LICENSEE EVENT REPORT (LER) Form Rev. 2.0

Facility Name (1)	Docket Number (2)	Page (3)
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Title (4) The Design Ba of the Quad Cities Station Reactor Building Superstructure is not in Literal Conformance With Updated Final Safety Analysis Report (UFSAR) Description as it Per.. Class I Loading Combinations. The FSAR, when Originally Written, Lacked Sufficient Detail in Description of Class I Structure Loading Combinations for Addressing Infrequent Loading Conditions Concurrent With a Seismic Event.

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 Names	Docket Number(s)
0 1	1 5	9 8	9 8	0 0 7	0 0	0 2	1 1	9 8	Quad Cities Unit 2	0 5 0 0 0 2 6 5

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)					
4	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)		
POWER LEVEL (10) 0 0 0	20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)		
	20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	Other (Specify in Abstract below and in Text		
	20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)			
	20.405(a)(1)(iv)	X 50.73(a)(2)(ii)	50.73(a)(viii)(B)			
	20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)			

LICENSEE CONTACT FOR THIS LER (12)

Name	TELEPHONE NUMBER
Charles Peterson, Regulatory Affairs Manager, ext. 3609	AREA CODE 3 0 9 6 5 4 - 2 2 4 1

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)		Expected Submission Date (15)	Month	Day	Year
X YES (If yes, complete EXPECTED SUBMISSION DATE)	NO		* *	* *	* *

ABSTRACT (Limit to 1400 spaces, i.e. approximately fifteen single-space typewritten lines) (16)

ABSTRACT:

The UFSAR identifies the applicable loading combinations for Class I structures. The loading combinations are generically listed and include dead loads, live loads, seismic loads, etc. The UFSAR does not elaborate how these loads are to be combined when considering Reactor Building (RB) over head crane loading effects. The identified concern is that the current design basis calculation for the RB superstructure is not in literal conformance with the UFSAR description of Class I loading combinations. This is due to the fact that the FSAR, when originally written, lacked sufficient detail in description of Class I loading combinations for addressing infrequent loading conditions (such as the crane) concurrent with a seismic event.

At the time of event discovery, the RB overhead crane was in its normally parked position where it has been demonstrated that the superstructure design is in full conformance with the UFSAR description of Class I loading combinations. The crane was administratively taken Out-Of-Service (OOS) in the parked position. The safety significance of the identified concern cannot yet be determined.

Reconstitution of RB superstructure calculations is currently being performed. Upon completion of the reanalysis, the safety significance can be determined. No previous concerns associated with the RB superstructure design have been identified. Upon completion of the analysis and investigation, a supplemental LER will be submitted.

*Indeterminate at this time.

PLANT AND SYSTEM IDENTIFICATION:
General Electric - Boiling Water Reactor - 2511 MWt rated core thermal power.

EVENT IDENTIFICATION: The design basis of the Quad Cities Station Reactor Building (RB) superstructure is not in literal conformance with Updated Final Safety Analysis Report (UFSAR) description of Class I loading combinations. This is due to the fact that the FSAR, when originally written, lacked sufficient detail in description of Class I loading combinations for addressing infrequent loading conditions (such as the crane) concurrent with a seismic event.

A. CONDITIONS PRIOR TO EVENT:

Unit:	1	Event Date:	011598	Event Time:	1449 EST
Reactor Mode:	4	Mode Name:	Cold Shutdown	Power Level:	000%
Unit:	2	Event Date:	011598	Event Time:	1449 EST
Reactor Mode:	4	Mode Name:	Cold Shutdown	Power Level:	000%

This report was initiated by Licensee Event Report 254/98-007.

Cold Shutdown (4) - Mode switch in Shutdown position with average reactor coolant temperature ≤ 212 degrees F.

B. DESCRIPTION OF EVENT:

During a calculation review relating to the Dresden Station Dry Cask Storage project, a 1973 unsigned Dresden calculation (Project No. 4805-4806 dated 12-14-73) was identified that contained information indicating applicability to Quad Cities Station. The subject calculation provided stress interaction results for the Reactor Building (RB) [NH]overhead crane [CRN] support girders, crane support columns, and associated building columns for both Dresden Station and Quad Cities Station.

The 1973 calculation tabulated localized over-stress conditions for the corresponding Quad Cities Station building columns considering the crane dead weight with a concurrent seismic event. The Quad Cities stress interaction values tabulated in the 1973 calculation are greater than those normally allowed by the Quad Cities UFSAR. This calculation also tabulates that the Quad Cities building column stress interactions for normal loading conditions (i.e. crane with and without lifted load anywhere along the runway) are within UFSAR allowable limits.

The information contained in the 1973 calculation has initiated a potential concern with regard to the design basis and design requirements of the Quad Cities RB superstructure steel columns. Documentation exists that states that the Quad Cities RB overhead crane itself satisfies all applicable regulatory requirements, therefore, the issue pertains only to the RB superstructure.

A historical calculation review was undertaken to determine the original design basis of the Quad Cities RB superstructure and also to validate the tabulated values contained in the 1973 calculation. The following information is the result of this review.

The design (sizing) of the crane support structure is based on Sargent and Lundy (S&L) Structural Calculations Volume 9, Job No. 3620 dated 1967 for crane girder, crane columns, vertical bracing and roof truss. The loading combinations, in part, considered for the design in these calculation were:

D + L
D + L' + OBE

Where D is the dead weight of the structure and the crane, L is the live load including the crane maximum rated lifted load and the roof snow load, L' includes the roof snow load and 75 kips crane lifted load, and OBE is the operating basis earthquake. Column sizes were also determined for the (D + OBE + Full crane lifted load) loading. However, the calculation has a note stating that the 75 kip lifted load case should be used. No connection design calculations were performed in the calculation. This is consistent with the design practice at the time. At that time the connection design was the responsibility of the steel fabricator. The (D + SSE) loading condition, where SSE is the Safe Shutdown Earthquake, was also not analyzed. Calculations also do not include the stresses in the support column due to the seismic loads imposed by the RB siding. The 1967 calculations also used an incorrect method to compute the column moments due to the OBE. Thus, the columns over stress was not detected.

In 1973, as part of the crane trolley replacement project, the 1967 calculations for the crane girder and the crane columns were corrected for the error in the 1967 calculations and updated (red marked). The revised calculations included the effects of the new, heavier single failure proof trolley for the (D + OBE) loading. In addition, the column and the crane girder stresses were computed for the (D + SSE) loading. The mark-up of the 1967 calculation is documented in S&L Calculation Volume #15, Job #3620, 3447 and 4806, dated 1973. The 1973 markup shows that the columns stress interactions are 1.96 and 2.56 for the OBE and SSE loading respectively with the heavier crane trolley. The roof truss and vertical bracing were not evaluated for the effects of the heavier trolley or the (D + SSE) loading. The updated calculations concluded that the support structure would require modifications to meet the OBE and SSE loading.

In 1975 new calculations (S&L calculation 3060-SDQ-1200DG01 dated 121975) were prepared for the columns, girders and the vertical bracing to compute the effects of the new heavier trolley. Modifications for the columns and the vertical bracing were designed. This calculation used seismic inputs and analysis methodology more conservative than that stated in the UFSAR. The modifications to the crane and the end bay columns and the vertical bracing were implemented. The modifications designed for the intermediate columns were not implemented based on the assumption documented in the calculation that "the seismic event is expected to occur only when the crane is parked." The roof truss was not evaluated.

Quad Cities UFSAR, revision 4, Section 3.2 "Classification of Structures, Components, and Systems" states that the RB is classified as a Class I structure. Class I is defined in the Quad Cities UFSAR as "Those structures and equipment of which a failure of the roof could cause significant release of radioactivity (i.e. calculated off-site doses in excess of 10 CFR 100) or are vital to a safe plant shutdown." The RB overhead crane (125 ton) is classified as "Safety Class II equipment and is not seismically qualified" in Quad Cities UFSAR Section 9.1.4.2.2. The RB steel superstructure extends from the refuel floor at El. 690'-6" to the roof framing at El. 739'-9". The steel superstructure supports the RB overhead crane, the building steel siding, and roof slab panels. The RB exterior siding panels above elevation 690' - 6", form a Secondary Containment boundary.

Quad Cities UFSAR, revision 4, Section 3.8.4.1.3 "Loads and Load Combinations" defines load "D" as "Dead load of structure and equipment plus any other permanent loads contributing stress, such as soil or hydrostatic loads or operating pressures, and live loads expected to be present when the plant is operating." "E" is defined as the design earthquake and "E' " is defined as the maximum earthquake load.

Section 3.8.4.1.4 "Design and Analysis Procedures" shows, in part, load combinations for Class I Structures include D+E (OBE)and D+E' (SSE). Under the heading "Class I Structures Criteria" for the case "D+E," the acceptance criteria is stated as "Normal allowable code stresses (i.e. American Institute of Steel Construction (AISC) for structural steel. American Concrete Institute (ACI) for reinforced concrete - See Table 3.8-11 for a more detailed summary of this criteria related to stress allowables.) The customary increase in design stresses when earthquake loads are considered is not permitted." For the case of "D+E'," the acceptance criteria is stated as "Stresses are limited to the minimum yield point as a general case. (See Table 3.8-11 for a more detailed summary of this criteria related to stress allowables)." UFSAR Table 3.8-11 provides numeric values for allowable stress limits for the "D+E" case. UFSAR Table 3.8-11 states the criteria for "D+E' " case as being "Safe shutdown of the plant can be achieved."

The basic issue is that the design basis calculation for the RB superstructure, when considering overhead crane load conditions, is not in literal conformance with the UFSAR description of Class I structure design loading combinations. The current design basis calculation states, as one of its design considerations, that "The seismic event is expected to occur only when the crane is parked." The calculation demonstrates that the RB superstructure is seismically qualified for the condition of the crane in the parked position without a lifted load.

C. CAUSE OF EVENT:

Section 3.8.4 of the UFSAR identifies the applicable loading combinations for Class I structures. The loading combinations are generically listed and include dead loads, live loads, seismic loads, etc. The UFSAR does not elaborate how these loads are to be combined when treating crane loading effects, which is a special case of either dead or live loads. This elaboration, like for most other design issues for the plants of this vintage, is provided in the design calculations. In summary, any discussion on design issues (i.e. crane loading effects onto the superstructure) is elaborated in the calculations; the lack of clarity of the UFSAR on this issue logically triggers a review of the design calculations to obtain a complete understanding.

The basic issue is that the design basis calculation for the RB superstructure, when considering overhead crane load conditions, is not in literal conformance with the UFSAR description of Class I structure design loading combinations. The FSAR, when originally written, lacked sufficient detail in the description of Class I loading combinations for addressing infrequent loading conditions (such as the crane) concurrent with a seismic event.

D. SAFETY ANALYSIS:

The design function being evaluated is the ability of the Class I RB superstructure to resist all applicable Class I loading conditions.

Two safety significant potential effects of building column overstress are: (a) excessive deformation of the superstructure supporting the exterior siding could result in loss of Secondary Containment function and (b) actual column failure or excessive deformation could potentially result in derailment of the crane which could potentially fall to the elevation 690'-6" refuel floor. It is noted that the crane itself has stops which hook under both the bridge and trolley rails to prevent derailment for any anticipated load condition.

The specific design function in question is that the current design basis calculation for the Quad Cities RB columns is based on the consideration that a seismic SSE event will only occur while the overhead crane is in its parked position. The RB superstructure is qualified for support of the crane, including full lifted load, at any position along the crane runway provided that seismic loads are not considered.

UFSAR Section 3.8.4.1.4 "Design and Analysis Procedures" shows, in part, load combinations for Class I Structures include D+E and D+E' where E and E' represent the effects of an Operating Basis Earthquake (OBE) and Safe Shutdown Earthquake (SSE) respectively. The UFSAR does not specifically allow any exceptions where seismic loads need not be considered in the design of Class I structures. Conformance with the UFSAR as it pertains to Class I structure design loading conditions can therefore not be currently demonstrated and requires further review.

The safety significance of this issue cannot be determined until completion of the on-going analysis and investigation (see Corrective Actions to be Completed). Upon completion of the analysis and investigation, a supplemental LER will be submitted.

E. CORRECTIVE ACTIONS:

Corrective Actions Completed:

1. The Operations Department administratively placed the RB overhead crane Out-Of-Service (OOS) in its parked position. The RB superstructure is seismically qualified for the condition of the crane in the parked position without a lifted load.

Corrective Actions to be Completed:

1. Reconstitution of design basis calculations for the entire RB superstructure for crane loading conditions is being performed. This activity is being tracked to completion with an expected completion date of 033198. (NTS# 25418098SCAQ0000701; Design Engineering)

2. Any additional corrective actions will be identified in a supplemental LER upon review of analyses results. A supplemental LER, which will include an evaluation of the safety significance, will be submitted within 30 days of completion of Item 1. (NTS# 25418098SCAQ0000702; Design Engineering)

F. PREVIOUS OCCURRENCES:

The Quad Cities LER database was searched, utilizing key words: reactor building, seismic, overhead crane, heavy load, fuel handling, and superstructure, for any inconsistencies between design bases and licensing bases requirements. There are no Quad Cities LERs associated with this topic within the last two years.

G. COMPONENT FAILURE DATA:

This topic is not applicable because there is no component associated with this issue.