Docket No. 50-331

MAY 18 1983

Mr. Lee Liu, President
and Chief Executive Officer
Iowa Electric Light and Power Company
P. O. Box 351
Cedar Rapids, Iowa 52406

Dear Mr. Liu:

SUBJECT: RESOLUTION OF NUREG-0737 ITEM II.K.3.45, DEPRESSURIZATION WITH OTHER THAN ADS

Re: Duane Arnold Energy Center

We have completed our review of the BWR Owners Group (BWROG) response, dated December 30, 1980, to NUREG-0737 Item II.K.3.45, Depressurization with Other than ADS. In your letter of December 15, 1980, you referenced the BWROG position as applying to your facility. Also, the BWROG confirms that its position on this item applies to your facility.

Based on our evaluation of the BWROG submittal, we conclude that alternative modes of depressurization would not contribute to plant safety and no modification in plant design or operations is required.

This issuance of this letter and enclosed Safety Evaluation completes our action on this item.

Sincerely,

ORIGINAL SIGNED BY
Domenic B. Vassallo, Chief
Operating Reactors Branch #2
Division of Licensing

Enclosure
Safety Evaluation

cc w/enclosure
See next page

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Mr. Lee Liu
Iowa Electric Light & Power Company

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SAFETY EVALUATION OF BWR OWNERS' GROUP GENERIC RESPONSE TO ITEM II.K.3.45 OF NUREG-0737 "DEPRESSURIZATION WITH OTHER THAN AUTOMATIC DEPRESSURIZATION SYSTEM"

1.0 Introduction

NUREG-0737 Item II.K.3.45 requires an analyses or a feasibility study to examine depressurization modes other than full actuation of the automatic depressurization system (ADS). Slower depressurization would reduce the possibility of exceeding vessel integrity limits by rapid depressurization.

The BWR Owners Group has performed such a feasibility study. The study applies to all licensed BWR plants to which Item II.K.3.45 would apply. The objective of the study was to determine the effects of slower modes of depressurization in comparison to ADS blowdown on reactor pressure vessel (RPV) structural integrity and core cooling capability.

2.0 Evaluation

The automatic depressurization system is an independent backup system for the high pressure emergency core cooling system which reduces the reactor pressure in the event of a small pipe break so that LPCI/LPCS can maintain core cooling and limit fuel cladding temperature. The ADS employs safety and relief valves (SRVs) to relieve high pressure steam to the suppression pool.

The BWR Owners' Group generic response to this item is given in a letter to Darrell G. Eisenhut (NRC) from D. B. Waters (BWR Owners' Group), BWROG-80-12, "BWR Owners' Group Evaluation of NUREG-0737 requirements," December 29, 1980.

The BWR Owners' Group has analyzed two base transients (an outside steamline break and stuck open relief valve) as candidates for slower modes of depressurization assuming no high pressure cooling system is available.

The feasibility study includes the following various cases to determine core uncovered time and liquid inventory in the core using the SAFE computer code.

Depressurization cases:

Initiation from Top of Active Fuel

(1) Full ADS blowdown - 3.3 minutes (ADS actuation depressurizes reactor pressure from 1050 psig to 180 psig in approximately 3.3 minutes).

(2) Vessel depressurization within 6 to 10 minutes.

(3) Vessel depressurization within 15 to 20 minutes.

Initiation from Level 2 (level at which ECCS initiate) plus 60 seconds

(1) Full ADS blowdown 3.3 minutes.

(2) Vessel depressurization within 6 to 10 minutes.

(3) Vessel depressurization within 15 to 20 minutes.

The BWR Owners' Group has concluded that slower modes of depressurization would not have any significant benefit on RPV fatigue usage but can affect core cooling capability. Earlier depressurization would not affect core cooling capability; however, it will increase challenges to HPCI/HPCS and in turn may result in increased ADS actuations. In addition, an operator will have less time available to restore HPCI/HPCS.

Our contractor, EG&G, has performed a confirmatory analysis using the TRAC computer code to verify the GE conclusions and has found similar results. We have evaluated the BWR Owners Group response, and concur with the Owners' Group response and conclusions based on the following information.

The reactor pressure vessel stress and fatigue analyses are performed in accordance with ASME Code, Section III (NB-3200) requirements. Detailed fatigue analyses for RPV include pressure/temperature/flow design transients for plant systems operating and testing conditions. GE has concluded that the feedwater nozzle is the limiting component from a RPV fatigue usage point of view. The plant normal heat-up condition contributes the maximum fatigue usage for the feedwater nozzle. The ADS actuation event is not the limiting transient affecting RPV structural integrity. All BWR RPVs could withstand more than one ADS blowdown event based on the GE fatigue analyses information.

However, if a BWR plant should experience the ADS actuation event without HPCI/HPCS, there is a concern for the integrity of welded

connections in the core vicinity. These welded connections have a tendency to become embrittled due to their exposure to irradiation and the thermal environment. Also this environment would reduce their fracture toughness. Under these circumstances, licensees must demonstrate integrity of welded connections in the vessel by analysis or inspection before a plant can resume further operation (following an ADS actuation event).

All BWR containment structures are designed to accommodate the loadings associated with the SRV discharge pool dynamic loadings resulting from plant systems design transients. This provides assurance that containment structural integrity would be maintained under the ADS actuation event loadings.

3.0 Conclusion

We conclude that the as designed RPV and containment structures of all BWR plants listed in Table 1 would maintain structural integrity under the ADS event and would be able to withstand more than one ADS evnt. Slower modes of depressurization could affect core cooling capability without any significant benefit on RPV fatigue usage. Earlier modes of depressurization would not affect core cooling capability, however they would increase challenges to HPCI/HPCS and also affect ADS actuation frequency. Overall, alternate modes of depressurization in comparison to ADS blowdown would not contribute any significant benefit to plant operation and safety, and therefore, no modifications in plant design and operation are required.

Dated: MAY 18 1983

Principal Contributor: K. Desai

TABLE 1

NUREG-0737 ITEM II.K.3.45

Boston Edison	Pilgrim 1
Carolina Power & Light	Brunswick 1 & 2
Commonwealth Edison	LaSalle 1 & 2, Dresden 2 & 3, Quad Cities 1,2
Georgia Power	Hatch 1 & 2
Iowa Electric Light & Power	Duane Arnold
Jersey Central Power & Light	Oyster Creek 1
Niagara Mohawk Power	Nine Mile Point 1 & 2
Nebraska Public Power District	Cooper
Northeast Utilities	Millstone 1
Northern States Power	Monticello
Philadelphia Electric	Peach Bottom 2 & 3; Limerick 1 & 2
Power Authority of the State of New York	Fitzpatrick
Tennessee Valley Authority	Browns Ferry 1-3; Hartsville 1-4, Phipps Bend 1 & 2
Vermont Yankee Nuclear Power	Vermont Yankee
Detroit Edison	Enrico Fermi 2
Long Island Lighting	Shoreham
Mississippi Power & Light	Grand Gulf 1 & 2
Pennsylvania Power & Light	Susquehanna 1 & 2
Washington Public Power Supply System	Hanford 2
Cleveland Electric Illuminating	Perry 1 & 2
Houston Lighting & Power	Allens Creek
Illinois Power	Clinton Station 1 & 2
Public Service of Oklahoma	Black Fox 1 & 2