NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Dresden Nuclear Power Station, Unit 2	05000237	1 of 9

TITLE (4)
Post-LOCA Temperature in the Secondary Containment higher than values used for the Environmental Qualification of Electrical Equipment Due to Original Design Error

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME: Dresden Unit 3	DOCKET NUMBER: 05000249
01	07	98	98	001	00	02	06	98	FACILITY NAME: N/A	DOCKET NUMBER: 05000

OPERATING MODE (9)	1 (1)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more) (11)							
POWER LEVEL (10)	100 (100)		20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
			20.2203(a)(2)(i)		20.2203(a)(3)(i)	X	50.73(a)(2)(ii)		50.73(a)(2)(x)
			20.405(a)(1)(ii)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
			20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)		OTHER
			20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
X	YES (If yes, complete EXPECTED SUBMISSION DATE).		NO		06	30	98

ABSTRACT (Limit to 1400 spaces, i. e., approximately 15 single-spaced typewritten lines) **(16)**

The design basis calculation for the development of the post-LOCA temperatures for the Dresden Unit 2 and 3 reactor building (secondary containment) Environmental Qualification (EQ) zones can not be located and new calculations were performed to validate the post-LOCA EQ zone temperatures. The calculated post-LOCA temperatures in the reactor building are higher than the values listed in the Dresden Updated Safety Analysis Report (UFSAR) Section 3.11, "Environmental Qualification of Electrical Equipment". The higher temperatures in the reactor building may affect the environmental qualification of equipment located in the general areas of the reactor building that need to perform safety functions during DBA/LOCA, the ability of the electrical protective devices located in the general areas of both the LOCA and the non-LOCA units to perform their intended function as designed and the instrument setpoints of instruments located in the general areas of both the LOCA and the non-LOCA units. It is not clear to what extent the higher temperatures would have affected the operability of the affected equipment, electrical protective devices and instrument setpoints. An operability evaluation was performed and compensatory actions were identified to reduce the post-LOCA temperatures in the reactor building. Sensitivity analyses that included the compensatory actions and the current lower outside ambient temperatures resulted in post-LOCA temperatures in the general areas of the reactor building of 125 degrees F. An operability determination that is based on 125 degrees F post-LOCA temperature, found all affected components to be operable on a short term basis until April 20, 1998. Further evaluation is in progress to address long term operability and identify long term resolutions.

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2527 MWt rated core thermal power

Energy Industry Identification System (EIIS) Codes are identified in the text as [XX] and are obtained from IEEE Standard 805-1984, IEEE Recommended Practice for System Identification in Nuclear Power Plants and Related Facilities.

EVENT IDENTIFICATION:

Calculated post-LOCA environmental temperatures in the Reactor Building (Secondary Containment) in both LOCA and non-LOCA unit are higher than the values in the Updated Safety Analysis Report(UFSAR) Section 3.11, "Environmental Qualification of Electrical Equipment"

A. PLANT CONDITIONS PRIOR TO EVENT:

Unit: 2(3) Event Date: 1-7-98 Event Time: 1245 CST

Reactor Mode: 1(1) Mode Name: Run(Run) Power Level: 100(100)

Reactor Coolant System Pressure: 999(996) psig

No systems or components were inoperable at the start of this event which contributed to the event.

B. DESCRIPTION OF EVENT:

This LER is being submitted pursuant to 10 CFR 50.73(a)(2)(ii)(A) which requires the reporting of any event or condition that resulted in the nuclear power plant being in an unanalyzed condition that significantly compromised plant safety.

The post-LOCA temperatures for the general areas of the reactor building listed in the UFSAR Section 3.11 is 104 degrees F. During a recent review, a Design Engineer became concerned that the 104 degrees F temperature may be too low. Dresden documentation was searched to locate the original design basis calculation and none were found. A calculation to determine the reactor building post-LOCA temperature was prepared and an independent review of this calculation is in progress. The calculated maximum post-LOCA temperatures in the general areas of the reactor building varied from 121 degrees F to 152 degrees F for both the LOCA and the non-LOCA units. The Reactor Building Temperature calculations conservatively considered a LOCA without LOOP. LOCA concurrent with LOOP will result in lower temperatures in the general areas of the reactor building.

Various components such as ECCS equipment, Reactor protection instrumentation, MOV's, Motor control centers, Reactor Instrumentation, etc. located in the reactor building that are required to perform post-LOCA safety function, and to allow the non-LOCA unit to achieve and maintain cold shutdown are affected by the higher temperatures in the general areas of the reactor building. The higher temperatures in the general areas of the reactor building may affect the environmental qualification of equipment that need to perform safety functions during DBA/LOCA, the ability of the electrical protective devices in both the LOCA and the non-LOCA units to perform their intended function as designed and setpoints of instruments in both the LOCA and the non-LOCA units. In summary, mitigating the consequences of a LOCA and bringing the LOCA unit to safe shutdown, meeting the GDC criteria 19 requirements limiting the control room operator dose, meeting the off site dose requirement per 10 CFR 100 and achieving and maintaining cold shutdown of the non-LOCA unit may be affected by the higher post-LOCA temperatures in the reactor building of both LOCA and non-LOCA units.

A sensitivity analysis was performed to identify compensatory measures that could lower the post accident temperatures in the reactor building. Based on the sensitivity analysis compensatory actions were taken to minimize the post accident temperatures in the reactor building. As a result of the compensatory actions and the current low outside ambient temperatures, the calculated maximum post-LOCA temperatures in the general areas of the reactor building are limited to 125 degrees F for both the LOCA and the non-LOCA units. Based on historical environmental condition and the compensatory actions, an operability evaluation found all affected components to be operable on a short term basis until April 20,1998. Further evaluation is in progress to address long term operability and resolutions.

C. CAUSE OF EVENT:

The cause of this event is original design error in the development of the post-LOCA temperatures for the EQ zones in 1980. The post-LOCA temperatures in the EQ zones with LOCA heat sources were based on normal EQ zone temperatures and the LOCA heat load. The post-LOCA temperatures in EQ zones without LOCA heat sources were assumed to be the same as the normal EQ zone temperatures. The main cause for the event is ignoring the slow build up of temperatures in the reactor building of both LOCA and non-LOCA unit due to the combined effect of loss of ventilation due to the post-LOCA isolation of the secondary containment and heat load generated in the reactor building due to operating equipment and lighting. The significance of the above heat build up was not understood when the post-LOCA temperatures for the EQ Zones were determined. Ignoring the heat load from one EQ zone to the other due to conduction through walls was a contributing factor. (NRC Cause Code: A)

D. SAFETY ANALYSIS

During post-LOCA, the Reactor Building (RB) HVAC is isolated, the RB isolation dampers are closed, the ventilation fans are shut down, and the Standby Gas Treatment System (SBGTS) is activated. The SBGTS is designed to maintain negative pressure in the secondary containment. The heat removed by the SBGTS and the heat loss through the building walls are less than the heat generated by the equipment and lighting. The net addition of heat into the secondary containment due to the loss of reactor building ventilation results in long term heat build-up in the reactor building.

The post-LOCA temperature in the general areas of the reactor building listed in the UFSAR Section 3.11 is 104 degrees F. The maximum temperatures in the general areas of the reactor building from the recent calculation varied from 121 degrees F to 152 degrees F for both the LOCA and the non-LOCA units. The above calculation was based on a 30 day average summer outside maximum ambient temperatures. If the outside temperatures are lower as currently exist, the maximum post-LOCA temperature in the reactor building will be lower. The reactor building temperature calculations conservatively considered a LOCA without LOOP. If LOCA concurrent with LOOP is used in the calculation, the resulting post-LOCA temperatures in the reactor building will be lower.

A sensitivity analysis was performed to identify factors that could lower the post accident temperatures and the following was found to lower the post-LOCA temperature in the general area of the reactor building:

Using lower outside temperature will result in lower temperature build up in the reactor building. Based on historical data, the maximum average dry bulb temperature of 68 degrees F for 30 days is representative for the month of May and average dry bulb temperature of 44 degrees F for 30 days is representative for the month of March. The average outside dry bulb temperature for 30 days of 44 degrees F can be used to demonstrate short term operability until Feb. 21, 1998 and average outside dry bulb temperature for 30 days of 68 degrees F can be used to and demonstrate short term operability until April 20, 1998.

The tarpaulin used to close equipment hatches at 613 level of the reactor building can be removed to increase natural convective air flow in the reactor building and increase the heat loss through the reactor building roof. (The tarpaulin can only be installed during a refueling outage in the unit which is in refueling only)

The non-LOCA unit can commence shut down within 12 hours after the LOCA and be in cold shut down within 20 hours post-LOCA and reduce heat load due to equipment in the non-LOCA unit.

The initial reactor building temperature can be maintained at less than or equal to 98 degrees F prior to the accident to increase the time required to reach maximum temperatures in the reactor building.

Only one shut down cooling pump can be used in the non-LOCA unit to reduce the heat load

Shut down the Reactor Water Clean-Up system in the non-LOCA unit within 2 hours after the LOCA.

Limit the number of fuel pool cooling pumps operated in the LOCA and non-LOCA units to one per unit within 2 hours after the LOCA and thus reduce the heat load into the non-LOCA unit Reactor Building.

The south turbine building roll up doors can be opened (if the turbine building ventilation is not operating) within 12 hours after the LOCA to increase the heat loss from the reactor building through the reactor building/turbine building wall.

With the outside average dry bulb temperature of 44 degrees F for 30 days and all of the above compensatory actions in place the maximum post-LOCA temperature in the general area of the reactor building is limited to 125 degrees F in both the LOCA and the non-LOCA units. When the outside average dry bulb temperature for 30 days is greater than 44 degrees F and less than 68 degrees F, the lights in the reactor building must also be turned off within 48 hours of LOCA to limit the maximum post-LOCA temperature in the reactor building to 125 degrees F.

Various components located in the reactor building that are required to perform post-LOCA safety functions and to allow the non-LOCA unit to achieve and maintain cold shutdown were evaluated for the higher temperatures in the general areas of the reactor building. All equipment needed to perform the following safety functions were included in the evaluation:

To mitigate the consequences of LOCA and bring the LOCA unit to safe shutdown
To meet the GDC criteria 19 requirements limiting the control room operator dose.
To meet the off site dose requirement per 10 CFR 100.
To achieve and maintain cold shutdown of the non-LOCA unit

In summary, various components such as ECCS equipment, Reactor protection instrumentation, MOV's, Motor control centers (AC & 250 VDC), Reactor Instrumentation (Vessel Level, Pressure, etc. are affected. The UFSAR Sections 3.11 and 10 CFR 50.49 (EQ) Licensing Basis are affected by the higher temperatures in the reactor building and failure of equipment to operate at elevated temperatures could have resulted in unmonitored release in excess of 10 CFR 100 limits.

The higher temperatures in the reactor building affect the environmental qualification of equipment located on the general areas of the reactor building of both the LOCA and the non-LOCA units that need to perform safety functions during DBA/LOCA, the ability of the electrical protective devices that are located in the general areas of the reactor building of both the LOCA and the non-LOCA units to perform their intended function as designed and the instrument setpoints of instruments that are located on the general areas of the reactor building of both the LOCA and the non-LOCA units. The evaluation of the affected components in the LOCA and non-LOCA units for reactor building general area temperature of 125 degrees F is presented below:

Environmental qualification

Based on engineering judgment most of the Class 1E equipment located in the reactor building is the same type that is included in the Dresden Environmental Qualification (EQ) program and will perform its safety function up to an elevated temperatures of 145 degrees F. Calculations demonstrated that Class 1E equipment located in the RB would perform its safety related functions at an elevated temperature up to 145 degrees F. Since the elevated temperature of 145 degrees F bounds the post-LOCA temperature of 125 degrees F, the Class 1E equipment located in general areas of Reactor Building will perform its functions at the temperatures resulting from post-LOCA conditions.

Electrical Protective Devices

The electrical power protective devices and instruments setpoints temperature compensation factor may not be affected because sufficient margin may be available in the calculations and the vendor data. Assessment of equipment ability to perform their safety function at elevated temperatures demonstrated that equipment should perform its function based on previous experience. However, no detailed calculations are available. Based on experience with Dresden's equipment, the thermal overloads have been noted to be oversized, so they will support operation at elevated temperatures.

Based upon the evaluated temperatures in the reactor buildings especially on the 517', 535' and the 570' elevations, a concern exists with the electrical protection devices such as molded case circuit breakers, fuses, and thermal overload (TOL) devices. These devices are inherently temperature sensitive. For molded case circuit breakers there are two types that need to be addressed. These are magnetic and thermal-magnetic only.

Circuit Breakers

The magnetic only circuit breakers are usually used in a combination MCC starter along with thermal overload relays and thermal overloads. The magnetic circuit breaker is sized to allow for motor starting and acceleration and yet protect the field cable under fault conditions. These types of breakers are the least susceptible to elevated temperatures since they do not contain a thermal trip element.

Thermal-magnetic type circuit breakers are used for non-rotating loads such as transformers and heating elements. These circuit breakers are there to protect the field cable and as well to supply the electrical load requirements. Although this specific circuit breaker does contain a thermal trip element and elevated temperature can affect its performance, it is anticipated based upon circuit breaker selection criteria, sufficient margin exists to address the higher than expected temperature.

Good engineering practices utilized the sizing criteria of the circuit breaker to protect the field cable and not the loads or service. This practice allows for larger sized circuit breakers than needed.

The Dresden EQ Binders contain the qualification of the motor control centers. The qualification included testing the MCC at 131 degrees F(55 degrees C) for 96 hours. The testing included size 1, 2, and 3 starters for continuous duty motors. This test utilized both types of circuit breakers with various amperage trip ratings. Based on this, they are found to be acceptable for a post-LOCA temperature of 125 degrees F.

Thermal Overload Heaters

In selecting TOL heaters, a greater importance is placed on preventing spurious actuation of equipment than other selection criteria (i.e., overvoltage, undervoltage, etc.). In this regard, consideration is often given to selecting the next larger heater size. As a base criterion, the minimum TOL heater rating must be between 110 percent and 125 percent of motor full load current (FLI), depending on the motor service factor, and could be as high as 130 percent to 140 percent of FLI, again depending on motor service factor. From a historical perspective, there are no formally documented bases for original TOL sizes.

The Dresden EQ Binders contain the qualification of motor control centers. The qualification included testing the MCC at 131 degrees F (55 degrees C) for 96 hours. The testing included size 1, 2, and 3 starters for continuous duty motors. The heater elements and currents used are consistent with normal sizing methods listed in the sizing methods listed in the GE application catalog.

As part of the GL 89-10 program, the overloads for the MOVs were calculated using the assumptions of 50 degrees C ambient, twice full load current, and two strokes in determining acceptable thermal overload heater sizes.

In addition, as modifications have been made to existing systems over the years and the associated TOL's were impacted by the change, calculations have been performed to document the heater selection. During the selection process of the new TOL heater, a general observation that the original heater selections were very conservative has been made. These heater sizes were usually one size larger than required by the current ComEd selection criteria.

Based on the above, it is judged that sufficient margin exists in the TOL trip ratings to offset any premature tripping that could occur as a result in the increase in ambient temperature.

Motors

The life of a motor is dependent on the temperature of the winding insulation. Continuous duty motors have insulation systems that are designed function at 105 degrees C (typically 65 degrees C rise over a 40 degrees C ambient). In addition the 10 degrees C rule states that the insulation life is reduced by 50 percent for each 10 degrees C above its rated maximum. However the Dresden motors used to reach shutdown or mitigate an accident are not operated for years at a time and the brake horsepower required by most motors is somewhat less than the motor rating. Therefore, potentially operating at a higher ambient temperature may have an impact on insulation life, but would not impact the functionality of the motor and sizing a TOL for the higher current is acceptable.

Fuses

Fuses are used in the reactor building in the control circuits of MCCs and switchgear in both AC and DC applications. Control circuits are typically "non-dual element" type. Based on vendor data, a non-dual element type fuse would have a current rating of between 90-95 percent of its normal rating when used in a 140 degrees F ambient. Standard practice sizes fuses to at least 125 percent of the maximum load seen by the circuit. Therefore, a fuse meeting these criteria would not open on designed load current.

Instrumentation Setpoint Calculation Review

Instrument setpoint calculations have been sampled and these will support operation at an elevated temperature as well. A preliminary design engineering review was performed on various setpoint calculations to determine the effect of elevated temperatures in the non-LOCA unit reactor building within the first 24 hours after a LOCA in the opposite unit. This review was based on the time/temperature profiles identified in the base case. Temperature effects are addressed within the setpoint calculation methodology. Temperature effects can be significant to the final setpoints, but are dependent upon the specific type of instrument, the process monitored, and the installation configuration. Most of the affected Tech Spec instruments and some of the other safety related instruments and their corresponding setpoint calculations were reviewed. Positive margin for all reviewed calculations is maintained by using temperature effects that calculate the maximum temperature changes between the average ambient temperature during calibration for normal plant operating conditions and the maximum temperature identified in the base case calculation.

In conclusion, based on preliminary review of the design margins for breakers, thermal overloads and instruments setpoints it is determined by engineering judgment that all affected components will perform their safety functions up to 125 degrees F reactor building temperature. Further, based on engineering judgment most of the known equipment located in the reactor building is of the same type that is included in the EQ program and would perform its safety function at elevated temperatures up to 145 degrees F.

E. CORRECTIVE ACTIONS:

The following compensatory actions were taken to reduce the calculated maximum post-LOCA temperatures in the general areas of the reactor building:

The tarpaulin used to close the equipment hatches at 613 level of the reactor building was removed. The tarpaulin can only be installed during a refueling outage in the unit which is in refueling only. (complete)

Administrative measures were taken to limit the normal reactor building temperature to less than or equal to 98 F. (complete)

Administrative measures were taken to require opening the south turbine building roll up doors (if the turbine building ventilation is not operating) within 12 hours after the LOCA. (complete)

Administrative measures were taken to limit the number of shut down cooling pumps operated during the shutdown of the LOCA and non-LOCA unit to one per unit. (complete)

Administrative measures were taken to commence shut down of the non-LOCA unit within 12 hours after the LOCA and in cold shut down within 20 hours post-LOCA. (complete)

Administrative measures were taken to shut down the Reactor Water Clean-Up system in the non-LOCA unit within 2 hours after the LOCA. (complete)

Administrative measures were taken to limit the number of fuel pool cooling pumps operated in the LOCA and non-LOCA units to one per unit within 2 hours after the LOCA and thus reduce the heat load into the non-LOCA unit Reactor Building. (complete)

Administrative measures will be taken prior to February 21, 1998, to shut off the non emergency lights of the reactor building in 48 hours or further evaluation will be performed to justify continued operation. (NTS 237-180-98-00106)

Based on the current operability evaluation, Dresden Units 2 and 3 are operable until April 20, 1998. The corrective actions for the resolution of the higher post-LOCA temperatures in the reactor building has not been finalized. A follow-up response will include the corrective actions to restore the degraded condition. The following corrective actions will be taken to restore the degraded condition.

Perform an independent review of the reactor building post-LOCA temperature calculations. (NTS 237-180-98-00105)

Develop a long term plan to reduce the post-LOCA temperatures in the Reactor Building or qualify the affected equipment. (NTS 237-180-98-00104)

Review the basis of the post-LOCA temperatures for the other EQ zones in Section 3.11 of the UFSAR and update Section 3.11 of the UFSAR. (NTS 237-180-98-00101)

The following corrective action will prevent reoccurrence.

Currently design inputs and engineering calculations are controlled by ComEd NEP 12-01 and 12-02. Engineering input similar to the EQ zone temperatures are required to be documented in engineering calculations that are prepared, reviewed and approved per NEP 12-02 (Complete)

F. PREVIOUS OCCURRENCES:

None.

G. COMPONENT FAILURE DATA:

Not applicable. No component failed.