and is less than that assumed in the licensee's analyses (+1.2°F per refueling cycle). Based upon this conclusion, the licensee states that their calibration methodology is valid. The staff accepts the licensee's justification of this calibration methodology; however, the staff requires the licensee to maintain a historical record of the as-found and as-left calibration data and the surveillance data of each RTD to ensure that the cumulative drift of the RTDs remains within the safety analysis envelope.

2.2.4 RTD Failure Detection

A median signal selector (MSS) that satisfies the control and protection interaction requirements of IEEE 279-1971 will replace the existing high auctioneered T(avg) and delta T signals presently used in the control channels. There will be a separate MSS for each function. The MSS will use as inputs the protection grade T(avg) or delta T signals from all three loops, and will supply as an output the channel signal that is the median of the three signals. The effect will be that the various control grade systems will continue to use a valid RCS temperature in the case of a single signal failure. The staff has approved use of this MSS design for ~~Beaver Valley Unit 2~~, and accepts the use of the MSS at Turkey Point Units 3 and 4. ↳ Replace with— H.B. Robinson 2

To ensure proper action by the MSS, the existing manual switches for defeating a T(avg) or delta T signal from a single loop will be eliminated. The MSS will automatically select a valid signal in the case of a signal failure. Warnings that a loop signal failure has occurred will be provided by T(avg) and delta T deviation alarms. This method of detecting a defective RTD channel is acceptable.

The licensee will replace the existing Model 7100 process electronics monitoring RCS temperature for the overtemperature, overpower, T(avg) low-low, ~~loss of flow~~ and pressurizer level with the Eagle 21 Process Protection System for each affected protection set. The licensee will remove all existing 7100 modules for these channels and use the modules as spares. ~~in other protection channels.~~ The two-out-of-three voting logic will remain the same. The Eagle-21 TAS is identical to the TAS used in the Sequoyah Nuclear Plant, and was reviewed by the staff. The licensee further states that the isolation devices are the same as those used at Sequoyah, and found acceptable by the staff. The staff's review of the Sequoyah Eagle-21 system found the TAS (as part of that system) to be acceptable. Since the TAS design with isolation devices proposed for the Turkey Point plants is identical to the TAS design used at the Sequoyah plant and approved by the staff, the staff accepts the licensee's implementation of the Eagle-21 TAS at Turkey Point Units 3 and 4.

Delete

Delete
Editorial

3.0 SUMMARY

The staff concludes that the modified RTD system is not functionally different from the existing system except for the use of three RTDs instead of one in each hot leg. The RTS and ESFAS will operate as before. Section 7 of the FSAR remains valid. The additional electronics for averaging the three hot leg RTD signals and the associated isolation devices are the same as those approved by the staff for use in the Sequoyah Nuclear Plant, and are consequently acceptable for use in the replacement of the existing RTD Bypass system with the proposed temperature measurement system. The MSS is the same as the design approved by the staff for the ~~Beaver Valley, Unit 2~~, and is also acceptable.

Replace with → H.B. Robinson 2

The licensee's request for a quarterly surveillance interval and a 4-hour period during which a channel may be placed in bypass for testing for the racks being upgraded with the Eagle-21 process protection equipment is consistent with the intervals previously approved by the staff in its review of Westinghouse Topical Report WCAP-10271-P-A, and in its review of EAGLE-21 process protection system implementation at Sequoyah Nuclear Plant.

The staff requires the licensee to maintain historical records of the as-found and as-left calibration and surveillance data for each RTD. These records will ensure cumulative RTD drift remains within the safety analysis envelope.

To support the modifications required to eliminate the RTD bypass manifold system, the licensee proposed changes to the Turkey Point plant TS. The TS revisions are a result of changing the Turkey Point TS format to a 5-column standard format, and specific revisions to address changes in instrumentation and system uncertainties. Evaluations performed by the licensee and reviewed by the staff show the uncertainty values to be acceptable. Technical specification changes revise the use of the power imbalance function, and are acceptable to the staff. The licensee increased the Tavg-LOW trip setpoint to a more conservative value based upon the results of the vendor's setpoint analyses. This change is also acceptable to the staff. Additionally, the licensee proposed changes in the operational test surveillance intervals and the allowable outage times for INOPERABLE channels. These changes are acceptable.

4.0 STATE CONSULTATION

Based upon the written notice of the proposed amendments, the Florida State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

These amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20, and change surveillance requirements. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration and there has been no public comment on such finding (56 FR 891). Accordingly, these amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of these amendments.