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PSEG
Nuclear LLC

LR-N03-0099
LCR S02-008

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Gentlemen:

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING CHANGE TO TECHNICAL SPECIFICATIONS TO REFLECT NEW SETPOINTS AND ALLOWABLE VALUES FOR STEAM GENERATOR LOW-LOW LEVEL TRIP SALEM GENERATING STATION UNITS 1 AND 2 FACILITY OPERATING LICENSES NOS. DPR-70 AND DPR-75 DOCKET NOS. 50-272 AND 50-311

Reference: Letter LR-N02-0315, *Request For Change To Technical Specifications To Reflect New Setpoints And Allowable Values For Steam Generator Low-Low Level Trip*, dated September 26, 2002

On September 26, 2002, PSEG Nuclear LLC (PSEG) submitted the referenced request for a revision to the Technical Specifications (TS) to reflect new setpoints and allowable values for steam generator low-low level trip.

In a letter dated February 20, 2003, PSEG received a request from the NRC staff for additional information regarding the subject request. This request for additional information was discussed with Mr. Robert Fretz, NRC Hope Creek Project Manager and other members of the NRC staff on January 27, 2003. Attachment 1 contains PSEG's response.

A001

If you have any questions or require additional information, please contact Mr. Michael Mosier at (856) 339-5434.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 3/20/03

Sincerely,

D. F. Garchow
Vice President-Projects and
Licensing

Attachment

C: Mr. H. Miller, Administrator – Region I
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SALEM GENERATING STATION UNIT NOS. 1 AND 2 – REQUEST FOR ADDITIONAL INFORMATION (RAI) RE: REQUEST FOR CHANGE TO TECHNICAL SPECIFICATIONS ON STEAM GENERATOR LOW-LOW LEVEL TRIP

Question:

Section 4 of Attachment 1 to the September 26, 2002, letter states that the total calculated channel uncertainties for the low-low level channel are +12.233% and 10.339% for Salem Unit Nos. 1 and 2, respectively.

Describe the setpoint methodology, the calculations for the proposed setpoint, and allowable value for the low-low steam generator trip function. If the setpoint methodology is different from the existing methodology, the NRC will review it. The setpoint calculation for each unit should include the uncertainty values and the bases for all measurement instrument components, rack calibration accuracy, and the bias (pressure drop and equivalent % of narrow range span) assigned to account for the effect of the mid-deck plate pressure differential induced by the primary separator downcomer steam flow.

Response:

Calculation SC-CN001-01, "Salem Unit 1 & 2 Steam Generator Level Trip, Alarm, Ind & Rec," utilizes Instrument Society of America (ISA) S67.04 methodology. This methodology is endorsed in Regulatory Guide 1.105. This calculation (SC-CN001-01) was submitted to the NRC on October 4, 1994 (NLR-N94166). This calculation considers normal operating conditions, not adverse, in concurrence with Westinghouse instructions since the scenario would be on loss of main feedwater (MFW).

The calculation of the low - low setpoint is comprised of a) process effects and b) instrumentation loop uncertainty:

Process Effects (combined algebraically/bias)

- Reference Leg Temperature Variation,
- Process Pressure Variation,
- Downcomer Subcooling,
- Fluid Velocity,
- Mid-deck Plate Pressure Loss

All the effects are normalized to percent of narrow range span for its final combination with the loop instruments uncertainties, also in percent of narrow range span. The direction of these effects is defined and are combined to account for the total process measurement as bias. See Table 1 below.

Table 1

Process Measurement Effect	Low Level Effects	
Reference Leg Temperature Variation Normal Plant Conditions Indication/Low-Low Level Trip	Unit 1 +0.310%	Unit 2 +0.300%
Process Pressure Variation	Unit 1 +0.833%	Unit 2 +1.165%
Downcomer Subcooling (Low-Low Level Trip)	Unit 1 +0.476 %	Unit 2 +0.480 %
Fluid Velocity	Negligible	
Mid-Deck Plate Delta-P Indication/Low-Low Level Trip	Unit 1 + 8.506%	Unit 2 + 6.471%
Total Process Measurement Effect Low-Low Level Trip	Unit 1 +10.125%	Unit 2 +8.416%

Loop Instrumentation Accuracies (independent and random instruments accuracies are statistically combined, SRSS) (Table 2 below)

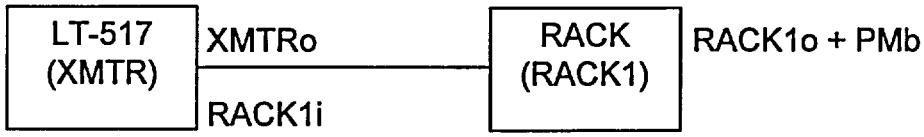
- Transmitter
- Rack (Resistor + Bistable)

Table 2

Uncertainty Source	Uncertainty (percent span)	
Transmitter (Normal)	UNIT 1 ± 1.694%	UNIT 2 ± 1.457%
Rack3	± 1.255%	

Uncertainty Calculation (Low - Low Trip 100% Power)

The following is a representation of the error propagation throughout the channel including process uncertainties calculated for low-low level trip conditions. Only the worst case scenario is calculated. The worst case is the transient scenario with the postulated loss of feedwater at 100% power with the level effect due to the steam flow dp across the mid-deck differential (larger than the accident scenario).



UNIT 1

PMb = +10.125% span
$XMTR_{LLT}$ = +1.694% span
RACK1 = +1.255% span (with Bistable)

$RACK1o = +[(XMTR)^2 + (RACK1)^2]^{1/2} + PMb$

$RACK1o = +[(1.694\%)^2 + (1.255\%)^2]^{1/2} + 10.125\%$

CU =+12.233% span

UNIT 2

PMb = +8.416% span
$XMTR_{LLT}$ = +1.457% span
RACK1 = +1.255% span (with Bistable)

$RACK1o = +[(XMTR)^2 + (RACK1)^2]^{1/2} + PMb$

$RACK1o = +[(1.457\%)^2 + (1.255\%)^2]^{1/2} + 8.416\%$

CU = +10.339% span

Low-Low Level Trip Setpoint

The current Technical Specification TS) trip setpoint and allowable values (AV) are:

Functional Unit	Trip Setpoint	Allowable Value
Steam Generator Water Level Low-Low	≥9% of NR Instr span each Steam Generator	≥8% of NR Instr span each Steam Generator

The Analytical Limit for the low-low trip is 0% span, since a level in the narrow range in any intact steam generator is sufficient to ensure an adequate secondary inventory for a heat sink.

The low-low trip is in accordance with the uncertainties summary for each unit by adding the positive direction channel uncertainty (CU) to the Analytical limit. Margin is added for conservatism.

Where:

Unit 1
AL = 0%
CU = 12.233 %
CS = AL + CU
CS = 0% + 12.233 %
SP = 12.233 % span + Margin
SP = 12.233 % span + 1.767 % Margin
SP = 14.000% span

Margin (M) = SP - CS = 14.000% - 12.233 % = 1.767 %

The calculated trip setpoint shown above indicates that the current TS trip setpoint needs to be changed to the new calculated value that includes margin. This means that a low-low trip setpoint must be established at/or above 12.233 % to adequately protect the Analytical Limit. The Low-Low trip setpoint of 14.0% narrow range span represents channel uncertainty away from the Analytical Limit with the addition of margin for conservatism. The allowable value (AV) is recommended at 13%; as follows:

Functional Unit	Trip Setpoint	Allowable Value
Steam Generator Water Level Low-Low	≥14% of NR Instr span each Steam Generator	≥13% of NR Instr span each Steam Generator

Unit 2
AL = 0%
CU = 10.339%
CS = AL + CU
CS = 0% + 10.339 %
SP = 10.339 % span + Margin
SP = 10.339 % span + 3.661 % Margin
SP = 14.000% span

Margin (M) = SP - CS = 14.0% - 10.339 % = 3.661%

The calculated setpoint shown above indicates that the current TS setpoint needs to be changed to the new calculated value. This means that a low-low trip setpoint must be established at/or above 10.339 % to adequately protect the Analytical Limit. The low-low trip setpoint of 14.0% narrow range span represents channel uncertainty away from the Analytical Limit with the addition of margin for conservatism. The AV is recommended at 13%; as follows:

Functional Unit	Trip Setpoint	Allowable Value
Steam Generator Water Level Low-Low	≥14% of NR Instr span each Steam Generator	≥13% of NR Instr span each Steam Generator

The Allowable Value of 13% shown above is analyzed as follows:

AVs are listed within the TS and provide criteria for determining the operability of the trip channel upon periodic testing of bistable 'as found' values. Exceeding these limits requires an operability determination. For devices in Technical Specification loops where no AV is provided, such as the transmitters, indicators and recorders, an administrative limit (Acceptable Value) was established to aid the plant in determining acceptable performance. AVs and Acceptable Values are based on the SRSS of the calibration tolerance, Drift, and M&TE Uncertainties applicable to the string calibration. This calculation evaluates the TS AVs and establishes new Acceptable Values for all applicable devices in this calculation.

The AV for the low-low setpoint is ≥13.0%. To determine the acceptability of this value, the SRSS of the rack Calibration Tolerance, Drift, and M&TE effects was performed as follows. Uncertainties used in this evaluation are from Section 7.5 of the calculation.

$$\text{Acceptable Value}_{RACK1} = \pm [CAL^2_{RACK1} + DR^2_{RACK1} + MTE^2_{RACK1} + BST^2_{RACK1}]^{1/2}$$

$$\text{Acceptable Value}_{RACK1} = \pm [(0.5\%)^2 + (1.0\%)^2 + (0.112\%)^2 + (0.25\%)^2]^{1/2}$$

$$\text{Acceptable Value}_{RACK1} = \pm 1.151\% \text{ span}$$

The AV for the low-low setpoint is ≥13.0%. This is 1% from the low-low setpoint and is conservative to the calculated acceptable value shown above. Furthermore, the 1% specified drift for the rack is conservative in this specific case, since the rack is only comprised of the Resistor, Comparator and Bistable, and the AV should be slightly below 1.0%. Therefore, the AV is acceptable.