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10 CFR 50.90

RS-07-069

June 29, 2007

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

LaSalle County Station, Units 1 and 2
Facility Operating License Nos. NPF-11 and NPF-18
NRC Docket Nos. 50-373 and 50-374

Subject: Request for a License Amendment to Technical Specification 3.7.3, "Ultimate Heat Sink"

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company, LLC (EGC) is requesting a change to the Technical Specifications (TS) of Facility Operating License Nos. NPF-11 and NPF-18 for LaSalle County Station (LSCS), Units 1 and 2. Surveillance Requirement (SR) 3.7.3.1 verifies the cooling water temperature supplied to the plant from the Core Standby Cooling System (CSCS) pond (i.e., the Ultimate Heat Sink (UHS)) is ≤ 100°F. Currently, if the temperature of the cooling water supplied to the plant from the CSCS pond is > 100°F, the UHS must be declared inoperable in accordance with TS 3.7.3. TS 3.7.3 Required Action B.1 requires that both units be placed in Mode 3 within 12 hours, and Required Action B.2 requires that both units be placed in Mode 4 within 36 hours.

Prolonged hot weather in the area over the past few summers has resulted in sustained elevated cooling water temperature supplied to the plant from the CSCS pond. High temperatures and humidity during the daytime, in conjunction with minimal cooling at night and little precipitation, have resulted in elevated water temperatures in the LSCS UHS. Continued hot weather conditions in the future may result in the temperature of the CSCS cooling pond challenging the current TS limit of 100°F.

This license amendment is being sought to increase the TS temperature limit of the cooling water supplied to the plant from the CSCS pond to ≤ 101.5°F, by reducing the temperature measurement uncertainty through the use of higher precision temperature measuring equipment. Should the UHS indicated temperature exceed 101.5°F, Required Action B.1 would be entered and both units would be placed in Mode 3 within 12 hours and Required Action B.2 would be entered requiring both units to be in Mode 4 within 36 hours.

This proposed change is supported by an engineering calculation of the instrument loop uncertainty values associated with the upgraded precision temperature measuring equipment. With a higher precision method of temperature monitoring, there is an increased instrument loop accuracy and a corresponding reduction in the uncertainty value assumed in the heat removal calculations supporting the design basis events evaluated in the current analysis.

The upgraded precision temperature measuring instrumentation is installed and fully functional for both Units 1 and 2. The temperature instrumentation indicating loops are of an equivalent design to the original thermocouples and the method and procedures used to determine the CSCS pond temperature (i.e., the UHS) are unchanged from the thermocouples previously installed.

The attached amendment request is subdivided as shown below.

Attachment 1 provides an evaluation of the proposed change.

Attachment 2 provides the uncertainty analysis for the upgraded precision measuring equipment and the applicable vendor data sheets.

Attachment 3 provides a simple schematic of the CW system for LSCS.

Attachment 4 includes the markup TS page with the proposed changes indicated.

Attachment 5 includes the associated typed TS page with the proposed changes incorporated.

Attachment 6 includes the typed TS Bases pages with the proposed changes incorporated. The TS Bases pages are provided for information only, and do not require NRC approval.

EGC requests approval of the proposed change by December 1, 2007, with the amendment being implemented within 30 days of issuance.

The proposed amendment has been reviewed by the LSCS Plant Operations Review Committee and approved by the Nuclear Safety Review Board in accordance with the requirements of the EGC Quality Assurance Program.

EGC is notifying the State of Illinois of this application for a change to the TS by sending a copy of this letter and its attachments to the designated State Official in accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b).

Should you have any questions concerning this letter, please contact Ms. Alison Mackellar at (630) 657-2817.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 29th day of June 2007.

Respectfully,

Darin M. Benyak
Director, Licensing and Regulatory Affairs

Attachment 1: Evaluation of Proposed Change
Attachment 2: Uncertainty Analysis and Vendor Data Sheets
Attachment 3: Simple schematic of the CW system for LSCS
Attachment 4: Mark-up of Proposed Technical Specifications Page Change
Attachment 5: Typed Page for Technical Specifications Change
Attachment 6: Typed Pages for Technical Specifications Bases Page Changes

ATTACHMENT 1
Evaluation of Proposed Change

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1.0 DESCRIPTION

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company, LLC (EGC) is requesting a change to the Technical Specifications (TS) of Facility Operating License Nos. NPF-11 and NPF-18 for LaSalle County Station (LSCS), Units 1 and 2. Surveillance Requirement (SR) 3.7.3.1 verifies the cooling water temperature supplied to the plant from the Core Standby Cooling System (CSCS) pond (i.e., the Ultimate Heat Sink (UHS)) is ≤ 100°F. Currently, if the temperature of the cooling water supplied to the plant from the CSCS pond is > 100°F, the UHS must be declared inoperable in accordance with TS 3.7.3. TS 3.7.3 Required Action B.1 requires that both units be placed in Mode 3 within 12 hours, and Required Action B.2 requires that both units be placed in Mode 4 within 36 hours.

Prolonged hot weather in the area over the past few summers has resulted in sustained elevated cooling water temperature supplied to the plant from the CSCS pond. High temperatures and humidity during the daytime, in conjunction with minimal cooling at night and little precipitation, have resulted in elevated water temperatures in the LSCS UHS. Continued hot weather conditions in the future may result in the temperature of the CSCS cooling pond challenging the current TS limit of 100°F.

This license amendment is being sought to increase the TS temperature limit of the cooling water supplied to the plant from the CSCS pond to ≤ 101.5°F, by reducing the temperature measurement uncertainty through the use of higher precision temperature measuring equipment. Should the UHS indicated temperature exceed 101.5°F, Required Action B.1 would be entered and both units would be placed in Mode 3 within 12 hours and Required Action B.2 would be entered requiring both units to be in Mode 4 within 36 hours.

Since the proposed increase in the allowable indicated temperature is based solely on a reduction of the existing instrument loop uncertainty value, there is no change in the containment pressure response, Loss of Coolant Accident (LOCA) and non-LOCA analyses, and there is no increase in risk associated with the post-accident heat removal. In addition, there are no identified adverse influences on risk associated with any other Design Basis Accident (DBA) and therefore a Probabilistic Risk Analysis (PRA) assessment is not needed for this change.

This proposed change is supported by an engineering calculation of the instrument loop uncertainty values associated with the upgraded precision temperature measuring equipment. With a higher precision method of temperature monitoring, there is an increased instrument loop accuracy and a corresponding reduction in the uncertainty value assumed in the heat removal calculations supporting the design basis events evaluated in the current analysis.

The upgraded precision temperature measuring instrumentation is installed and fully functional for both Units 1 and 2. The temperature instrumentation indicating loops are of an equivalent design to the original thermocouples and the method and procedures used to determine the CSCS pond temperature (i.e., the UHS) are unchanged from the thermocouples previously installed.

2.0 PROPOSED CHANGES

The proposed change to SR 3.7.3.1 is identified as follows:

SURVEILLANCE		FREQUENCY
SR 3.7.3.1	Verify cooling water temperature supplied to the plant from the CSCS pond is ≤ 101.5°F.	24 hours

3.0 BACKGROUND

The UHS provides a heat sink for process and operating heat from safety related components during a transient or accident, as well as during normal operation. The Residual Heat Removal Service Water System (RHRSW) and Diesel Generator Cooling Water System (DGCW) are the principal systems that utilize the UHS to reject heat from safety related plant loads.

The UHS consists of an excavated CSCS pond integral with the cooling lake. The volume of the CSCS pond is sized to permit the safe shutdown and cooldown of both units for a 30-day period with no additional makeup water source available for normal and accident conditions. The UHS is the heat sink for heat removed from both units' reactor cores following all postulated accidents and anticipated operational occurrences in which the units are cooled down and Residual Heat Removal (RHR) is placed in service. The function of the CSCS pond is to provide for cooling of the RHR heat exchangers, diesel generator coolers, CSCS cubicle area cooling coils, RHR pump seal coolers, and Low Pressure Core Spray (LPCS) pump motor cooling coils. The CSCS pond provides indirect heat rejection for the containment through the RHR heat exchangers. The CSCS pond also provides a backup source of emergency makeup water for spent fuel pool cooling and can provide water for fire protection equipment. Neither the ability to provide emergency makeup water for spent fuel pool cooling nor fire protection is limited by heat rejection considerations. The operating limits for heat rejection capability are based on conservative heat transfer analyses for the design basis LOCA.

A single UHS supports both Units 1 and 2. The Circulating Water (CW) suction is drawn from a single intake canal and piped underground to the respective units' main condensers. The intake canal is relatively narrow with a high flow rate ensuring that there is thorough mixing prior to being drawn into the suction of the six (i.e., three per unit) circulating water pumps. The difference in piping configurations between the two units' underground supplies is minor. There are four temperature measuring devices located in the CW inlet thermowells (i.e., two per unit), that provide input to the Plant Process Computer (PPC) and are used to verify the UHS cooling water temperature supplied to the plant from the CSCS pond, therefore meeting the requirements of SR 3.7.3.1. A simple schematic of the CW system for LSCS is included in Attachment 3.

The reduction in the existing instrument loop uncertainty value does not affect the results of the heat removal calculations that ensure the post accident heat loads can be removed for 30 days without challenging the design bases of the mitigation systems.

Prolonged hot weather in the area over the past few summers has resulted in sustained elevated cooling water temperature supplied to the plant from the CSCS pond. High temperatures and humidity during the daytime, in conjunction with minimal cooling at night and little precipitation, have resulted in elevated water temperatures in the LSCS UHS. Continued hot weather conditions in the future may result in the temperature of the CSCS cooling pond challenging the current TS limit of 100°F.

This license amendment is being sought to increase the TS temperature limit of the cooling water supplied to the plant from the CSCS pond to ≤ 101.5°F, by reducing the temperature measurement uncertainty through the use of higher precision temperature measuring equipment. Should the UHS temperature exceed 101.5°F, Required Action B.1 would be entered and both units would be placed in Mode 3 within 12 hours and Required Action B.2 would be entered requiring both units to be in Mode 4 within 36 hours.

4.0 TECHNICAL ANALYSIS

4.1 <u>Safety Analysis and Design Basis</u>

The UHS removes heat from both units' reactor cores following all postulated accidents and anticipated operational occurrences in which the units are cooled down and placed in Residual Heat Removal (RHR) operation. The function of the CSCS pond is to provide for cooling of the RHR heat exchangers, Diesel Generator (DG) coolers, CSCS cubicle area cooling coils, RHR pump seal coolers, and Low Pressure Core Spray (LPCS) pump motor cooling coils. The CSCS pond provides indirect heat rejection for the containment through the RHR heat exchangers.

The safety design basis for UHS are documented in the LSCS Updated Final Safety Analysis Report (UFSAR). In the unlikely event that the cooling lake dike is breached, the submerged pond (i.e., the CSCS cooling pond) is designed to provide the UHS for LSCS. The UHS is designed in accordance with Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants," Revision 1, dated March 1974, which requires a 30-day supply of cooling water in the UHS. The basis provided in Regulatory Guide 1.27 was employed for the temperature analysis of the LSCS UHS to implement General Design Criteria 2, "Design bases for protection against natural phenomena," and Criteria 44, "Cooling water," of Appendix A to 10 CFR Part 50, "General Design Criteria for Nuclear Power Plants."

Verification of the temperature of the water supplied to the plant from the CSCS pond (i.e., the UHS) ensures that the heat removal capabilities of the RHRSW System and DGCW System are within the assumptions of the Design Basis Analysis. To ensure that the maximum post-accident temperature of water supplied to the plant is not exceeded (i.e., 104°F), the temperature during normal plant operation must be maintained less than the TS limit. This TS limit accounts for the CSCS pond design requirement that it provide adequate cooling water supply to the plant (i.e., temperature ≤ 104°F) for 30 days without makeup, while taking into account solar heat loads and plant decay heat during the worst historical weather conditions. In addition, since the lake temperature follows a diurnal cycle (i.e., it heats up during the day and cools off at night), the allowable initial UHS temperature varies with the time of day. The allowable initial UHS temperatures, based on the actual sediment level and the time of day have been determined by analysis (i.e., Reference 9). The limiting initial UHS temperature determined in this analysis ensures the maximum post-accident temperature of 104°F is not exceeded. This calculated initial temperature is an analytical limit that does not include instrument uncertainty or additional margin. This limiting initial temperature remains bounded by the proposed TS SR 3.7.3.1 limit of ≤ 101.5°F.

4.2 Operating Limits and Design Analyses

In 2005, LSCS performed an engineering evaluation (i.e., Reference 10) to assess the impact of higher inlet cooling water temperatures on plant components. This evaluation addressed the consequences of an increase in the temperature of cooling water supplied to the plant on both safety-related and non-safety related systems. For safety-related systems, the applicable components are part of the CSCS cooling system. These systems were evaluated at a conservatively higher inlet cooling water temperature of 106°F, versus the post accident peak inlet temperature of 104°F. The assessment was based on current plant equipment conditions (e.g., current equipment inspections, monitoring, heat exchanger tube plugging, and performance testing information).

The results of the evaluation demonstrated that the increased maximum inlet temperature of cooling water supplied to the plant from the CSCS pond will have no adverse affect on the safety-related plant heat exchangers or the heat loads they serve. The design requirements of these interfacing components (i.e., heat exchangers) have been reviewed and a determination made that thermal margin exists to allow for an increased cooling water inlet temperature, while maintaining an acceptable heat transfer capability.

Although margin exists to support increasing the actual inlet temperature, the proposed increase in the allowable indicated temperature is based solely on a reduction of the existing instrument loop uncertainty value, there is no change in the actual inlet temperature, therefore there is no change in the containment pressure response, LOCA and non-LOCA analyses, and there is no increase in risk associated with the post-accident heat removal. In addition, there are no identified adverse influences on risk associated with any other DBA and therefore, a PRA assessment is not needed for this change.

4.3 Instrument Uncertainty

This license amendment is being sought to increase the TS temperature limit of the cooling water supplied to the plant from the CSCS pond to ≤ 101.5°F by reducing the temperature measurement uncertainty through the use of higher precision temperature measuring equipment. The existing conservative instrument uncertainty margin of 2°F is based on the previously installed thermocouple instrument loop uncertainty value of approximately ± 1.8°F, with 0.2°F margin added. The analysis considering the newly installed measuring devices uses the same maximum post accident temperature value of 104°F; however, the new analysis calculated an instrument measurement uncertainty of 0.454°F and conservatively uses a bounding margin of 0.5°F. Therefore the indicated UHS temperature may increase from the existing TS limit of ≤100°F to ≤101.5°F based on the improved instrument uncertainty. The current accident analyses results remain unchanged since the maximum UHS temperature realized using this new analysis assumption remains unchanged.

	Existing	Proposed
TS SR 3.7.3.1	≤100°F	≤101.5°F
Transient Heat up *	2.0 °F	2.0 °F
Instrument Uncertainty	± 1.8 °F	± 0.454 °F
Additional Margin	± 0.2 °F	± 0.046 °F
UHS Maximum Post Accident Inlet Temperature	104°F	104°F

* Note that the actual calculated value for transient heat up is 1.7°F; the value of 2.0 °F is used for conservatism.

The existing instrument uncertainty value of ±1.8 °F was developed consistent with the lowest level of the EGC graded approach methodology, only considering uncertainties for major loop components and adding an appropriate level of conservatism. It was not based on a rigorous evaluation of all potential uncertainty inputs. The uncertainty value of ± 0.454 °F was determined by a rigorous evaluation of the same error terms that would be evaluated for an ESF/RPS setpoint, but using a one-sigma (1σ) confidence level.

Calculation L-003230 (i.e., Attachment 2) was prepared in accordance with the EGC Setpoint Methodology contained in Nuclear Engineering Standard NES-EIC-20.04, Revision 4, "Analysis of Instrument Channel Setpoint Error and Instrument Loop Accuracy," (i.e., Reference 11). This calculation determined the uncertainty value of ± 0.454 °F used in the analysis.

The EGC methodology utilizes a graded approach similar to that of ISA TR67.04.09, "Graded Approaches to Setpoint Determination," (i.e., Reference 12). The EGC graded setpoint methodology has not been specifically approved by the NRC, but similar approaches are widely used in the industry.

The general breakdown of the Levels in the EGC graded approach methodology is as follows:

Level 1 – Applies to Limiting Safety System Setting (LSSS) values and uses the greatest rigor in determining the setpoint value to a 95/95 state (i.e., a 95 percent probability that limits will not be exceeded in 95 percent of the cases in which they are challenged). All uncertainties that could affect the setpoint are evaluated and included in the setpoint determination.

Level 2 – Applies to setpoints or limits considered important. All uncertainties that normally could affect the trip are included in the calculations. However, because there is expected conservative design margin in the station design, only one standard deviation is used for setpoint determination.

Level 3 – Applies to setpoints or limits useful for plant operation but not safety significant. Normal uncertainties are used for the setpoint calculation, but estimates and general knowledge can be used as the source of information for a given uncertainty. One standard deviation is used for setpoint determination.

Level 4 – Applies to non-safety related setpoints. The methodology requires documentation of the engineering justification for the uncertainty used.

Regulatory Guide 1.105, "Setpoints for Safety-Related Instrumentation," Revision 3, provides guidance on instrument setpoint methodology. It also establishes that instrument settings for safety-related instrumentation should provide a 95 percent probability that limits will not be exceeded in 95 percent of the cases in which they are challenged. This has been interpreted to imply that measurement uncertainties should be established as ± 1.96 standard deviations for a normal probability distribution with two-sided uncertainty, or 1.645 standard deviations for one-sided uncertainty. General practice establishes uncertainty rounded to two standard deviations (i.e., 2-sigma (2σ)). The EGC Level 1 graded instrument uncertainty methodology is consistent with this guidance (i.e., evaluating random uncertainties at a 2σ level.)

Calculation L-003230 was prepared using the EGC Level 2 graded instrument uncertainty methodology. This level methodology is applied to instrument loops typically associated with setpoints that provide the LSCS operator with specific action values or limits used to verify plant status. This includes instrument loops that provide an indication of acceptable performance for structures, systems, and components in the TS.

The Level 2 graded methodology calculates loop uncertainty utilizing the same error terms and rigor that would be evaluated for an ESF/RPS setpoint (i.e., EGC Level 1 methodology), but combines random errors using a 1σ confidence level. Level 2 also allows combining non-random errors by Square-Root-of-the-Sum-of-the-Squares (SRSS) and allows the utilization of single-sided confidence levels where function is only evaluated in a single direction (i.e., increasing or decreasing).

The use of the EGC Level 2 graded methodology is considered acceptable for this application because of conservatism in the evaluations supporting the UHS temperature limit; application of a conservative confidence level; relatively slow changing UHS temperatures; the limited seasonal duration of concern; and the 0.5°F allowance for conservatism bounding the instrument uncertainty associated with any combination of operable temperature measurement devices.

The acceptability of the EGC Level 2 graded methodology is detailed below:

1. There is sufficient conservatism included in the evaluation that established the limit for UHS temperature. This conservatism includes the following:

    - The UHS follows a diurnal cycle, (i.e., warms up during the day and cools off at night), so its thermal response following an accident is dependent upon the temperature of the lake and the time of day when the postulated failure of the dike occurs. The evaluation analyzed for the worst-case time of day for dike failure.

    - There are multiple parameter limits used in the cooling calculations, all of which would have to be in extreme conditions to adversely affect the use of a graded approach in the calculation for UHS Temperature. These limits include:

        - UHS dredged level – the UHS analysis evaluated an average silt deposition of the TS maximum of 1.5 ft. LSCS has seen minimal silt deposition since the plant began operations.

- Tube fouling in heat exchangers – the UHS analysis evaluated for the design fouling in all associated heat exchangers. These heat exchangers are routinely monitored in a CSCS monitoring program and excessive fouling has not been a significant problem identified during testing.

- Tube plugging in heat exchangers – the UHS analysis evaluated for the design number of tubes be plugged in each heat exchanger. No heat exchangers at LSCS are plugged to the design limit and most are well below.

- Post accident weather – the UHS analysis evaluated worst-case weather conditions (i.e., for temperature and evaporative losses) for thirty days post-LOCA.

- Lake dike breached – the UHS analysis evaluated the LSCS lake drained through a breach in the dike so that only the UHS remains.

- Transient heat up analysis shows 1.7°F with margin added to a total transient heat up of 2.0°F.

The expectation that all of the above would be in extremity is very low. Therefore conservative design margin supports the use of the EGC Level 2 graded approach using 1σ for the instrument uncertainty calculation.

2. The EGC calculation evaluated random errors at the two-sided 1σ confidence level for conservatism. Application of single-sided confidence level would be appropriate for this analysis because the setpoint of concern is only for increasing temperature. Therefore, use of the two-sided confidence level provides additional conservatism.

3. The UHS temperature changes are relatively slow and the UHS temperature is always available for viewing and trending in the Main Control Room using the PPC. This allows increased attention/monitoring of the parameter as it approaches the TS limit. The PPC can display each of the four temperatures as a single point and the average for each unit. In addition, each of the CW inlet temperature data points are set to alarm at the TS limit (note that this is not a Main Control Room board annunciator). The alarm/alert consists of an audible alarm and an alarm message on the PPC.

4. The UHS TS temperature limit is typically a concern only during a period of three months during the summer. During this period, the temperature only challenges the limit for an average of four to five days. Therefore, the probability of reaching the UHS temperature limit is extremely small and supports the use of Level 2 (1σ) methodology.

5. The total instrument measurement uncertainty calculated an instrument measurement uncertainty of 0.454°F. The uncertainty for one available loop is ± 0.454°F, for two available instrument loops is ± 0.326°F, for three available loops is ± 0.270°F, and for four available loops is ± 0.236°F. It is considered extremely unlikely that three of the four RTDs or associated circuitry would be out of service simultaneously. In the unlikely event this condition was to occur, the 0.5°F allowance for conservatism bounds the

instrument uncertainty associated with any combination of operable temperature measurement devices to meet the requirements of SR 3.7.3.1.

LSCS engineering calculation L-003230 which determined the uncertainty for the upgraded instrumentation and the supporting vendor data sheets are presented in Attachment 2.

4.4 Diurnal Cycle

Because the UHS follows a diurnal cycle (i.e., heats up during the day and cools down at night), the thermal response of the UHS following an accident is dependent upon the temperature of the lake and the time of day when the postulated design basis accident and failure of the dike occur. A parametric study of UHS performance was conducted using sediment level, time of day when the postulated failure of the dike occurs, and initial UHS temperature. Historically, the UHS temperature peaks in the late afternoon. Due to diurnal cooling, the UHS temperature slowly drops over the next several hours.

If the UHS temperature were to exceed the TS limit, diurnal cooling alone would be expected to return the temperature to less than the TS limit within a few hours. Given the time required to perform a concurrent orderly shutdown of two reactors, the UHS temperature would be returned to within the TS limit before the shutdown of either unit could be accomplished, thus restoring compliance with the Limited Condition for Operation (LCO). Increasing the allowable indicated UHS temperature to 101.5°F will reduce the likelihood of simultaneous and unnecessary transients on two large reactors.

4.5 Operational Considerations

There are four temperature measuring devices located in individual CW inlet thermowells (i.e., two per unit), that provide input to the PPC which are used to verify the UHS cooling water temperature supplied to the plant from the CSCS pond and therefore meet the requirements of SR 3.7.3.1. The new high precision resistance temperature detector (RTD) temperature measuring devices use the same CW inlet thermowells that were utilized by the thermocouples. The temperature measurements recorded from the newly installed RTDs show extremely close correlation between units and between individual RTDs that is well within the instrument performance predicted by the uncertainty analysis. Thus, it is considered that the CW temperature for any of the installed RTDs on either unit is representative of the UHS temperature.

The method for determining UHS temperature did not change with the installation of the upgraded measuring devices (i.e., RTDs). Operators perform a shiftly surveillance procedure, LOS-AA-S101(201), "Unit 1(2) Shiftly Surveillance," which includes recording the daily CW inlet temperature computer point average value for both units. As stated above, the CW temperatures for any of the installed RTDs on either unit is representative of the UHS temperature required to satisfy the 24-hour SR 3.7.3.1. There is no difference in determining the UHS temperature reading to satisfy TS requirements between the old configuration (i.e., thermocouples) and the new configuration (i.e., RTDs).

There are two computer points per unit for the actual RTD loop readings (i.e., F285 = LINE A COND INLET and F286 = LINE B COND INLET). There is also one calculated computer point per unit that provides the average inlet temperature (i.e., C361 = [F285 + F286]/2). The operators obtain the UHS temperature by averaging the Unit 1 and Unit 2 temperature readings (i.e., computer points U1C361 for Unit 1 and U2C361 for Unit 2) and perform a simple average by calculating (U1C361+U2C361)/2. If a unit does not have a CW pump in operation (i.e., the unit is shutdown), the operating department surveillance procedure directs the CW temperature to be recorded from the unit that does have a CW pump in operation.

There were no changes to any PPC, I/O, or workstation configuration as a result of installing upgraded measuring devices; however, the PPC database has been updated to reflect the relocation of the CW inlet temperature loop inputs from the thermocouple cards to the analog input cards. The current alarm setpoint on individual computer points are set at 100°F. Upon approval of the proposed change to increase the temperature limit of the cooling water supplied to the plant from the CSCS pond to ≤ 101.5°F, the individual computer alarm points will be set to the new limit of 101.5°F.

The analysis considering the newly installed measuring devices uses the same peak temperature value of 104°F; however, the new analysis calculated an instrument measurement uncertainty of 0.454°F and conservatively uses a bounding margin of 0.5°F; therefore the indicated UHS temperature may increase from the existing TS limit of ≤100°F to ≤101.5°F. The current accident analyses results remain unchanged since the maximum UHS temperature realized using this new analysis assumption remains unchanged.

5.0 REGULATORY ANALYSIS

5.1 No Significant Hazards Consideration

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company, LLC (EGC) is requesting a change to the Technical Specifications (TS) of Facility Operating License Nos. NPF-11 and NPF-18 for LaSalle County Station (LSCS), Units 1 and 2. Surveillance Requirement (SR) 3.7.3.1 verifies the cooling water temperature supplied to the plant from the Core Standby Cooling System (CSCS) pond (i.e., the Ultimate Heat Sink (UHS)) is ≤ 100°F. Currently, if the temperature of the cooling water supplied to the plant from the CSCS pond is > 100°F, the UHS must be declared inoperable in accordance with TS 3.7.3. TS 3.7.3 Required Action B.1, requires that both units be placed in Mode 3 within 12 hours, and Required Action B.2 requires that both units be placed in Mode 4 within 36 hours.

Prolonged hot weather in the area over the past few summers has resulted in sustained elevated cooling water temperature supplied to the plant from the CSCS pond. High temperatures and humidity during the daytime, in conjunction with minimal cooling at night and little precipitation, have resulted in elevated water temperatures in the LSCS UHS. Continued hot weather conditions in the future may result in the temperature of the CSCS cooling pond challenging the current TS limit of 100°F.

This license amendment is being sought to increase the TS temperature limit of the cooling water supplied to the plant from the CSCS pond to ≤ 101.5°F, by reducing the temperature measurement uncertainty through the use of higher precision temperature measuring equipment. Should the indicated UHS temperature exceed 101.5°F, Required Action B.1 would be entered and both units would be placed in Mode 3 within 12 hours and Required Action B.2 would be entered requiring both units to be in Mode 4 within 36 hours.

Since the proposed increase in the allowable indicated temperature is based solely on a reduction of the existing instrument loop uncertainty value, there is no change in the containment pressure response, Loss of Coolant Accident (LOCA) and non-LOCA analyses, and there is no increase in risk associated with the post-accident heat removal. In addition, there are no identified adverse influences on risk associated with any other Design Basis Accident (DBA) and therefore a Probabilistic Risk Analysis (PRA) assessment is not needed for this change.

This proposed change is supported by an engineering calculation of the instrument loop uncertainty values associated with the upgraded precision temperature measuring equipment. With a higher precision method of temperature monitoring, there is an increased instrument loop accuracy and a corresponding reduction in the uncertainty value assumed in the current heat removal calculations supporting the design basis events evaluated in the current analysis.

The upgraded precision temperature measuring instrumentation is installed and fully functional for both Units 1 and 2. The temperature instrumentation indicating loops are of an equivalent design to the original thermocouples and the method and procedures used to determine the CSCS pond temperature (i.e., the UHS) are unchanged from the thermocouples previously installed.

According to 10 CFR 50.92, "Issuance of amendment," paragraph (c), a proposed amendment to an operating license involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not:

(1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or

(2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or

(3) Involve a significant reduction in a margin of safety.

In support of this determination, an evaluation of each of the three criteria set forth in 10 CFR 50.92 is provided below regarding the proposed license amendment.

1. The proposed TS change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

The proposed change will allow the indicated temperature of the cooling water supplied to the plant from the CSCS pond to be increased to ≤ 101.5°F based on reducing the temperature measurement uncertainty by use of higher precision temperature measuring equipment.

Analyzed accidents are assumed to be initiated by the failure of plant structures, systems, or components. An inoperable UHS is not considered as an initiator of any analyzed events. As such, there is not a significant increase in the probability of a previously evaluated accident. Allowing the UHS to operate at a higher allowable indicated temperature, but still within the design limits of the equipment it supplies, will not affect the failure probability of that equipment. The current heat analysis calculations of record for LSCS, Units 1 and 2, assume a UHS post-accident peak inlet temperature of 104°F. The proposed temperature increase is based solely on a reduction of the existing instrument loop uncertainty value. The current analysis bounds the proposed change. This higher allowable indicated temperature does not impact the LOCA Peak Clad Temperature Analysis, LOCA Containment Analysis or the non-LOCA analyses; therefore, continued operation with a UHS temperature > 100°F but ≤ 101.5°F will not increase the consequences of an accident previously evaluated in the UFSAR.

Based on the above information, the increase in the allowable indicated temperature of the cooling water supplied to the plant from the UHS to ≤ 101.5°F by reducing the existing instrument loop uncertainty value has no effect on the result of the design basis event and will continue to allow each required heat exchanger to perform its safety function. The heat exchangers will continue to provide sufficient cooling for the heat loads during the most severe 30-day period.

Based on the above information, increasing the allowable indicated temperature of the cooling water supplied to the plant from the CSCS pond from ≤ 100°F to ≤ 101.5°F by reducing the instrument uncertainty value has no impact on any analyzed accident; therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. **The proposed TS change does not create the possibility of a new or different kind of accident from any accident previously evaluated.**

The proposed change involves newly installed upgraded precision temperature measuring equipment. This proposed action will not alter the manner in which equipment is operated, nor will the functional demands on credited equipment be changed. Raising the indicated UHS temperature limit does not introduce any new or different modes of plant operation, nor does it affect the operational characteristics of any safety-related equipment or systems; as such, no new failure modes are being introduced. The proposed action reduces the instrument uncertainty value but does not alter assumptions made in the safety analysis.

Increasing the allowable indicated temperature of the cooling water supplied to the plant from the CSCS pond from ≤ 100°F to ≤ 101.5°F has no impact on safety related systems. The plant is designed such that the RHR pumps on the unit undergoing the LOCA/LOOP conditions would start upon the receipt of a signal, and would load onto their respective Emergency Diesel Generators' emergency bus during the LOOP event. The increase in the allowable indicated temperature of the cooling water supplied to the plant from the CSCS pond will not require operation of additional RHR pumps; therefore, system operation is unaffected by the proposed change in the indicated UHS temperature limit.

Based on the above information, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. **The proposed TS change does not involve a significant reduction in a margin of safety.**

   The proposed change allows an increase in the allowable indicated temperature of the cooling water supplied to the plant from the CSCS pond to ≤ 101.5°F. The margin of safety is determined by the design and qualification of the plant equipment, the operation of the plant within analyzed limits, and the point at which protective or mitigative actions are initiated. The proposed action does not impact these factors as the analyzed peak inlet temperature of the UHS is unaffected based on the improved instrument uncertainty of the upgraded high precision temperature measurement instrumentation. This change is supported by an engineering calculation of the instrument loop uncertainty values associated with upgraded precision temperature measuring equipment. The reduction in the uncertainty value associated with the temperature measuring equipment from ± 1.8°F to ± 0.454°F is based solely on the use of more precise equipment. No setpoints are affected, and no other change is being proposed in the plant operational limits as a result of this change. All accident analysis assumptions and conditions will continue to be met. Adequate design margin is available to ensure that the required margin of safety is not significantly reduced.

   Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above evaluation, EGC concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c).

5.2 Applicable Regulatory Requirements/Criteria

The design of the Ultimate Heat Sink (UHS) must satisfy the requirements of 10 CFR 50.36, "Technical Specifications," paragraph (c)(2)(ii), Criterion 3. These requirements state the following:

> (ii) A Technical Specification Limiting Condition for Operation (TS LCO) of a nuclear reactor must be established for each item meeting one or more of the following criteria:
>
> Criterion 3. A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

The proposed change does not relocate the UHS temperature limit from TS 3.7.3, "Ultimate Heat Sink," and therefore the Criterion 3 of 10 CFR 50.36(c)(2)(ii) continues to be met.

General Design Criteria 2, "Design bases for protection against natural phenomena," and General Design Criteria 44, "Cooling water," of Appendix A to 10 CFR Part 50, "General Design Criteria for Nuclear Power Plants," provides design considerations for the UHS. Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants," Revision 1, dated March 1974, provides an acceptable approach for satisfying this criterion. The basis provided in Regulatory Guide 1.27, Revision 1, was employed for the temperature analysis of the LSCS UHS.

The reduction of the existing instrument loop uncertainty value does not affect the results of the heat removal calculations that ensure the post accident heat loads can be removed for 30 days without challenging the design bases of the mitigation systems.

Regulatory Guide 1.105, "Setpoints for Safety-Related Instrumentation," Revision 3, provides guidance on instrument setpoint methodology. It also establishes that instrument settings for safety-related instrumentation should provide a 95 percent probability that limits will not be exceeded in 95 percent of the cases in which they are challenged. This has been interpreted to imply that measurement uncertainties should be established as ± 1.96 standard deviations for a normal probability distribution with two-sided uncertainty, or 1.645 standard deviations for one-sided uncertainty. General practice establishes uncertainty rounded to two standard deviations (i.e., 2σ).

The EGC Level 2 graded methodology calculates loop uncertainty utilizing the same error terms and rigor that would be evaluated for an ESF/RPS setpoint (i.e., EGC Level 1 methodology), but combines random errors using a 1σ confidence level. Level 2 also allows combining non-random errors by Square-Root-of-the-Sum-of-the-Squares (SRSS) and allows the utilization of single-sided confidence levels where function is only evaluated in a single direction (i.e., increasing or decreasing).

The use of the EGC Level 2 graded methodology is considered acceptable for this application because of conservatism in the evaluations supporting the UHS temperature limit; application of a conservative confidence level; relatively slow changing UHS temperatures; the limited seasonal duration of concern; and the 0.5°F allowance for conservatism bounding the instrument uncertainty associated with any combination of operable temperature measurement devices.

This change is supported by an engineering calculation for the instrument loop uncertainty values for the upgraded precision temperature measuring equipment. With a higher precision method of temperature monitoring, there is an increased instrument loop accuracy and a corresponding reduction in the uncertainty value utilized in the current analyzed heat removal calculations for mitigation of the design basis events.

Since the proposed temperature increase is based solely on a reduction of the existing instrument loop uncertainty value, there is no change in the containment pressure response, LOCA and non-LOCA analyses, and there is no increase in risk associated with the post-accident heat removal. In addition, there are no identified adverse influences on risk associated with any other Design Basis Accident (DBA) and therefore, a Probabilistic Risk Analysis (PRA) assessment is not needed for this change.

Impact on Previous Submittals/Precedent

EGC has previously submitted and subsequently withdrawn a temporary amendment to increase the UHS temperature limit for LaSalle County Station, Units 1 and 2, dated August 2, 2001 as documented in References 1, 2 and 3. This request was withdrawn based on the temporary nature of the amendment and the moderation of local area temperature conditions.

EGC previously submitted a license amendment request to increase the LSCS, Units 1 and 2 UHS temperature on March 13, 2006, (i.e., Reference 5) that was subsequently denied by the

NRC on November 3, 2006 (i.e., Reference 6). Following public meetings on January 26, 2007 and April 5, 2007 with the NRC, this amendment request is a re-submittal of Reference 5 with the additional information and detail based on insights from these meetings.

6.0 ENVIRONMENTAL EVALUATION

EGC has evaluated this proposed operating license amendment consistent with the criteria for identification of licensing and regulatory actions requiring environmental assessment in accordance with 10 CFR 51.21, "Criteria for and identification of licensing and regulatory actions requiring environmental assessments." EGC has determined that this proposed change meets the criteria for a categorical exclusion set forth in paragraph (c)(9) of 10 CFR 51.22, "Criterion for categorical exclusion; identification of licensing and regulatory actions eligible for categorical exclusion or otherwise not requiring environmental review," and as such, has determined that no irreversible consequences exist in accordance with paragraph (b) of 10 CFR 50.92, "Issuance of amendment." This determination is based on the fact that this change is being proposed as an amendment to the license issued pursuant to 10 CFR 50, "Domestic Licensing of Production and Utilization Facilities," which changes a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, "Standards for Protection Against Radiation," or which changes an inspection or a surveillance requirement, and the amendment meets the following specific criteria:

(i) The amendment involves no significant hazards consideration.

As demonstrated in Section 5.1, "No Significant Hazards Consideration," the proposed change does not involve any significant hazards consideration.

(ii) There is no significant change in the types or significant increase in the amounts of any effluent that may be released offsite.

The proposed change does not result in an increase in power level, does not increase the production nor alter the flow path or method of disposal of radioactive waste or byproducts. The proposed action would allow the operation of LSCS Units 1 and 2 with an increase in the allowable indicated temperature of the cooling water supplied to the plant from the CSCS pond up to ≤ 101.5°F; however, all accident analyses limits are met. It is expected that all plant equipment would operate as designed in the event of an accident to minimize the potential for any leakage of radioactive effluents; thus, there will be no change in the amounts of radiological effluents released offsite.

Based on the above evaluation, the proposed change will not result in a significant change in the types or significant increase in the amounts of any effluent released offsite.

(iii) There is no significant increase in individual or cumulative occupational radiation exposure.

There is no net increase in individual or cumulative occupational radiation exposure due to the proposed change. The proposed action will not change the level of controls or methodology used for processing of radioactive effluents or handling of solid radioactive waste, nor will the proposed action result in any change in the normal radiation levels within the plant.

Based on the above information, there will be no increase in individual or cumulative occupational radiation exposure resulting from this change.

7.0 REFERENCES

1. Letter from K. A. Ainger (Exelon Generation Company, LLC) to NRC, "Application for Amendment to Technical Specifications Surveillance Requirement for the Ultimate Heat Sink Temperature," dated August 2, 2001

2. Letter from T. W. Simpkin (Exelon Generation Company, LLC) to NRC, "Withdrawal of License Amendment Requests Related to the Ultimate Heat Sink Temperature for the Braidwood and LaSalle County Stations," dated September 21, 2001

3. Letter from NRC to O. D. Kingsley (Exelon Generation Company, LLC), "LaSalle County Station, Units 1 and 2 – Withdrawal of Amendment Request (TAC Nos. MB 2564 and MB2565)," dated October 1, 2001

4. Letter from K. R. Jury (Exelon Generation Company, LLC), "Request for a License Amendment to Technical Specification 3.7.3, 'Ultimate Heat Sink', dated March 13, 2006

5. Letter from NRC to C. M. Crane (Exelon Generation Company, LLC), "LaSalle County Station, Units 1 and 2 – Denial of License Amendment," dated November 3, 2006

6. U. S. NRC to C. M. Crane (Exelon Generation Company, LLC), "LaSalle County Power Station, Units 1 and 2 – Request for Additional Information Related to Ultimate Heat Sink License Amendment Request," dated June 15, 2006

7. Letter from J. A. Bauer (Exelon Generation Company, LLC), "Additional Information Supporting the License Amendment Request to Technical Specification 3.7.3, "Ultimate Heat Sink," dated July 13, 2006

8. Letter from D. M. Benyak (Exelon Generation Company, LLC), "Additional Information Supporting the License Amendment Request to Technical Specification 3.7.3, "Ultimate Heat Sink," dated August 4, 2006

9. LSCS Design Analysis L-002457, Revision 5, "LaSalle County Station Ultimate Heat Sink Analysis"

10. LSCS Engineering Evaluation, Revision 1, "Assessment of High Lake Temperature on the Functionality of the Plant (Summer Readiness 2005)"

11. EGC Nuclear Engineering Standard NES-EIC-20.04, Revision 4, "Analysis of Instrument Channel Setpoint Error and Instrument Loop Accuracy"

12. ISA TR67.04.09, "Graded Approaches to Setpoint Determination"

ATTACHMENT 2

LASALLE COUNTY STATION
UNITS 1 and 2

Docket Nos. 50-373 and 50-374

License Nos. NPF-11 and NPF-18

Uncertainty Analysis for the New Precision RTDs and Vendor Data Sheets

ATTACHMENT 1
Design Analysis Cover Sheet

Last Page No. 14

Analysis No.	L-003230	**Revision**	000
EC/ECR No.	361689	**Revision**	000
Title:	CW Inlet Temperature Uncertainty Analysis		

		Component(s)	
Station(s)	LaSalle		
Unit No.:	1, 2	1TE-CW010	2TE-CW010
Discipline	I & C	1TE-CW011	2TE-CW011
Description Code/ Keyword	I04	1TT-CW010	2TT-CW010
Safety Class	NSR	1TT-CW011	2TT-CW011
System Code	CW	U1 Computer Point F285	U2 Computer Point F285
Structure	N/A	U1 Computer Point F286	U2 Computer Point F286

CONTROLLED DOCUMENT REFERENCES

Document No.	From/To	Document No.	From/To

Is this Design Analysis Safeguards? Yes ☐ No ☒

Does this Design Analysis Contain Unverified Assumptions? Yes ☐ No ☒ ATI/AR#

Is a Supplemental Review Required? Yes ☐ No ☒ If yes, complete Attachment 3

	Print Name	Sign Name	Date
Preparer	T. J. Van Wyk	[signature]	8/2/06
Reviewer	V. R. Shah	[signature]	8/2/06

Method of Review ☒ Detailed Review ☐ Alternate Calculations ☐ Testing

Review Notes:

	Print Name	Sign Name	Date
Approver	L. L. Lehman	[signature]	8-2-06

(For External Analyses Only)

	Print Name	Sign Name	Date
Exelon Reviewer	N/A		
Approver	N/A		

Description of Revision (list affected pages for partials):

THIS DESIGN ANALYSIS SUPERCEDES:

CALCULATION TABLE OF CONTENTS

CALCULATION NO. L-003230	Revision 000	PAGE NO. 2
SECTION:	PAGE NO.	SUB-PAGE NO.

1 PURPOSE / OBJECTIVE

1.1 The purpose of this calculation is to evaluate the loop uncertainty for the CW Inlet Temperature Indication Loops. These are revised instrument loops that were implemented by EC359060 for Unit 1 and EC359114 for Unit 2.

1.2 These instrument loops provide Ultimate Heat Sink (UHS) temperature indication via the Plant Process Computer (PPC). These new loop configurations replaced the existing thermocouples 1(2)CW010/011 (the sensing elements for computer points F285/F286) with new RTD temperature sensing elements and new temperature compensators (transmitters), and relocated the computer inputs to the appropriate Input/Output (I/O) analog input cards.

2 METHODOLOGY AND ACCEPTANCE CRITERIA

2.1 The methodology used for this calculation is based on NES-EIC-20.04 "Analysis of Instrument Channel Setpoint Error and Instrument Loop Accuracy", Rev. 4 (Reference 5.1.2). Additionally, for calculating the average uncertainty using up to four indicating loops, the multiple test criterion of ASME PTC 19.1 (Ref. 5.1.4), Section 3.2 was used.

2.2 The instrumentation evaluated in this calculation provides indication (via the Plant Process Computer) for Ultimate Heat Sink Temperature. This is a non-safety indication loop, but the indication is used to verify the Technical Specification SR 3.7.3.1 is met. In accordance with Reference 5.1.2, Appendix D, a Level 3 evaluation is appropriate for this analysis. However, in response to questions during the NRC review of the License Amendment Request to increase the UHS temperature surveillance requirement value, this analysis will evaluate all uncertainty terms and determine the total uncertainty value using methodology consistent with safety-related indicating loops (Reference 5.1.2, Appendix D, Level 2).

2.3 Temperature, humidity and pressure errors, when available from the manufacturer, are to be evaluated with respect to the conditions specified in the station EQ Zones. If not provided, an evaluation must be made to ensure that the environmental conditions are bounded by the manufacturer's specified operational limits. If the environmental conditions are bounded, these error effects are considered to be included in the manufacturer's reference accuracy.

2.4 Published instrument vendor specifications are considered to be based on sufficiently large samples so that the probability and confidence level meets the 2σ criteria, unless stated otherwise by the vendor (Reference 5.1.2, Appendix A, Section 8.0).

2.5 For normal error analysis, normal vibrations and seismic effects are considered negligible or capable of being calibrated out in accordance with Appendix I of Reference 5.1.2.

2.6 The calibration standard error is considered negligible; the calibration standard error (STD) is more accurate than the M&TE by a ratio of at least 4:1 (Reference 5.1.2, Appendix A, Section 5.1.4).

2.7 The insulation resistance error is considered negligible unless the instrumentation is expected to operate in an abnormal or harsh environment (Reference 5.1.2, Appendix A, Section 7.0).

2.8 Reference 5.1.2, Appendix I states that the effects of normal radiation are small and accounted for in the periodic calibration process. Outside of containment during normal operation, the uncertainty introduced by radiation effects on components is considered to be negligible.

3 ASSUMPTIONS AND LIMITATIONS

3.1 Evaluation of M&TE errors for the digital multimeter is based on the assumption that the test equipment listed in Section 4.5 is used.

3.2 It is assumed that the calibration standard of the equipment utilized is more accurate than the M&TE equipment by a ratio of at least 4:1 such that the calibration standard errors can be considered negligible with respect to the M&TE specification per Section2.6. This is considered a reasonable assumption since M&TE equipment is certified to its required accuracy under laboratory conditions.

4 DESIGN INPUTS

4.1 The new instrument loops will consist of the following components: high accuracy RTD temperature elements, temperature transmitters, precision input resistors at the field input to the I/O card, and the D/A conversion in the PPC I/O equipment. The loop components evaluated in this document have the following specifications:

4.1.1 New Minco RTDs in the existing thermowells (replacing the existing thermocouples). The new RTDs have the following performance specifications (Ref. 5.4.1):

Repeatability: ±0.2°F

[The RTDs are designed to EN60751 Class A specifications with high precision and repeatability requirements. Thus, this specification could be considered to be at a 3σ confidence level. However, for conservatism, this specification will be used as a 2σ value.]

Drift: ±0.1°F/year (Ref. 5.4.3)

[The study in Reference 5.5.3 shows that RTDs are inherently stable, and after the first few months following installation RTDs attain a stable condition from which it may not drift sufficiently to exceed accuracy limits. RTD cross-calibration is performed to identify if an element has experienced significant drift. Although the RTDs are not separately calibrated, for conservatism the vendor's drift value will be expanded using the loop calibration interval of 4 years (+ 1 year late factor).]

4.1.2 The resistance value equivalent to the temperature value of interest (101.5°F) for the RTDs was obtained from the Minco calibration reports for the RTDs installed at LaSalle (Ref. 5.4.10). The highest of the four resistance values was 115.013Ω. This value will be used to determine the M&TE error for the indicating loop (applied to Module 2). The change in resistance per 1°F change in temperature (0.214Ω/°F) was also obtained using the actual resistance values in the calibration reports for 101.5°F and 102.5°F.

4.1.3 New ifm® efector600 TR2432 temperature transmitter modules. These new modules have the following performance specification (Ref.5.4.4, 5.4.5):

Accuracy (includes drift):	±0.54°F / 2 years
"Temperature Drift":	±0.1% of measured range/ 10°C

[Note: Ref. 5.4.5 indicates that the accuracy specification includes drift error and is warranted to hold the accuracy and drift within the specified value for 2 years. It further states that testing is performed on 100% of the devices after production to verify conformance with these specifications. Therefore, these values are 3σ confidence level. It also states that the accuracy specification includes the resolution error and electronic component drift, and that there are no other environmental influences that will affect the accuracy specification.]

4.1.4 PPC I/O input card. The I/O input cards have the following performance specification (Ref.5.4.9): [2σ]

Accuracy: ±0.025% of full scale (30°F to 120°F)

4.2 RTD extension wire has the identical conductor types as the RTD, and therefore there is no emf drop or change in conductor size at the point of connection on the RTD (Ref. 5.4.2).

4.3 The Instrument Loop power supply is a SOLA® SDN 2.5-24-100P (Ref. 5.4.8), which has the following performance specifications: [2σ]

Output tolerance:	± 2% overall (combined Line, load, time, and temperature related changes)
Temperature range:	-10°C to 60°C
Humidity:	< 90% RH, non-condensing

4.4 The precision signal resistor at the input terminals of the I/O card (Module 3) is a high-precision resistor with a tolerance of ± 0.02% (Reference 5.3.2) [2σ]

4.5 The loop is calibrated using a variable resistance input (to simulate the RTD input), measured with either a Fluke 45 DMM or an HP 34401A, and reading the indicated temperature at the PPC. The calibration procedures (Ref. 5.2.1 and 5.2.2) each specify that one loop will be calibrated using either the Fluke 45 OR the HP 34401A. The other loop must be calibrated using the other DMM.

4.5.1 Reference Accuracy for the Fluke 45 (medium speed) on the 300Ω range is:

(± 0.05% reading + 2 LSD + 0.02Ω) (Ref. 5.4.6) [2σ]

4.5.2 Reference Accuracy for the HP 34401A on the 1kΩ range is:

± (0.01% reading + 0.001% range) (Ref. 5.4.7) [2σ]

Temperature coefficient for the HP 34401A on the 1kΩ range is (for 0°C to 18°C and 28°C to 55°C):

± (0.0006% of reading + 0.0001% of range /°C) (Ref. 5.4.7) [2σ]

4.6 LOCAL SERVICE ENVIRONMENTS (Ref. 5.5.2)

Table 4.6

	RTDs	Ifm efector600 TR2432	Plant Process Computer
EQ Zone	H7		C1A
Location	Turbine Bldg		Control Room (Computer Room)
Temperature	83°F to 102°F		50 to 104°F (Normal: 65 to 85°F)
Pressure	0 "wc		0.125 to +3.0 "wc
Humidity	39 to 47% RH		2.6 to 90% RH [see note below]

[Note: Per reference 5.5.2, the normal expected humidity in this zone is 20 to 50% RH]

4.7 Calibration Tolerance

The calibration tolerance for these indication loops is ± 0.54°F. Per Ref. 5.1.2, this is a 3σ value.

5 REFERENCES

5.1 METHODOLOGY

5.1.1 ANSI/ISA-S67.04-Part 1-1994, "Setpoints for Nuclear Safety Related Instrumentation"

5.1.2 NES-EIC-20.04, "Analysis of Instrument Channel Setpoint Error and Instrument Loop Accuracy," Revision 4

5.1.3 ANSI/ISA TR67.04.09, "Graded Approaches to Setpoint Determination," dated 10/15/05

5.1.4 ASME PTC 19.1, Part 1, "Measurement Uncertainty," 1985

5.2 PROCEDURES

5.2.1 LIP-CW-501 [New loop-specific calibration procedure in development; tracked by CAP process]

5.2.2 LIP-CW-601 [New loop-specific calibration procedure in development; tracked by CAP process]

5.3 LASALLE STATION DRAWINGS

5.3.1 1 E-1(2)-4022ZC "Schematic Diagram, Circulating Water System CW Pt. 3," as revised by EC359060 and EC359114.

5.3.2 1 E-1(2)-4707AA, "Wiring Diagram Analog Input Cabinet 1(2)C91-P607 AITs 1,2,3,4 Left Side," as revised by EC359060 and EC359114.

5.4 VENDOR PRODUCT INFORMATION

5.4.1 Minco® Quotation 160056-2, January 26, 2006

5.4.2 Minco® Drawing S100995, dated 4/27/99

5.4.3 E-mail from Keith Johnson or Minco® to Vikram Shah of LaSalle dated 7/25/06

5.4.4 ifm efector600® TR2432 Operating Instructions, 701724/01, dated 02/04

5.4.5 Letter from Ameera Shah of ifm efector to Vikram Shah of LaSalle dated 7/26/06

5.4.6 Fluke® 45 Dual Display Multimeter Users Manual, Revision 4, dated 07/97

5.4.7 HP 34401A Multimeter User's Guide, Edition 4, printed February 1996

5.4.8 SOLA® SDN Power Supplies Specifications for SDN 2.5-24-100P

5.4.9 RTP® 8436 Series Analog Input Cards Technical Manual, 981-0021-211A, Rev. A, dated 04-96

5.4.10 Minco Report of Calibration for Platinum RTD, Model S100995PD, Serial No. P/N366

5.5 OTHER REFERENCES

5.5.1 LaSalle Technical Specifications, Sections 3.7.3, B 3.7.3, Amendments 178/164

5.5.2 LaSalle UFSAR, Rev. 16, Tables 3.11-18 and 3.11-24

5.5.3 EPRI TR-103099, "Effects of Resistance Temperature Detector Aging on Cross-Calibration Techniques," Final Report dated June 1994

6 CALCULATIONS

6.1 RTD ERRORS (MODULE 1)

6.1.1 Random Errors **σ1**

6.1.1.1 RTD Reference Accuracy **RA1**

The RTD Reference Accuracy is ±0.2°F (Section 4.1.1). This is a 2σ value.

$RA1_{2\sigma}$ = ± 0.2°F / 2

RA1 = ± 0.1°F

6.1.1.2 RTD Calibration Error **CAL1**

The RTDs are not separately calibrated. Therefore, there is no calibration tolerance for this module. (The loop calibration tolerance is applied to Module 2, which is the module that is adjusted during loop calibration.)

CAL1 = 0

6.1.1.3 RTD Setting Tolerance ST1

The RTDs are not separately calibrated. Therefore, there is no setting tolerance for this module. (The loop calibration tolerance is applied to Module 2, which is the module that is adjusted during loop calibration.)

ST1 = 0

6.1.1.4 Random Input Errors σ1in

The RTDs are the first modules in the loop. Therefore,

σ1in = 0

6.1.1.5 Drift Error D1

The RTD Drift value (IDE) specified by the vendor is ± 0.1°F/year. [2σ] The RTDs are not separately calibrated: RTD cross-calibration is performed to identify if an RTD has experienced significant drift. For conservatism the vendor's drift value will be expanded using the loop calibration interval (Section 4.1.1). The interval for these indicating loops is 4 years. The 25% late factor is 1year. (VDP is the vendor drift period, or 1 year in this case.)

$$\begin{aligned} D1_{2\sigma} &= [IDE] \times [(SI + LF)/VDP)]^{1/2} \\ &= [0.1°F] \times [(4 \text{ years} + 1\text{year})/1\text{year}]^{1/2} \\ &= 0.1°F \times 2.236 \\ &= 0.224°F \end{aligned}$$

D1 = 0.112°F

6.1.1.6 RTD Random Error **σ1**

$$\begin{aligned} \sigma 1 &= \pm [(RA1n)^2 + (CAL1)^2 + (ST1)^2 + (\sigma 1in)^2 + (D1)^2]^{1/2} \\ &= \pm [(0.1°F)^2 + (0)^2 + (0)^2 + (0)^2 + (0.112)^2]^{1/2} \\ &= \pm 0.150 °F \end{aligned}$$

σ1 = ± 0.150 °F

6.1.2 Non-Random Errors **Σe1**

RTDs are passive devices that produce a resistance signal proportional to temperature. As such, they are not affected by the following non-random effects.

Humidity Effects:	eH1 = 0
Static Pressure Effects:	eSP1 = 0
Ambient Pressure Effects:	eP1 = 0
Power Supply Effects:	eV1 = 0
Seismic Effects:	eS1 = 0
Radiation Effects:	eR1 = 0
Process Effects:	ePr1 = 0

6.1.2.1 Insulation Resistance Errors **eIR1**

Insulation Resistance error is to be evaluated where actuation functions are expected to operate in an abnormal or harsh environment (Section 2.7). There are no terminal blocks in 100% relative humidity areas, therefore,

eIR1 = 0

6.1.2.2 Resistance Drop of the Extension Wire **eRD1**

Since the RTD extension wires are made of the same material as the RTD itself, there is no emf rise or drop across the RTD head terminals (Section 4.2)

eRD1 = 0

6.1.2.3 Temperature Errors **eT1**

RTDs are designed to exhibit a precise temperature effect that is used to develop the input signal to the loop. Since the RTDs are designed to function at temperatures well above the system design temperature, there is no temperature error other than the reference accuracy error. Therefore,

eT1 = 0

6.1.2.4 Non-Random Input Errors **e1in**

The RTD is the first module in the loop. Therefore,

e1in = 0

6.1.2.5 Non-Random Error **Σe1**

Σe1 = eH1 + eSP1 + eP1 + eV1 + eS1 + eR1 + eT1 + eIR1 + ePr1 + eIR1 + eRD1 + e1in
= 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 = 0°F

Σe1 = 0°F

6.2 TEMPERATURE TRANSMITTER ERRORS (MODULE 2)

6.2.1 Random Error **σ2**

6.2.1.1 Reference Accuracy **RA2**

Reference Accuracy is ± 0.54°F (Section 4.1.3). This is a 3σ value.

RA2 = ± 0.54°F / 3 = ± 0.18°F

Per Reference 5.4.5, this accuracy includes drift and is warranted for 2 years. The calibration interval is 4 years. The 25% late factor is 1year. (VDP is the vendor drift period, or 2 years in this case.) The formula for applying the surveillance interval to Drift will be applied to the entire RA2 error term.

RA2 = $\pm$ [IDE] x [(SI + LF)/VDP)]$^{1/2}$
= $\pm$ [0.18°F] x [(4years + 1 year)/2 years)]$^{1/2}$
= $\pm$ [0.18°F] x [1.581139]

RA2 = ± 0.285°F

6.2.1.2 Calibration Error **CAL2**

The loop is calibrated using a variable resistance input, measured with a Fluke 189 DMM, and reading the indicated temperature at the PPC.

6.2.1.2.1 Measurement & Test Equipment Error **MTE2**

HP 34401A
Reference Accuracy is the manufacturer's accuracy (± 0.01% reading + 0.001% of range for the 1kΩ) as a 2σ value (Section 5.4.6). The highest reading of interest is 101.5°F. The Minco calibration reports for the RTDs show that the highest resistance value for this temperature is 115.013Ω. (Section 4.1.2)

$RAMTE_{2\sigma}$ = ± 0.01% x 115.013Ω + (0.00001 x 1000Ω)
= ± 0.0115Ω + 0.01Ω = 0.0215Ω
= ± 0.0215Ω x 1°F/0.214Ω = 0.100°F

RAMTE2 = ± 0.050°F

The manufacturer also specifies a Temperature coefficient for this range (1kΩ) for 0°C to 18°C and 28°C to 55°C as 0.0006% of reading + 0.0001% of range per °C. The normal turbine building ambient temperature in the zone where the transmitter is installed varies from 83°F to 102°F(Ref. 5.5.2). For additional conservatism, this range is expanded to 75°F to 102°F (or 23.9°C to 38.9°C). The lower temperature (23.9°C) is within the range where the coefficient is not applicable, so the applicable ΔT is: (38.9°C - 28°C) or 10.9°C

$TEMTE2_{2\sigma}$ = ±(0.0006% x 115.013Ω) + (0.000001 x 1000Ω)
= ± 0.00069Ω + 0.001Ω = ± 0.00169Ω
= ± 0.00169Ω x 1°F/0.214Ω = 0.00789°F

RAMTE2 = ± 0.00395°F

The temperature error is a degradation of the specified accuracy and is not considered an additional random error. Therefore, the total M&TE error for the HP 34401A is:

MTE2 = $\pm [(0.050°F)^2 + (0.00395°F)^2]^{1/2}$

MTE2 = ± 0.0502°F

Fluke 45 (medium speed)
Reference Accuracy is the manufacturer's accuracy [± (0.05% reading + 2 LSD + 0.02Ω)] as a 2σ value (Section 5.4.6). [The LSD for the Fluke 45 is 0.01Ω.] The highest reading of interest is 101.5°F. The Minco calibration reports for the RTDs show that the highest resistance value for this temperature is 115.013Ω. (Section 4.1.2)

$RA_{2\sigma}$ = ±(0.05% x 115.013Ω) + [(2 x 0.01Ω) + 0.02Ω]

$= \pm 0.0575\Omega + 0.04\Omega = 0.0975\Omega$
$= \pm 0.0975\Omega \times 1°F/0.214\Omega = 0.456°F$

MTE2 = ± 0.228°F

The Fluke 45 (med. speed) M&TE error is bounding and will be used to evaluate total loop uncertainty.

6.2.1.2.2 Calibration Standard Error **STD2**

The calibration standard error is evaluated as negligible (Section 3.2).

STD2 = 0

6.2.1.2.3 Loop Calibration Tolerance **ST2**

The calibration tolerance for this indicating loop is ± 0.54°F (Section 4.7). [3σ]

ST2 = ± 0.54°F / 3

ST2 = ± 0.18°F

6.2.1.2.4 Calibration Error **CAL2**

The total calibration error for the M&TE is:

$CAL2 = \pm [(MTE2)^2 + (STD2)^2 + (ST2)^2]^{1/2}$
$= \pm [(0.228°F)^2 + (0)^2 + (018)^2]^{1/2}$

CAL2 = ± 0.29°F

6.2.1.3 Ambient Temperature Error **σT2**

The vendor states the "temperature drift" error for the temperature transmitter as 0.1% of measuring range / 10°C (Ref. 4.1.3) [3σ]. This is applied in this calculation as an ambient temperature error. Measuring range: 30 to 120°F = 90°F.

The normal turbine building ambient temperature in the zone where the transmitter is installed varies from 83°F to 102°F(Ref. 5.5.2). For additional conservatism, this range is expanded to 75°F to 102°F (27°F difference).

$\sigma T2_{3\sigma} = \pm (0.1\% * Span)$
$= \pm [(0.001 * 90°F)/10°C \times (27°F \times 5°F/8°C)$
$= \pm 0.1519\ °F / 3$

σT2 = ± 0.051°F

6.2.1.4 Random Input Error **σ2In**

σ2In = σ1 = **± 0.150°F**

6.2.1.5 Power Supply Effects **σ2PS**

The transmitter specifications are valid for voltages between 20 and 30 vDC. The 24-volt power supply variability is less than ± 2% all errors combined (4.3). This is equal to 23.5vDC to 24.5vDC. Therefore,

σ2PS = ± 0 °F

6.2.1.6 Total Random Error **σ2**

$\sigma 2 = \pm [(RA2)^2 + (CAL2)^2 + (\sigma T2)^2 + (\sigma 2in)^2 + (\sigma 2PS)^2]^{1/2}$

$\sigma 2 = \pm [(0.285°F)^2 + (0.290°F)^2 + (0.051°F)^2 + (0.150°F)^2 + (0°F)^2]^{1/2}$

$\boldsymbol{\sigma 2 = \pm 0.436°F}$

6.2.2 Non-Random Error **Σe2**

6.2.2.1 Humidity Error **e2H**

No humidity effect errors are provided in the manufacturer's specifications, and the humidity conditions at the instrument location are within the operating limits of the module. Humidity errors are negligible during normal conditions. (Reference 5.1.2, Appendix I)

e2H = 0

6.2.2.2 Radiation Error **e2R**

No radiation errors are provided in the manufacturer's specifications. Per Section 2.8, it is reasonable to consider the normal radiation effect as negligible. Therefore,

e2R = 0

6.2.2.3 Seismic Error **e2S**

No seismic effect errors are provided in the manufacturer's specifications. A seismic event defines a particular type of accident condition. Therefore, there is no seismic error for normal operating conditions

e2S = 0

6.2.2.4 Static Pressure Offset Error **e2SP**

The transmitter is an electrical device and therefore not affected by static pressure.

e2SP = 0

6.2.2.5 Ambient Pressure Error **e2P**

The transmitter is an electrical device and therefore not affected by ambient pressure.

e2P = 0

6.2.2.6 Process Error **e2Pr**

The transmitter receives an analog input from an RTD. Any errors associated with the conversion of temperature to resistance have been accounted for as RTD errors. Therefore,

e2Pr = 0

6.2.2.7 Non-Random Input Error **e2In**

e2In = Σe1 = 0

6.2.2.8 Total Non-Random Error **Σe2**

$\Sigma e2 = e2H + e2R + e2S + e2SP + e2P + e2Pr + e2in$

$= 0 + 0 + 0 + 0 + 0 + 0 + 0$

$\boldsymbol{\Sigma e2 = 0}$

6.3 PPC I/O MODULE ERRORS (MODULE 3)

6.3.1 Random Error **σ3**

6.3.1.1 Reference Accuracy **RA3**

Reference Accuracy is ± 0.025% calibrated range (Ref. 5.4.9). The calibrated range is 30°F to 120°F (120°F – 30°F = 90°F).

$RA3_{2\sigma}$ = ±0.00025 x 90°F = 0.0225°F

RA3 = ±0.0113°F

6.3.1.2 Calibration Error **CAL3**

The I/O module is not separately calibrated; indication is verified during loop calibration.

CAL3 = ±0°F

6.3.1.3 Drift Error **D3**

The vendor does not specify a drift error specification for the I/O module.

D3 = ± 0°F

6.3.1.4 Random Input Error **σ3in**

σ3in = σ2 = **± 0.437°F**

6.3.1.5 Total Random Error **σ3**

$$\sigma3 = \pm [(RA3)^2 + (CAL3)^2 + (\sigma D3)^2 + (\sigma 3in)^2 + (\sigma 3r)^2]^{1/2}$$
$$\sigma3 = \pm [(0.0113°F)^2 + (0.0°F)^2 + (0°F)^2 + (0.436°F)^2]^{1/2}$$

σ3 = ± 0.436°F

6.3.2 Non-Random Error **Σe3**

6.3.2.1 Humidity Error **e3H**

No humidity effect errors are provided by the manufacturer'; specified RH for PPC equipment is 20 to 80% RH. The I/O module is located in EQ Zone C1A, (Section 4.6), where expected RH levels are 20 to 50%. Humidity errors are negligible. (Reference 5.1.2, Appendix I)

e3H = 0

6.3.2.2 Radiation Error **e3R**

No radiation errors are provided in the manufacturer's specifications. Per Section 2.8, it is reasonable to consider the normal radiation effect as negligible. Therefore,

e3R = 0

6.3.2.3 Seismic Error **e2S**

No seismic effect errors are provided in the manufacturer's specifications. A seismic event defines a particular accident condition. Therefore, there is no seismic error for normal operating conditions

e3S = 0

6.3.2.4 Static Pressure Offset Error **e3SP**

The I/O module is an electrical device and therefore not affected by static pressure.

e3SP = 0

6.3.2.5 Ambient Pressure Error **e3P**

The I/O module is an electrical device and therefore not affected by ambient pressure.

e3P = 0

6.3.2.6 Process Error **e3Pr**

The I/O module receives an analog current input from the transmitter. Any errors associated with the conversions of temperature to resistance, and resistance to current have been accounted for as errors associated with modules 1 and 2. Therefore,

e3Pr = 0

6.3.2.7 Input Signal Resistor Error **e3SR**

e3SR = ± (0.02% * Span) (Section 4.4)
= ± 0.0002 * 90°F
= ± 0.018 °F

e3SR = ± 0.018°F

6.3.2.8 Non-Random Input Error **e3In**

e3In = Σe2 = 0

6.3.2.9 Total Non-Random Error **Σe3**

Σe3 = e3H + e3R + e3S + e3SP + e3P + e3Pr + e3SR + e3in
= 0 + 0 + 0 + 0 + 0 + 0 + 0.018 + 0

Σe3 = 0.018

6.4 SUMMARY AND CONCLUSION (TOTAL ERROR)

6.4.1 As discussed in Methodology Section 2.2, Level 2 methodology is applied for determining Total Error for this indication loop:

TE = σ3 + Σe3
= ± (0.436°F)+ 0.018°F
= ± 0.454°F

TE = ± 0.454°F

In conclusion, the total uncertainty for the CW Inlet Temperature Indication loop is ± 0.454°F

6.4.2 To obtain a more accurate value of the UHS temperature using these instruments, the average of the available values can be taken. This assumes that the four readings are sensing the same input temperature and that there is little effect between the input and the measurement point.

$$T_{CWAverage} = \frac{T_{1TE-CW010} + T_{1TE-CW011} + T_{2TE-CW010} + T_{2TE-CW011}}{4}$$

The accuracy of this process is considered the same as the accuracy of summing networks addressed in References 5.1.1 and 5.1.2, or by the multiple test criterion of Reference 5.1.4 Section 3.2.

In all of these cases the final random uncertainty (σ) is the square root sum of the squares of the individual channel random uncertainties considering the multiplier for each of the uncertainties is one divided by the number of channels that are being averaged. The non-random uncertainty (e) will remain the same as for a single loop (Ref. 5.1.4, Section 3.2).

$$\sigma_{Average} = \sqrt{\left(\frac{\sigma_1}{n}\right)^2 + \left(\frac{\sigma_2}{n}\right)^2 + \left(\frac{\sigma_3}{n}\right)^2 + \bullet \quad \bullet \quad \bullet \quad \bullet + \left(\frac{\sigma_n}{n}\right)^2}$$

If all of the instrument loops are identical then this equation will reduce to:

$$\sigma_{Average} = \frac{\sigma_i}{\sqrt{n}} + e$$

Thus for the CW temperatures, the accuracy of the average of the readings for **two loops** will be:

$$\sigma_{Average} = \frac{0.436}{\sqrt{2}} + e = 0.308 + 0.018 = 0.326\ °\text{F}$$

The accuracy of the average of the readings for **three loops** will be:

$$\sigma_{Average} = \frac{0.436}{\sqrt{3}} + e = 0.252 + 0.018 = 0.270\ °\text{F}$$

The accuracy of the average of the readings for **four loops** will be:

$$\sigma_{Average} = \frac{0.436}{\sqrt{4}} + e = 0.218 + 0.018 = 0.236\ °\text{F}$$

MINCO
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L-003230 Rev. 0
Attachment A
Page A1 (final)

7300 Commerce Lane
Minneapolis, MN 55432 U.S.A.
Customer Service Telephone: 763-571-3123
Sales Inquiries Fax: 763-571-0927
Purchase Order Fax: 763-571-0942
E-Mail: custserv@minco.com

QUOTATION

To: Vikram Shah
Exelon Corporation
LaSalle County Nuclear Station
2601 N 21st Marsailles Road
Marseilles IL 61341-9757
Phone: 815-415-3828
Fax:

Fax Order to 763-571-0942 or
E-Mail Order to custserv@minco.com

Quote No: 160056-2
Page: 1
Date: January 26, 2006
RFQ: RTD Assemblies

CC: Thermo/Cense, Inc.
942 Turret Court
Mundelein, IL 60060
Phone: 847-949-8070,8071
Fax: 847-949-8074

Please Reference Above Quote Number When Placing Your Order.

Item	Description	Quantity	Unit Price U.S. $
1	Minco Part # ASSEMBLY Assembly Consisting Of: CGASSY CH359P2T6 FG113-1 FG750F8M12 XS853PD157X4 X = Class A sensor. Single Element RTD assembly	1 - 9	162.60
2	Minco Part # XRT07 Test charge for a chart of temperature readings at .1F intervals from -272F to 932F	1 - 9	425.00

Notes:

1. These assemblies will replace the existing head that is on the thermowell. This is due to not knowing how long the replacement probe would need to be. The drawing does not provide all of this information to determine the proper length. Lead time for these parts is also relatively short as compared to a special probe.
2. 1. Probe length is 15.6". This is the necessary length of the probe to fit in the thermowell and fit into the connection head.
   2. The probe diameter is .25", but will fit in the thermowell without any reduction in performance.
   3. Drift specifications on the S852 sensor is listed as +/- .2 F per year, repeatability is also +/- .2 F. This specification assumes cycling throughout the full temperature range of the sensor, from -50C to 260C. A smaller temperuture cycle will change the amount of drift.

WHEN ORDERING SPECIFY CASE LENGTH, NUMBER OF LEADS, AND LEAD LENGTH.

S100995PD48Z36 ← EXAMPLE OF MODEL NUMBER	
S100995	SPECIFICATIONS DRAWING NUMBER.
PD	SENSING ELEMENT: PD = 100 OHM ±.06%, .00385 PLATINUM.
48	CASE LENGTH A IN .1" INCREMENTS (48 = 4.8"). MINIMUM A = 28 (2.8") [71]; MAXIMUM A = 480 (48.0") [1219].
Z	NUMBER OF LEADS: Y = 2 LEADS; Z = 3 LEADS; X = 4 LEADS.
36	LEAD LENGTH B IN INCHES.

REVISIONS				
REV	DESCRIPTION	DATE	ECO	DR	APPD

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Attachment B
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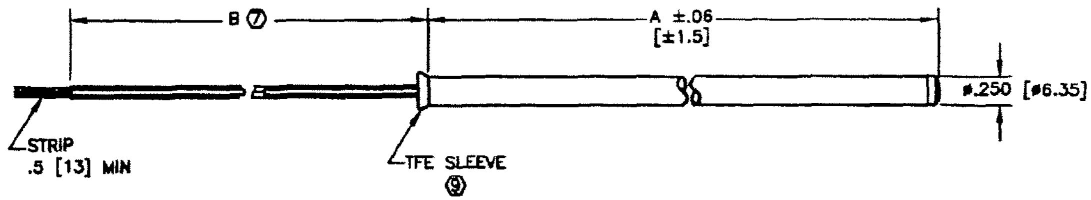
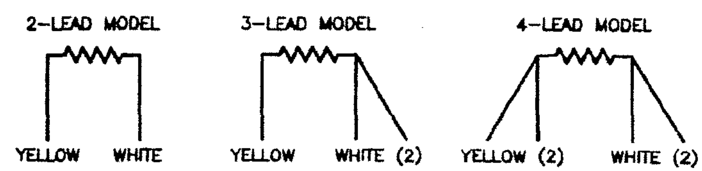


SCHEMATIC DIAGRAMS



1. ELEMENT: PLATINUM.
2. RESISTANCE: 100.00 OHMS ±.06% (100.06/99.94) AT 0°C (32°F), EXCLUDING LEADWIRE RESISTANCE; R/T TABLES #5-100 (°C) AND #6-100 (°F).
3. RESISTANCE-TEMPERATURE COEFFICIENT: .00385 OHM/OHM/°C NOMINAL FROM 0°C TO 100°C.
4. TEMPERATURE RANGE: -50°C TO 260°C (-58°F TO 500°F).
5. INSULATION RESISTANCE: 1000 MEGOHMS MINIMUM AT 500 VOLTS DC, LEADS TO CASE.
6. LEADS: AWG #22, STRANDED, TFE INSULATED.
7. ⑦ TOLERANCE ON LEAD LENGTH:
   71" [1803] AND UNDER: +2/-0" [+51/-0];
   72" TO 119" [1829 TO 3023]: +4/-0" [+102/-0];
   120" [3048] AND OVER: +6/-0" [+152/-0].
8. CASE: STAINLESS STEEL, COPPER ALLOY TIP.
9. ⑨ CASE MAY BE CUT TO SHORTER LENGTH. USE CARE NOT TO DAMAGE LEADWIRE INSULATION. LOCATE THE SLIP-FIT TFE SLEEVE IN END OF CUT-OFF CASE TO PROTECT LEADWIRE INSULATION AT POINT OF EMERGENCE. MINIMUM A FOR CUT-OFF CASE IS 28 (2.8") [71].
10. THE RESISTANCE THERMOMETER WILL MEET THE RESISTANCE-TEMPERATURE RELATIONSHIP AND TOLERANCES SPECIFIED IN IEC 751, CLASS A.

UNLESS OTHERWISE SPECIFIED DIMENSIONS AND TOLERANCES IN INCHES DIMENSIONS IN [ ] ARE IN MILLIMETERS ONE PLACE (.0) ±.020 [±0.51] TWO PLACE (.00) ±.010 [±0.25] THREE PLACE (.000) ±.005 [±0.13] ANGLES:		INITIALS	DATE	ITEM / REQD / PART/STOCK NO	MATERIAL DESCRIPTION	
	DR	WAB	04-13-99	TITLE: RESISTANCE THERMOMETER PROBE TYPE, TIP-SENSITIVE S100995 SERIES	MINCO PRODUCTS, INC. MINNEAPOLIS, MN, USA COMPANY CONFIDENTIAL PROPRIETARY INFORMATION OF MINCO PRODUCTS, INC. DO NOT DUPLICATE	
	CHK	PHP	04-27-99			
	APP				CAGE IDENT. 09359	THIRD ANGLE PROJECTION
MATERIAL:	ENGR	DLW	04-27-99			
	QA					
	PRD				S100995	REV –
FINISH:	NEXT ASSY		INIT. JOB 5–	CGP Transferred 04/27/99 WAB		
	USED ON			SCALE: NONE / STOCK NO / DWG SIZE B	SHEET 1 OF 1	

Print Date: 07/28/2006 10:12

VanWyk, Thomas J.

From: Keith Jensen [Keith.Jensen@minco.com]
Sent: Wednesday, July 26, 2006 9:22 AM
To: Shah, Vikram R.
Subject: Fwd: Exelon Corporation

100995.pdf

>>> Keith Jensen 7/25/2006 3:50 PM >>>
Vikram Shah 815-415-3828
Exelon Corporation
Marsailles IL
vikram.shah@exelon.com

XS853PD157X4 RFQ 160056-2

The S100995 probe meets the EN60751 Class A +/- 0.06% @ 0C sensor accuracy requirements

Minco estimates the drift per year over the range of 30F to 120F would be expected to be around 0.1F or less (PHP)

The drawing is attached

Keith Jensen 763-586-2908
Applications Engineer
MINCO PRODUCTS INC.
Minneapolis MN
keith.jensen@minco.com

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Attachment D
Page D1

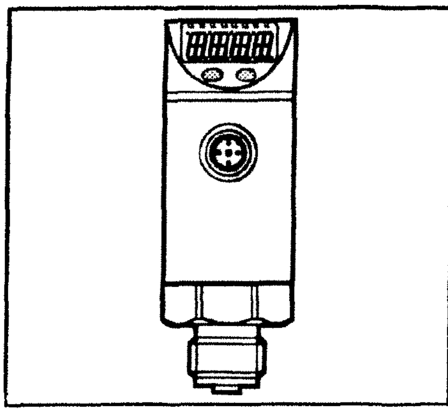
CE

ifm electronic

Bedienungsanleitung
Operating instructions
Notice utilisateurs

efector 600

Auswerteelektronik für Temperatursensoren
Control monitor for temperature sensors
Amplificateur pour sondes de température
TR2432



DEUTSCH
ENGLISH
FRANÇAIS

Sachnr. 701724/01 02/04

Technical data

Operating voltage [V]	20 ... 30 DC [1]
Current rating [mA]	250
	Short-circuit prot., reverse polarity prot. / overload prot., watchdog
Voltage drop [V]	< 2
Current consumption [mA]	< 55[2]
Constant current sensor [mA]	0.2 (Pt 1000 element)
Constant current sensor [mA]	2.0 (Pt 100 element)
Power-on delay time [s]	1.5
Response time switching output [ms]	130
Analogue output (measuring range scaleable)	4 ... 20 mA / 0 ... 10 V
Max. load current output [Ω]	(U_B - 10) x 50; 700 at U_B = 24 V
Min. load with voltage output [Ω]	2000
Response time analogue output [ms]	384
Accuracy	
Switching output [°C/°F]	± 0.3 / ± 0.54
Analog output [°C/°F]	± 0.3 / ± 0.54
Display [°C/°F]	± (0.3 / ± 0.54 + ½ Digit)
Resolution	
Switching output [°C/°F]	0.1 / 0.1
Analogue output [°C/°F]	0.1 / 0.1
Display [°C/°F]	0.1 / 0.1
Temperature drift [% of value of measuring range/10 K]	± 0.1
Housing material	stainless steel (304S15); EPDM/X (Santoprene); PC (Macrolon); Pocan; FPM (Viton)
Operating temperature [°C]	-25 ... +70
Storage temperature [°C]	-40 ... +85
Protection	IP 67, III
Insulation resistance [MΩ]	> 100 (500 V DC)
Shock resistance [g]	50 (DIN / IEC 68-2-27, 11ms)
Vibration resistance [g]	20 (DIN / IEC 68-2-6, 10 - 2000 Hz)
EMC	
EN 61000-4-2 ESD:	4 / 8 KV
EN 61000-4-3 HF radiated:	10 V/m
EN 61000-4-4 Burst:	2 KV
EN 61000-4-6 HF conducted:	10 V

[1] to EN50178, SELV, PELV;
referring to UL: see page 21 (Electrical connection).
[2] 41 mA when the display is switched off;
the values apply to the operating voltage = 24 V and unloaded outputs.

ENGLISH

ifm efector inc.
782 Springdale Drive, Exton, PA 19341 • 800-441-8246 • Fax: 800-329-0436 • www.ifmefector.com

July 26, 2006

Mr. Vikram Shah
Exelon Corporation
2601 N 21st Rd.
Marseilles, Illinois 61341

Dear Vikram:

This letter is in response to your concern about the specifications of the **ifm efector** TR2432 temperature sensor. The following points should clarify the questions that you had:

- After production, 100% of the sensors are verified and tested to the specifications listed on our datasheet.
- The analog accuracy specification of (+/- 0.54°F) already includes the analog resolution value of (0.1°F), and is inclusive of any electronic component drift.
- The temperature drift specification is the electronic drift that occurs for every 10°C change in temperature that occurs in the application. This drift is in addition to the accuracy specification.
- There are no other environmental influences that will affect the accuracy specification.
- These sensors have a warranty period of 2 years.

Please contact me if you have any further questions, or if you require any additional information.

Best regards,

Ameera Shah

Ameera Shah
Product Support Engineer
Fluid Sensors Team

Attachment F: Fluke 45 Accuracy Specifications

OHMS

Range	Resolution			Accuracy	Typical Full Full Scale Voltage	Max Current Through the Unknown
	Slow	Medium	Fast			
300Ω	—	10 mΩ	100 MΩ	0.05% + 2 + 0.02Ω	0.25	1 mA
3 kΩ	—	100 MΩ	1Ω	0.05% + 2	0.24	120 μA
30 kΩ	—	1Ω	10Ω	0.05% + 2	0.29	14 μA
300 kΩ	—	10Ω	100Ω	0.05% + 2	0.29	1.5 μA
3 MΩ	—	100Ω	1 kΩ	0.06% + 2	0.3	150 μA
30 MΩ	—	1 kΩ	10 kΩ	0.25% + 3	2.25	320 μA
300 MΩ*	—	100 kΩ	1 MΩ	2%	2.9	320 μA
100Ω	1 mΩ	—	—	0.05% + 8 + 0.02Ω	0.09	1 mA
1000Ω	10 mΩ	—	—	0.05% + 8 + 0.02Ω	0.10	120 μA
10 kΩ	100 mΩ	—	—	0.05% + 8	0.11	14 μA
100 kΩ	1Ω	—	—	0.05% + 8	0.11	1.5 μA
1000 kΩ	10Ω	—	—	0.06% + 8	0.12	150 μA
10 MΩ	100Ω	—	—	0.25% + 6	1.5	150 μA
100 MΩ*	100 kΩ	—	—	2 % + 2	2.75	320 μA

*Because of the method used to measure resistance, the 100 MΩ (slow) and 300 MΩ (medium and fast) ranges cannot measure below 3.2 MΩ and 20 MΩ, respectively. "UL" (underload) is shown on the display for resistances below these nominal points, and the computer interface outputs "+1E-9".

Open Circuit Voltage

3.2 volts maximum on the 100Ω, 300Ω, 30 MΩ, 100 MΩ, and 300 MΩ ranges, 1.5 volts maximum on all other ranges.

Input Protection

500V dc or rms ac on all ranges

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SOLA/HEVI-DUTY

SDN™ Specifications (Single Phase)

Description	SDN 2.5-24-100P	SDN 4-24-100LP	SDN 5-24-100P	SDN 10-24-100P	SDN 20-24-100P
Input					
Nominal Voltage	115/230 VAC auto select				
-AC Range	85-132/176-264 VAC				
-DC Range[6]	90-375 VDC	210-375 VDC			N/A
-Frequency	47 - 63 Hz				
Nominal Current[1]	1.3 A / 0.7 A	2.1 A / 1.0 A	2.2 A / 1.0 A	5 A / 2 A typ.	9 A/ 3.9 A
-Inrush current max.	typ. < 25 A	typ. < 20 A		typ. < 40 A	
Efficiency (Losses[2])	> 87.5% typ (8.6 W)	> 88% typ (13.1 W)	> 88% typ (16.4 W)	> 88% typ (32.7 W)	> 90% typ (48 W)
Power Factor Correction	Units Fulfill EN61000-3-2				
Output					
Nominal Voltage	24 VDC (22.5 - 28.5 VDC adj.)	24 VDC (22.5 - 25.5 VDC adj.)	24 VDC (22.5 - 28.5 VDC adj.)		
-Tolerance	< ±2% overall (combination Line, load, time and temperature related changes)				
-Ripple[3]	< 50 mVpp				
Nominal Current	2.5 A (60 W)	3.8 A (92 W)	5 A (120 W)	10 A (240 W)	20 A (480 W)
-Peak Current[4]	1.6x Nominal Current < 2 sec.	4.2 A max at 23.8V	8 A 2x Nominal Current < 2 sec.	12 A 2x Nominal Current < 2 sec.	25 A 2x Nominal Current < 2 sec.
-Current Limit	Fold Forward (Current rises, voltage drops to maintain constant power during overload up to max peak current)				
Holdup Time[5]	> 50 ms	> 100 ms	> 100 ms		> 20 ms
Parallel Operation	Single or Parallel use is selectable via Front Panel Switch (SDN4 should not be used in parallel as Class 2 rating would be violated.)				
General					
EMC: -Emissions	EN61000-6-3, -4; Class B EN55011, EN55022 Radiated and Conducted including Annex A.				
-Immunity	EN61000-6-1, -2; EN61000-4-2 Level 4, EN61000-4-3 Level 3; EN61000-4-6 Level 3; EN61000-4-4 Level 4 input and Level 3 output; EN61000-4-5 Isolation Class 4, EN61000-4-11; Transient resistance according to VDE 0160/W2 over entire load range.				
Approvals	EN60950; EN50178; EN60204; UL508 Listed, cULus; UL60950, cRUus, CE (LVD 73/23 & 93/68/EEC). EN61000-3-2, IEC60079-15 (Class 1, Zone 2, Hazardous Location, Groups A, B, C, D w/ T3A temp class up to 60°C Ambient.) SEMI F47 Sag Immunity. SDN2.5 & SDN4 - UL60950 testing to include approval as Class 2 power supply.				
Temperature	Storage: -25°C...+85°C Operation. -10°-60°C full power with operation to 70°C possible with a linear derating to half power from 60°C to 70°C (Convection cooling, no forced air required). Operation up to 50% load permissable with sideways or front side up mounting orientation. The relative humidity is < 90% RH, noncondensing; IEC 68-2-2, 68-2-3. For operation below -10°C, contact Technical Services.				
MTBF:	> 820,000 hours	> 640,000 hours		> 600,000 hours	> 510,000 hours
- Standard	Bellcore Issue 6 Method 1 Case 3 @ 40C				MIL217F @ 30C
Warranty	5 years				
General Protection/Safety	Protected against continuous short-circuit, overload, open-circuit. Protection class 1 (IEC536), degree of protection IP20 (IEC 529) Safe low voltage: SELV (acc.EN60950)				
Status Indicators	Green LED and DC OK signal (N.O. Solid State Contact rated 200 mA / 60 VDC)				
Installation					
Fusing -Input	Internally fused. External 10 A slow acting fusing for the input is recommended to protect input wiring.				
-Output	Outputs are capable of providing high currents for short periods of time for inductive load startup or switching. Fusing may be required for wire/loads if 2x Nominal O/P current rating cannot be tolerated. Continuous current overload allows for reliable fuse tripping.				
Mounting	Simple snap-on system for DIN Rail TS35/7.5 or TS35/15 or chassis-mounted (optional screw mounting set SDN-PMBRK2 required).				
Connections	Input: IP20-rated screw terminals, connector size range: 16-10 AWG (1.5-6 mm2) for solid conductors. 16-12 AWG (0.5-4 mm2) for flexible conductors. Output: Two connectors per output, connector size range: 16-10 AWG (1.5 - 6 mm2) for solid conductors.				
Case	Fully enclosed metal housing with fine ventilation grid to keep out small parts.				
-Free Space	25 mm above and below, 25 mm left and right, 10 mm in front		25 mm above and below, 25 mm left and right, 15 mm in front	70 mm above and below, 25 mm left and right, 15 mm in front	
H x W x D (Inches/mm)	4.88 in. x 1.97 in. x 4.56 in. (124 mm x 50 mm x 116 mm)	4.88 in. x 2.56 in. x 4.55 in. (124 mm x 65 mm x 116 mm)		4.88 in. x 3.26 in. x 4.55 in. (124 mm x 83 mm x 116 mm)	4.88 in. x 6.88 in. x 4.56 in. (124 mm x 175 mm x 116 mm)
Weight (lbs/g)	1 lb (460g)	1.5 lbs (620g)		2.2 lbs (1100g)	3 lbs (1520g)

[1] Input current ratings are conservatively specified with low input, worst case efficiency and power factor.
[2] Losses are heat dissipation in watts at full load, nominal input line.
[3] Ripple/noise is stated as typical values when measured with a 20 MHz, bandwidth scope and 50 Ohm resistor.
[4] All peak current is calculated at 24 Volt levels.
[5] Full load, 100 VAC Input @ T_{amb} = +25°C
[6] Not UL listed for DC input.

L-003230 Rev. 0
Attachment H
Page H1 (final)

8436/32 8-Channel Isolated Low-Level Analog Input Card

The RTP8436/32 8-Channel Isolated Analog Input Card provides high accuracy low-level (±160 mV) analog measurements. Sampling transformers provide channel-to-channel isolation. Very high noise immunity is characteristic of the transformer multiplexer, achieving 160 dB of common mode rejection. Immunity to noise is further enhanced with a two-pole low pass filter, set to provide 70 dB of normal mode rejection at 60 Hz.

Analog to digital conversion is performed by a 16-bit switched capacitor successive approximation A/D converter. A precision voltage source provides a self-test function for the card's amplifiers and A/D converter. No field adjustments are necessary after the initial factory setup.

Specifications

Input Signal Range:	± 160 mV
Multiplexer Type:	8-channel solid state multiplexer with individual transformers for complete channel-to-channel isolation
Sample Rate:	50 samples per second per channel
Accuracy:	0.025% of Full Scale
Temperature Ranges:	−25° to +85°C (−13° to +185°F), storage 0° to +55°C (+32° to +131°F), standard operating −20° to +60°C (−4° to +140°F), extended operating **Note:** Input measurements may not meet the accuracy specification at the upper or lower ends of the extended operating range.
Isolation:	600 VAC RMS or 400 VDC 1500 VAC @ 60 Hz for 60 seconds withstand
Common Mode Voltage:	600 VAC RMS or 400 VDC continuous
Common Mode Rejection:	−160 dB at 60 Hz (100Ω unbalanced)
Common Mode Crosstalk:	−150 dB at 60 Hz
Normal Mode Rejection:	2-pole low-pass filter, −70 dB at 60 Hz
Input Impedance:	5 MΩ in parallel with 10 pF at 50 samples/second per channel
Input Bias Current:	8 nA maximum at 50 samples/second per channel
Input Source Impedance:	100Ω maximum to meet accuracy specification

115200

L-003230 Rev. 0
Attachment I
Page I1

* * * Report of Calibration * * *
for
Platinum Resistance Thermometer
Model S100995PD
Serial No. P/N366

2TE-CW011

T(°F)	R(ohms)	T(°F)	R(ohms)	T(°F)	R(ohms)	T(°F)	R(ohms)
100.0	114.692	105.0	115.762	110.0	116.832	115.0	117.901
100.1	114.713	105.1	115.784	110.1	116.854	115.1	117.922
100.2	114.735	105.2	115.805	110.2	116.875	115.2	117.944
100.3	114.756	105.3	115.827	110.3	116.896	115.3	117.965
100.4	114.777	105.4	115.848	110.4	116.918	115.4	117.986
100.5	114.799	105.5	115.869	110.5	116.939	115.5	118.008
100.6	114.820	105.6	115.891	110.6	116.961	115.6	118.029
100.7	114.842	105.7	115.912	110.7	116.982	115.7	118.051
100.8	114.863	105.8	115.934	110.8	117.003	115.8	118.072
100.9	114.884	105.9	115.955	110.9	117.025	115.9	118.093
101.0	114.906	106.0	115.976	111.0	117.046	116.0	118.115
101.1	114.927	106.1	115.998	111.1	117.067	116.1	118.136
101.2	114.949	106.2	116.019	111.2	117.089	116.2	118.157
101.3	114.970	106.3	116.041	111.3	117.110	116.3	118.179
101.4	114.992	106.4	116.062	111.4	117.132	116.4	118.200
101.5	115.013	106.5	116.083	111.5	117.153	116.5	118.221
101.6	115.034	106.6	116.105	111.6	117.174	116.6	118.243
101.7	115.056	106.7	116.126	111.7	117.196	116.7	118.264
101.8	115.077	106.8	116.148	111.8	117.217	116.8	118.286
101.9	115.099	106.9	116.169	111.9	117.238	116.9	118.307
102.0	115.120	107.0	116.190	112.0	117.260	117.0	118.328
102.1	115.142	107.1	116.212	112.1	117.281	117.1	118.350
102.2	115.163	107.2	116.233	112.2	117.303	117.2	118.371
102.3	115.184	107.3	116.255	112.3	117.324	117.3	118.392
102.4	115.206	107.4	116.276	112.4	117.345	117.4	118.414
102.5	115.227	107.5	116.297	112.5	117.367	117.5	118.435
102.6	115.249	107.6	116.319	112.6	117.388	117.6	118.456
102.7	115.270	107.7	116.340	112.7	117.410	117.7	118.478
102.8	115.291	107.8	116.362	112.8	117.431	117.8	118.499
102.9	115.313	107.9	116.383	112.9	117.452	117.9	118.520
103.0	115.334	108.0	116.404	113.0	117.474	118.0	118.542
103.1	115.356	108.1	116.426	113.1	117.495	118.1	118.563
103.2	115.377	108.2	116.447	113.2	117.516	118.2	118.585
103.3	115.399	108.3	116.469	113.3	117.538	118.3	118.606
103.4	115.420	108.4	116.490	113.4	117.559	118.4	118.627
103.5	115.441	108.5	116.511	113.5	117.580	118.5	118.649
103.6	115.463	108.6	116.533	113.6	117.602	118.6	118.670
103.7	115.484	108.7	116.554	113.7	117.623	118.7	118.691
103.8	115.506	108.8	116.576	113.8	117.645	118.8	118.713
103.9	115.527	108.9	116.597	113.9	117.666	118.9	118.734
104.0	115.548	109.0	116.618	114.0	117.687	119.0	118.755
104.1	115.570	109.1	116.640	114.1	117.709	119.1	118.777
104.2	115.591	109.2	116.661	114.2	117.730	119.2	118.798
104.3	115.613	109.3	116.683	114.3	117.751	119.3	118.819
104.4	115.634	109.4	116.704	114.4	117.773	119.4	118.841
104.5	115.655	109.5	116.725	114.5	117.794	119.5	118.862
104.6	115.677	109.6	116.747	114.6	117.816	119.6	118.883
104.7	115.698	109.7	116.768	114.7	117.837	119.7	118.905
104.8	115.720	109.8	116.789	114.8	117.858	119.8	118.926
104.9	115.741	109.9	116.811	114.9	117.880	119.9	118.947
105.0	115.762	110.0	116.832	115.0	117.901	120.0	118.969

DC Characteristics

Accuracy Specifications ± (% of reading + % of range) [1]

Function	Range [3]	Test Current or Burden Voltage	24 Hour [2] 23°C ± 1°C	90 Day 23°C ± 5°C	1 Year 23°C ± 5°C	Temperature Coefficient /°C 0°C – 18°C 28°C – 55°C
DC Voltage	100.0000 mV		0.0030 + 0.0030	0.0040 + 0.0035	0.0050 + 0.0035	0.0005 + 0.0005
	1.000000 V		0.0020 + 0.0006	0.0030 + 0.0007	0.0040 + 0.0007	0.0005 + 0.0001
	10.00000 V		0.0015 + 0.0004	0.0020 + 0.0005	0.0035 + 0.0005	0.0005 + 0.0001
	100.0000 V		0.0020 + 0.0006	0.0035 + 0.0006	0.0045 + 0.0006	0.0005 + 0.0001
	1000.000 V		0.0020 + 0.0006	0.0035 + 0.0010	0.0045 + 0.0010	0.0005 + 0.0001
Resistance [4]	100.0000 Ω	1 mA	0.0030 + 0.0030	0.008 + 0.004	0.010 + 0.004	0.0006 + 0.0005
	1.000000 kΩ	1 mA	0.0020 + 0.0005	0.008 + 0.001	0.010 + 0.001	0.0006 + 0.0001
	10.00000 kΩ	100 μA	0.0020 + 0.0005	0.008 + 0.001	0.010 + 0.001	0.0006 + 0.0001
	100.0000 kΩ	10 μA	0.0020 + 0.0005	0.008 + 0.001	0.010 + 0.001	0.0006 + 0.0001
	1.000000 MΩ	5 μA	0.002 + 0.001	0.008 + 0.001	0.010 + 0.001	0.0010 + 0.0002
	10.00000 MΩ	500 nA	0.015 + 0.001	0.020 + 0.001	0.040 + 0.001	0.0030 + 0.0004
	100.0000 MΩ	500 nA // 10 MΩ	0.300 + 0.010	0.800 + 0.010	0.800 + 0.010	0.1500 + 0.0002
DC Current	10.00000 mA	< 0.1 V	0.005 + 0.010	0.030 + 0.020	0.050 + 0.020	0.002 + 0.0020
	100.0000 mA	< 0.6 V	0.01 + 0.004	0.030 + 0.005	0.050 + 0.005	0.002 + 0.0005
	1.000000 A	< 1 V	0.05 + 0.006	0.080 + 0.010	0.100 + 0.010	0.005 + 0.0010
	3.000000 A	< 2 V	0.10 + 0.020	0.120 + 0.020	0.120 + 0.020	0.005 + 0.0020
Continuity	1000.0 Ω	1 mA	0.002 + 0.010	0.008 + 0.020	0.010 + 0.020	0.001 + 0.002
Diode Test	1.0000 V	1 mA	0.002 + 0.010	0.008 + 0.020	0.010 + 0.020	0.001 + 0.002
DC:DC Ratio	100 mV to 1000 V		(Input Accuracy) + (Reference Accuracy) *Input Accuracy* = accuracy specification for the HI-LO input signal. *Reference Accuracy* = accuracy specification for the HI-LO reference input signal.			

Transfer Accuracy (typical)

$$\frac{\text{(24 hour \% of range error)}}{2}$$

Conditions:

- Within 10 minutes and ± 0.5°C.
- Within ±10% of initial value.
- Following a 2-hour warm-up.
- Fixed range between 10% and 100% of full scale.
- Using 6½ digit slow resolution (100 PLC).
- Measurements are made using accepted metrology practices.

ATTACHMENT 3

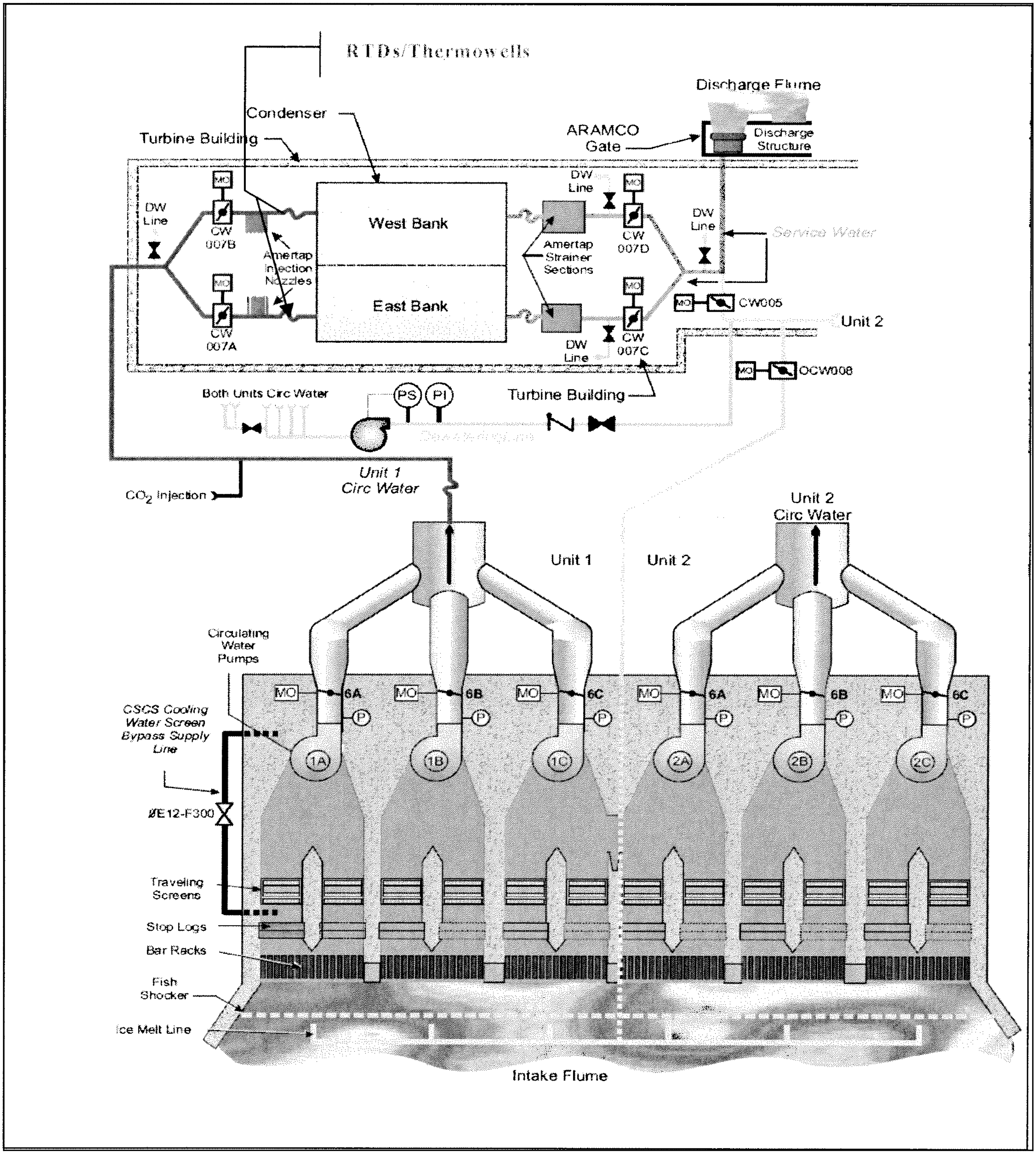
LASALLE COUNTY STATION
UNITS 1 and 2

Docket Nos. 50-373 and 50-374

License Nos. NPF-11 and NPF-18

Simple schematic of the CW system

ATTACHMENT 3
Simplified Circulating Water System



ATTACHMENT 4

LASALLE COUNTY STATION
UNITS 1 and 2

Docket Nos. 50-373 and 50-374

License Nos. NPF-11 and NPF-18

Markup of Proposed Technical Specifications Page Change

<u>REVISED TS PAGE</u>

3.7.3-2

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.3.1	Verify cooling water temperature supplied to the plant from the CSCS pond is ≤ ~~100°F.~~ 101.5°F	24 hours
SR 3.7.3.2	Verify sediment level is ≤ 1.5 ft in the intake flume and the CSCS pond.	24 months
SR 3.7.3.3	Verify CSCS pond bottom elevation is ≤ 686.5 ft.	24 months

ATTACHMENT 5

LASALLE COUNTY STATION
UNITS 1 and 2

Docket Nos. 50-373 and 50-374

License Nos. NPF-11 and NPF-18

Typed Page

for

Technical Specifications Change

<u>REVISED TS PAGE</u>

3.7.3-2

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.3.1	Verify cooling water temperature supplied to the plant from the CSCS pond is ≤ 101.5°F.	24 hours
SR 3.7.3.2	Verify sediment level is ≤ 1.5 ft in the intake flume and the CSCS pond.	24 months
SR 3.7.3.3	Verify CSCS pond bottom elevation is ≤ 686.5 ft.	24 months

ATTACHMENT 6

LASALLE COUNTY STATION
UNITS 1 and 2

Docket Nos. 50-373 and 50-374

License Nos. NPF-11 and NPF-18

Typed Pages of Proposed

Technical Specifications Bases

Page Changes

<u>REVISED TS BASES PAGES</u>

B 3.7.3-2 to B 3.7.3-5

BASES

APPLICABLE SAFETY ANALYSES (continued)

The UHS post-accident temperature is based on heat removal calculations (Ref. 5) that analyze for a maximum allowable post accident inlet cooling water temperature of 104°F. To account for the worst-case scenario and to apply conservatism, the post accident CSCS pond cooling water inlet temperature of 104°F consists of the CSCS pond TS temperature maximum of 101.5°F plus 2°F for transient heat up plus 0.5°F to account for instrument uncertainty (Ref. 6).

There are four temperature measuring devices located in the Circulating Water inlet thermowells (i.e., two per unit). The 0.5°F allowance bounds the instrument uncertainty associated with any combination of operable temperature measurement devices.

The UHS satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

OPERABILITY of the UHS is based on a maximum water temperature being supplied to the plant of 101.5°F and a minimum pond water level at or above elevation 690 ft mean sea level. In addition, to ensure the volume of water available in the CSCS pond is sufficient to maintain adequate long term cooling, sediment deposition (in the intake flume and in the pond) must be ≤ 1.5 ft and CSCS pond bottom elevation must be ≤ 686.5 ft.

APPLICABILITY

In MODES 1, 2, and 3, the UHS is required to be OPERABLE to support OPERABILITY of the equipment serviced by the UHS, and is required to be OPERABLE in these MODES.

In MODES 4 and 5, the OPERABILITY requirements of the UHS are determined by the systems it supports. Therefore, the requirements are not the same for all facets of operation in MODES 4 and 5. The LCOs of the systems supported by the UHS will govern UHS OPERABILITY requirements in MODES 4 and 5.

(continued)

BASES (continued)

ACTIONS

A.1

If the CSCS pond is inoperable, due to sediment deposition > 1.5 ft (in the intake flume, CSCS pond, or both) or the pond bottom elevation > 686.5 ft, action must be taken to restore the inoperable UHS to an OPERABLE status within 90 days. The 90 day Completion Time is reasonable based on the low probability of an accident occurring during that time, historical data corroborating the low probability of continued degradation (i.e., further excessive sediment deposition or pond bottom elevation changes) of the CSCS pond during that time, and the time required to complete the Required Action.

B.1 and B.2

If the CSCS pond cannot be restored to OPERABLE status within the associated Completion Time, or the CSCS pond is determined inoperable for reasons other than Condition A (e.g., inoperable due to the temperature of the cooling water supplied to the plant from the CSCS pond > 101.5°F, corrected for sediment level and time of day), the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 12 hours and in MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.3.1

Verification of the temperature of the water supplied to the plant from the CSCS pond ensures that the heat removal capabilities of the RHRSW System and DGCW System are within the assumptions of the DBA analysis. To ensure that the maximum post-accident temperature of water supplied to the plant is not exceeded (i.e., 104°F determined in Ref. 4), the temperature during normal plant operation must be ≤ 101.5°F (Ref. 3). This is to account for the CSCS pond design requirement that it provide adequate cooling water supply to the plant (i.e., temperature ≤ 104°F) for 30 days

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.3.1 (continued)

without makeup, while taking into account solar heat loads and plant decay heat during the worst historical weather conditions. In addition, since the lake temperature follows a diurnal cycle (it heats up during the day and cools off at night), the allowable initial UHS temperature varies with the time of day. The allowable initial UHS temperatures, based on the actual sediment level and the time of day have been determined by analysis (Ref. 5). The limiting initial UHS temperature of 102.3°F determined in this analysis ensures the maximum post-accident temperature of 104°F is not exceeded. These temperatures are analytical limits that do not include instrument uncertainty or additional margin. For example, if the lake temperature uncertainty and additional margin are determined to be 0.5°F, the limiting initial UHS temperature becomes 101.8°F. This limiting initial temperature remains bounded by the SR 3.7.3.1 limit of ≤ 101.5°F. The 24 hour Frequency is based on operating experience related to trending of the parameter variations during the applicable MODES.

SR 3.7.3.2

This SR ensures adequate long term (30 days) cooling can be maintained, by verifying the sediment level in the intake flume and the CSCS pond is ≤ 1.5 feet. Sediment level is determined by a series of sounding cross-sections compared to as-built soundings. The 24 month Frequency is based on historical data and engineering judgment regarding sediment deposition rate.

SR 3.7.3.3

This SR ensures adequate long term (30 days) cooling can be maintained, by verifying the CSCS pond bottom elevation is ≤ 686.5 feet. The 24-month Frequency is based on historical data and engineering judgment regarding pond bottom elevation changes.

(continued)

BASES (continued)

REFERENCES

1. Regulatory Guide 1.27, Revision 2, January 1976.
2. UFSAR, Section 9.2.1.
3. UFSAR, Section 9.2.6.
4. EC 334017, Rev. 0, "Increased Cooling Water Temperature Evaluation to a New Maximum Allowable of 104°F."
5. L-002457, Rev. 5, "LaSalle County Station Ultimate Heat Sink Analysis."
6. L-003230, Rev. 0, "CW Inlet Temperature Uncertainty Analysis."