APR 18 1983

DISTRIBUTION:
Docket File
NRC PDR
Local PDR
NSIC
PRC

LB#2 File
RCaruso
EHylton
Region I
ELJordan, DEQA:IE
JMTaylor, DRP:IE
Bordenick, OELD
ACRS (16)

Docket No.: 50-322

Mr. M. S. Pollock
Vice President - Nuclear
Long Island Lighting Company
175 East Old Country Road
Hicksville, New York 11801

Dear Mr. Pollock:

Subject: Evaluation of BWR Owners' Group Generic Response to Item II.K.3.16 of NUREG-0737, "Reduction of Challenges and Failures of Relief Valves - Feasibility Study and System Modification"

Enclosed is a copy of the staff safety evaluation of the BWR Owners' Group response to Item II.K.3.16 of NUREG-0737. A plant specific evaluation of this item for the Shoreham Nuclear Power Station was included in Supplement No. 1 to the Shoreham Safety Evaluation Report. The evaluation concluded that no modifications were necessary at that time, but that you would be subject to the results of the staff's generic review of this issue.

We request that you review the enclosed evaluation and that you provide, within 30 days of your receipt of this letter, a commitment to implement those modifications which the staff has found to be necessary. Please include your schedule for implementation and, if you disagree with any of the modifications, your justification for alternative actions. If you have any questions, please contact Mr. R. Caruso.

Sincerely,

Original signed by:

A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing

Enclosure:
As stated

cc: See next page

8304260129 830418
PDR ADOCK 05000322
P PDR

OFFICE	DL:LB#2/PM	DL:LB#2/BC					
SURNAME	RCaruso:pt	ASchwencer					
DATE	4/18/83	4/18/83					

Shoreham

Mr. M. S. Pollock
Vice President - Nuclear
Long Island Lighting Company
175 East Old Country Road
Hicksville, New York 11801

cc: Howard L. Blau, Esquire
Blau and Cohn, PC.
217 Newbridge Road
Hicksville, New York 11801

Mr. Jay Dunkleberger
New York State Energy Office
Agency Building 2
Empire State Plaza
Albany, New York 12223

Energy Research Group, Inc.
400-1 Totten Pond Road
Waltham, Massachusetts 02154

Mr. Jeff Smith
Shoreham Nuclear Power Station
Post Office Box 618
Wading River, New York 11792

W. Taylor Reveley, III, Esquire
Hunton & Williams
Post Office Box 1535
Richmond, Virginia 23212

Ralph Shapiro, Esquire
Cammer & Shapiro
9 East 40th Street
New York, New York 10016

Mr. Brian McCaffrey
Long Island Lighting Company
175 E. Old Country Road
Hicksville, New York 11801

Honorable Peter Cohalan
Suffolk County Executive
County Executive/Legislative Bldg.
Veteran's Memorial Highway
Hauppauge, New York 11788

David Gilmartin, Esquire
Suffolk County Attorney
County Executive/Legislative Bldg.
Veteran's Memorial Highway
Hauppauge, New York 11788

MHB Technical Associates
1723 Hamilton Avenue, Suite K
San Jose, California 95125

Stephen Latham, Esquire
Twomey, Latham & Shea
Post Office Box 398
33 West Second Street
Riverhead, New York 11901

Matthew J. Kelly, Esquire
Staff Counsel
New York State Public Service Commission
Three Rockefeller Plaza
Albany, New York 12223

Ezra I. Bialik, Esquire
Assistant Attorney General
Environmental Protection Bureau
New York State Department of Law
2 World Trade Center
New York, New York 10047

Resident Inspector
Shoreham NPS, U.S. NRC
Post Office Box B
Rocky Point, New York 11778

Herbert H. Brown, Esquire
Kirkpatrick, Lockhart, Hill,
Christopher & Phillips
1900 M Street, N.W.
Washington, D.C. 20036

Lawrence Coe Lanpher, Esquire
Kirkpatrick, Lockhart, Hill,
Christopher & Phillips
1900 M Street, N.W.
Washington, D.C. 20036

Karla J. Letsche, Esquire
Kirkpatrick, Lockhart, Hill,
Christopher & Phillips
1900 M Street, N.W.
Washington, D.C. 20036

SAFETY EVALUATION REPORT

BWR OWNERS' GROUP RESPONSE TO ITEM II.K.3.16 OF NUREG-0737, "REDUCTION OF CHALLENGES AND FAILURES OF RELIEF VALVES - FEASIBILITY STUDY AND SYSTEM MODIFICATION"

BACKGROUND

Most boiling water reactors (BWRs) were equipped with Target Rock (T/R) three-stage safety/relief valves (SRVs) and Dresser electromatic relief valves which have experienced recurring malfunctions. These malfunctions can be characterized by three categories: (1) failure of a valve to open properly on demand, (2) spurious opening of a valve with subsequent failure of the valve to properly reseat, and (3) proper opening of a valve with subsequent failure of the valve to properly reseat. Spurious openings and/or failure of valves to properly reseat result in a small loss-of-coolant accident (LOCA). These small LOCAs can produce unnecessary thermal transients on the reactor vessel and vessel internals, unnecessary hydrodynamic loadings on the containment pressure suppression chamber and its internal components and potential increases in the radioactivity release to the environs. They can also increase challenges to the emergency core cooling systems.

These SRVs provide overpressure protection to the reactor coolant pressure boundary and are also used for automatic depressurization in the case of small break LOCAs with concurrent failure of the high pressure coolant injection systems.

NUREG-0737 POSITION SUMMARY

The operating history of the relief valves has been relatively poor particularly in view of the classification of this equipment. The record of relief-valve failures to close for all BWRs in the past few years of plant operation is approximately 30 failures in 73 reactor years. This has demonstrated that the failure of a relief valve to close would be the most likely cause for a small LOCA. The high failure rate is the result of a high relief valve challenge rate and a relatively high failure rate per challenge. NUREG-0737, Item II.K.3.16 requires that a feasibility study be performed to identify system modifications to BWR design and operation. These system modifications should not compromise performance of the relief valves or other systems. Challenges to the relief valves should be reduced substantially (by an order of magnitude).

SUMMARY AND STAFF EVALUATION

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-8134, "BWR Owners' Group Evaluation of NUREG-0737 Requirements," March 31, 1981.

The BWR Owners' Group has performed a detailed feasibility study of system modifications to reduce relief valve challenges and failures. System modifications which are considered for this study are as follows:

(1) Main Steam Line Isolation Modifications:

(a) Lower the RPV water level isolation setpoint for MSIV closure from Level 2 to Level 1.

(b) Lower reactor pressure isolation setpoint.

(2) Feedwater Control System Modifications:

(a) Triple redundant or single failure proof control system

(b) Uninterrupted and redundant control system power

(c) Condensate system modifications and condensate/feedwater integration

(d) Feedwater runback

(e) Additional anticipatory scram on loss of feedwater

(3) SRV Control Logic/SRV Setpoint Revision:

(a) Low-Low Set (LLS) relief logic system or Equivalent Manual Actions

(b) Revised relief valve setpoints

(c) Offset relief valve setpoints

(d) Increase main steam line flow setpoint

(4) Other Candidate Modifications:

(a) Analog transmitter/trip unit system

(b) Improved recirculation flow control system

(c) Reduce isolations caused by surveillance testing

(d) Reduce MSIV testing frequency

(e) Installation of new relief valve with block valve in series

(f) Earlier initiation and increased flow of emergency core coolant

(5) More stringent leakage criteria and early removal of leaking valves

(6) Control of pneumatic supply pressure to SRVs

(7) Use of Target Rock two-stage SRVs

In addition, General Electric performed a detailed evaluation considering design transients, transient frequency, and the number of SRV initial and subsequent actuations to determine the maximum benefit achievable by using each system modification.

The staff has reviewed these system modifications in detail. Some system modifications are very complex in nature and do not provide maximum benefit to reduce relief valve challenges. The staff has considered the following system modifications based on safety impact, simplicity of design and their potential for significantly reducing relief valve challenges. These system modifications do not compromise relief valves operation or other systems performance.

STAFF RECOMMENDATIONS

System Modifications

(1) Low-Low Set (LLS) relief logic system or Equivalent Manual Actions

The LLS relief logic is an automatic SRV control system. It does not affect the SRVs first actuation. The LLS logic will initiate only on concurrent signals of reactor high pressure scram and any SRV opening. The reactor high pressure scram signal pressure is normally lower than the SRVs actuation set pressure. The open or closed status of SRVs is monitored by either tail pipe pressure switches or acoustical monitors. Separate annunciators are provided in a control room for SRV opening and LLS logic initiation. Once it is initiated, the LLS logic remains sealed in until manually reset by the operator.

The opening and closing set points for LLS SRVs are more widely separated than for normal SRV set points. Hence, the extent of reactor depressurization (blowdown) before reclosing an open SRV is increased when compared to the blowdown for normal SRV set points. Thus, more steam will be released each time a LLS SRV opens and more energy will be required for repressurization before a SRV reopens. This results in a longer blowdown, lowered reactor pressure and reduces subsequent actuations of SRVs.

Equivalent Manual Actions

The BWR Emergency Procedure Guidelines call for the equivalent manual action. A selected SRV is manually held open by an operator beyond the reclosure setpoint. This technique enables the reactor to sufficiently depressurize through the removal of stored heat such that subsequent valve actuations are limited to one valve for the removal of decay heat.

The LLS relief logic system or equivalent manual actions will reduce the total number of SRVs challenges significantly for most transient events.

This LLs logic should not actuate the automatic depressurization system SRVs.

(2) Lower the reactor pressure vessel water level isolation setpoint for main steam isolation valve (MSIV) closure from Level 2 to Level 1.

The lower MSIV water level trip causes the MSIV closure actuation to be changed from a reactor water level two signal to a reactor water level one signal. This design modification will maintain the main condenser availability for a longer time. This allows more energy to be released to the main condenser and will result in a slower repressurization rate. The lower MSIV water level trip reduces isolations, SRV challenges, and provides some benefit to SRV subsequent actuations.

This system modification is not applicable to BWR/2-3 because the level instrumentation design for these plants is incompatible with the design described herein.

(3) Increase SRV simmer margin

An SRV simmer margin is the difference between the SRV set pressure and the reactor pressure vessel operating pressure. An SRV simmer margin should be increased to the maximum possible consistent with other operating plant considerations. The General Electric Service Information Letter 196, Supplement 3, recommends a simmer margin of 120 psi. The T/R three stage SRVs appear to be more sensitive to leakage than the T/R two stage SRVs. This modification will minimize leakage and reduce the potential for spurious opening.

(4) Preventive maintenance program

In order to acceptably resolve Item II.K.3.16, each licensee should have a preventive maintenance program designed to enhance performance of SRVs on demand (self-actuation mode) during operation. This program should utilize, for example, the information which is available from I&E Bulletins, Information Notices, and General Electric Service Information Letters (SIL) to improve SRV performance. During each refueling outage, 50% of the T/R SRVs "top works" containing the pilot stage (set pressure is controlled by this part of the valve) should be steam/nitrogen tested for recalibration of setpoints, pilot leakage determination, and refurbishment. Moreover, during each refueling outage, 50% of the Dresser electromatic relief valves, Crosby and Dikkers SRVs should be tested for operability, setpoints recalibration, leakage determination, and refurbishment.

Generally, SRV leakage is not monitored directly but it is indicated by an increased tailpipe thermocouple temperature reading. Excessive leakage could affect valve performance. Early detection and removal of leaking SRVs would reduce SRVs malfunctions.

Safety/Relief Valve Design Modifications

(Target Rock two-stage SRV)

The majority of the T/R SRV failures have been attributed to original T/R three stage bellows assembly leakage. Target Rock modified the original SRV design by eliminating one of the pilot stages and by eliminating the bellows assembly. The new design is called the "two-stage Target Rock SRV." These SRVs have shown a reduced propensity for spurious opening and stuck-open relief valve events. Eleven operating BWR facilities have replaced T/R three-stage SRVs and installed these T/R two-stage SRVs.

Recent operating experience with the new two-stage SRVs indicates that they exhibit a binding/sticking phenomenon during operation. The binding/sticking results in a higher opening pressure during the first actuation. During subsequent actuations the valves have performed satisfactorily. Specifically, the failure of all the two-stage T/R SRVs installed at Hatch Unit 1 to open at or near the setpoint occurred in July 1982.

Those members of the BWR Owners' Group using two-stage Target Rock SRVs are working on this high setpoint drift problem to determine the exact nature of the sticking/binding phenomenon. They have identified two major valve problem areas: (1) sticking of the pilot disc to its seat and (2) friction in the labyrinth seal area. Target Rock has already modified the pilot disc design using a harder material, tungsten carbide, which they believe will resist both steam erosion by steam and the sticking phenomenon, in lieu of stellite 6B. Another change is to use a carbon sleeve in the labyrinth seal to reduce friction and galling. Target Rock believes that these design changes are positive steps toward eliminating the high setpoint drift problem. Target Rock is proposing in-plant operational testing as verification in the near future.

Based on T/R SRVs operating experience, it is not feasible for the staff to draw any specific conclusions concerning overall performance characteristics of either the T/R three-stage or the T/R two-stage SRVs.

Crosby and Dikkers SRVs

BWR/5-6s employ either Crosby or Dikkers SRVs for overpressure protection. The actual operating experience with these SRVs is too limited to draw any conclusion concerning their performance characteristics. However, to date none of the problems associated with the T/R SRVs has occurred for the Crosby or Dikkers SRVs.

CONCLUSION

For all BWR licensees listed in Appendix A, we find the following system modifications acceptable to reduce SRV challenges and failures:

(1) Low-Low Set (LLS) relief logic system or Equivalent Manual Actions, (2) Lower the reactor pressure vessel water level isolation setpoint for main steam isolation valve (MSIV) closure from Level 2 to Level 1, (3) Increase SRV simmer margin, and (4) Preventive maintenance program. The implementation of these system modifications would significantly reduce subsequent SRV actuations for plant transients, reactor isolations, and improve overall SRV performance. The General Electric evaluation concerning maximum benefit available from such system modifications appears to be reasonable, and estimates a

reduction in SRVs challenges and failures by a factor of eight. These system modifications do not compromise relief valves operation or other systems performance.

APPENDIX A

Participating Utilities

NUREG-0737 II.K.3.16

Utility	Plant
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
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
Vermont Yankee Nuclear Power	Vermont Yankee
Tennessee Valley Authority	Browns Ferry 1-3; Hartsville 1-4; Phipps Bend 1-2
Gulf States Utilities	River Bend