



Commonwealth Edison
One First National Plaza, Chicago, Illinois
Address Reply to: Post Office Box 767
Chicago, Illinois 60690

May 31, 1983

Director of Nuclear Reactor Regulation
Attention: Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: LaSalle County Station, Units 1 & 2
Reactor Water Level Reference Leg
Cooling System
NRC Docket Nos. 50-373 and 50-374

Reference (a): License NPF-11, Condition 2.C.30.(i)

Dear Sir:

The purpose of this letter is to provide an alternate, complete solution to Reference (a). Commonwealth Edison Company proposes installation of a guard pipe cooling system, as described herein, to assure that flashing of level instrument reference logs will not occur. The installation of this fix should resolve the NRC's concerns regarding detection of Inadequate Core Cooling and, subsequent to preoperational verification testing, it would be our intention to delete the interim station Emergency Procedures related to water-level instrument errors. A technical briefing on the Reactor Water Level Cooling System can be provided at the NRC's request. The initiation of detailed engineering design is on hold pending NRC approval of the acceptability of this conceptual design. A response from the NRC is needed by July 1, 1983 to assure design release, procurement, erection and verification testing by the first refueling outage on LaSalle Unit 2.

Background

LaSalle FSAR Appendix L.39 docketed a response to NUREG 0737 Item II.K.1.23, Reactor Vessel Level Instrumentation via an extraction of NEDO-24708A. More detailed information on provision of a common reference level for BWR-5 vessel level instrumentation was docketed via Appendix L.67. Additional information on level measuring system response to transients and accidents, on reference leg error effects on control and protection systems, and on the impact of level measurement errors on operator performance are all treated in the LaSalle response to Q.031.287. This more comprehensive treatment of large break and small break cases utilized revised information from NEDE-24801, April 1980, in

8306060146 830531
PDR ADOCK 05000373
P PDR

13001
1/40

presenting the operators' emergency responses to malfunctioning water level instrumentation. Specific station procedures exist at LaSalle to respond in the post accident time-frame with inventory makeup and depressurization actions that preclude core overtemperature events.

LaSalle FSAR Appendix L.31 docketed Edison's response to NUREG 0737 Item II.F.2, Inadequate Core Cooling (ICC), in four sequential submittals addressing: an operational appraisal of when ICC is pertinent and how required operator normal responses preclude degraded vessel water inventory; a value-benefit and risk assessment of NRC proposed incore thermocouples; an evaluation of thermocouple response time based on heat transfer analyses by S. Levy, Inc. (SLI-8117, Oct. 1981); and a committal to continue the evaluation of methods to resolve the possibility of LaSalle unique water level inaccuracies caused by reference leg boil-off. This last committal has been pursued by parallel efforts; the analytical and definition activity of the BWR Owners' Group which resulted in S. Levy, Inc. reports SLI-8311 and SLI-8218; and the engineering design effort to prevent the flashing or boil-off of reference leg fluid in the event of high drywell temperature and/or low reactor pressure.

Current Status

The analytical work has been communicated directly between the Owners' Group and the generic review group at NRC. The two Levy reports have been provided for generic review. The six principal concerns regarding the effects of high drywell temperatures on the water level instrumentation are treated generically in these Levy reports. These same concerns are discussed in Enclosure 1 for the LaSalle engineering design which precludes the problem.

The preliminary engineering design of the reactor water Level Reference Leg Cooling System (RLCS) is described in Enclosure 2. The elimination of the potential gross level error at LaSalle results in residual calibration errors of the magnitude reported in the Appendix L.67 and Q.031.287 responses for normal operations.

To the best of my knowledge and belief the statements contained herein and in the enclosure are true and correct. In some respects these statements are not based on my personal knowledge but upon information furnished by other Commonwealth Edison and contractor employees. Such information has been reviewed in accordance with Company practice and I believe it to be reliable.

Director of NRR

- 3 -

May 31, 1983

If there are any further questions regarding this matter, please contact this office.

One (1) signed original and forty (40) copies of this letter and enclosures are provided for your use.

Very truly yours,

C. W. Schroeder 5/31/83

C. W. Schroeder
Nuclear Licensing Administrator

lm

Enclosures

cc: NRC Resident Inspector - LSCS

6674N

Enclosure 1
Reactor Water Level Reference Leg Cooling System (RLCS)

NRC has raised concerns regarding the effects of above normal drywell temperatures on the reactor water level measurement system. Effects of high drywell temperature have been identified and extensively evaluated by General Electric¹ and the BWR Owner's Group². This enclosure addresses the six principal NRC concerns with respect to reference leg flashing and/or boil-off. It is written in the context that the RLCS is installed at LaSalle to prevent the adverse effects of drywell heating and reactor depressurization from causing water level instrument errors. The RLCS constitutes a means to prevent these water level errors.

1. Yarway Heated Reference Leg Flashing

LaSalle has a cold reference leg reactor water level measurement system and is not susceptible to this concern. The Yarway level instruments at LaSalle are utilized in the reactor recirculation system only. The operational reactor water level instruments are pressure and delta pressure sensors with associated trip circuits.

2. Restricting Orifice Location

LaSalle's restricting orifices are near the vessel to minimize the effect of an instrument line break inside containment. Although flashing can produce level errors due to loss of reference leg inventory, it is not clear that the errors caused by placement of the restricting orifices are of equal or greater significance. With the RLCS installed at LaSalle, the prevention of flashing makes the position of the restricting orifices inconsequential.

3. Calibration Errors at High Drywell Temperature

Because LaSalle's water level instrument reference legs and variable legs have comparable vertical drops inside the drywell, changes in water density affect reference leg and variable leg equally. With the RLCS installed at LaSalle, the cold reference leg remains "cold" during drywell heating events, therefore, LaSalle will not be affected by calibration errors at high drywell temperatures.

¹NEDO-24708, NEDE 24801, and Service Information Letter (SIL) 299, dated July 25, 1979.

²S. Levy, Inc. reports SLI-8117, SLI-8211, and SLI-8218.

4. Reference Leg Boiling at High Reactor Pressure and Low Reactor Pressure

Certain size line break events when the drywell rapidly heats up and the reactor depressurizes could lead to attainment of a saturated liquid condition in the reference leg and a subsequent loss of its inventory due to flashing and liquid boil-off. The approximately 13 foot vertical drop at LaSalle could lead to large errors in the indicated water level. To preclude reference leg boil-off or flashing a modification is added to the reactor water level measuring system to decouple it from the effects of elevated drywell heating. The fix proposed in Enclosure 2 describes the RLCS which ensures that the level measurement system remains reliable under hot drywell conditions. Incorporation of the RLCS obviates the need for specific Emergency Procedures utilized by the operator whenever drywell conditions could make the water level indications suspect.

5. Instrument Line Break Plus Specific Instrument Failures

On some plants, after a break of one reference leg, logic configurations could permit a single instrument failure to defeat a particular safety function, a sequence of events can result that require operator action to manage the vessel inventory. The instrument line break is addressed in LaSalle's FSAR 15.6.2, an orderly reactor shutdown takes place without acuation of ECCS. The scenario described above would not cause the reactor operator to take action different than described in the FSAR.

The assignment of one RLCS to each ECCS division and the physical separation of the ECCS's, as well as the related level instruments, assures that the total safety function is not defeated but that water inventory is provided to the vessel.

6. Reliability of Mechanical Level Instrumentation

Limited operating experience at LaSalle has not resulted in any decision regarding instrumentation reliability. The level instruments are either qualified to NUREG 0588 Category II standards or are being upgraded with equipment which meets NUREG 0588 Category I standards. The instrumentation is included in the normal maintenance trending program for future consideration.

Enclosure 2

Description

Reactor Water Level Reference Leg Cooling System (RLCS)

The primary objective of the reactor water level reference leg cooling system is to cool the reference legs of the reactor water level measuring system and thus prevent the fluid in the reference legs from flashing in the event of high drywell temperature and/or low reactor pressure. This objective is accomplished by surrounding a portion of each reference leg in drywell with a circulating water-jacket and by insulating the remaining portion of the drywell reference-leg piping. This essentially thermally insulates the reference leg from heating effects of the drywell and it preserves the original calibration accuracy of the water level instruments.

Design Basis

- A. A separate cooling water system is designed for the reference legs of each of the following condensing chambers used in the reactor water level measuring system. The associated ECCS water-leg pump which supplies water to the cooling jacket is also tabulated. Equipment in each reference leg is powered from separate electrical divisions as follows:

<u>Condensing Chamber</u>	<u>ESS Division</u>	<u>ECCS Loop</u>
LX-B21D004A	3	HPCS
LX-B21D004B	2	RHR B&C
LX-B21D004C	3	HPCS
LX-B21D004D	1	LPCS & RHR A

- B. Cooling water system for each reference leg is designed to maintain the corresponding reference leg temperature below 220°F in the event of a high drywell temperature of 340°F.
- C. Cooling water for each reference leg is supplied from suppression pool using the existing safety-related Emergency Core Cooling System water-leg pumps and piping.
- D. All components of the reference leg cooling water system are Seismic Category I, Quality Group B and Safety Related (Class 1E).
- E. The equipment and components of the Reference Leg Cooling System are environmentally qualified for their installed locations. The environmental parameters used for the qualification of the equipment and components are included in Appendix M of LaSalle County Station FSAR.

System Description

The Reference Leg Cooling System for each reference leg consists of a water jacket surrounding the vertical pipe leg from the condensing chamber as shown on P&ID M-139-06. Each cooling water jacket is designed to transfer heat from the reference leg piping to the suppression pool whenever a high drywell temperature exists. In addition, the water jacket, in combination with passive insulation surrounding another section of the vertical pipe leg, insulates a portion of the reference leg piping from the high drywell temperature. Cooling water for each jacket is supplied by the existing ECCS water-leg pumps as shown on the P&ID. The LPCS and RHR "A" water-leg pump supplies cooling water to the water jacket surrounding the reference leg of condensing chamber 1LX-B21D004D via a 3/4-inch line. The heated water from the cooling water jacket is returned to the suppression pool via a 3/4-inch line. The HPCS water-leg pump is utilized to supply cooling water to the cooling water jackets surrounding the reference legs of condensing chambers LX-B21D004C and A. The RHR B&C water-leg pump supplies cooling water to the cooling jacket on reference leg of condensing chamber LX-B21D004B.

System Operation

During normal plant operating conditions, each Emergency Core Cooling System water-leg pump is operated continuously and the flow is bypassed to the pump suction via a pump minimum-flow recirculating line. The water-leg pump operation is monitored in the control room as is the pressure in the water-leg itself. A high-point vent is used to assure that the water-leg is filled with water (gas is vented). The reference leg cooling inlet valves NB437, NB442 and NB447 are normally closed and the cooling water flow from the water-leg pumps to the reference leg cooling water jackets is thereby isolated. Under normal plant operating conditions, the reference leg temperature will be at containment ambient level. The reference leg cooling inlet valves are automatically opened and the reference leg cooling initiated whenever the following signals are sensed:

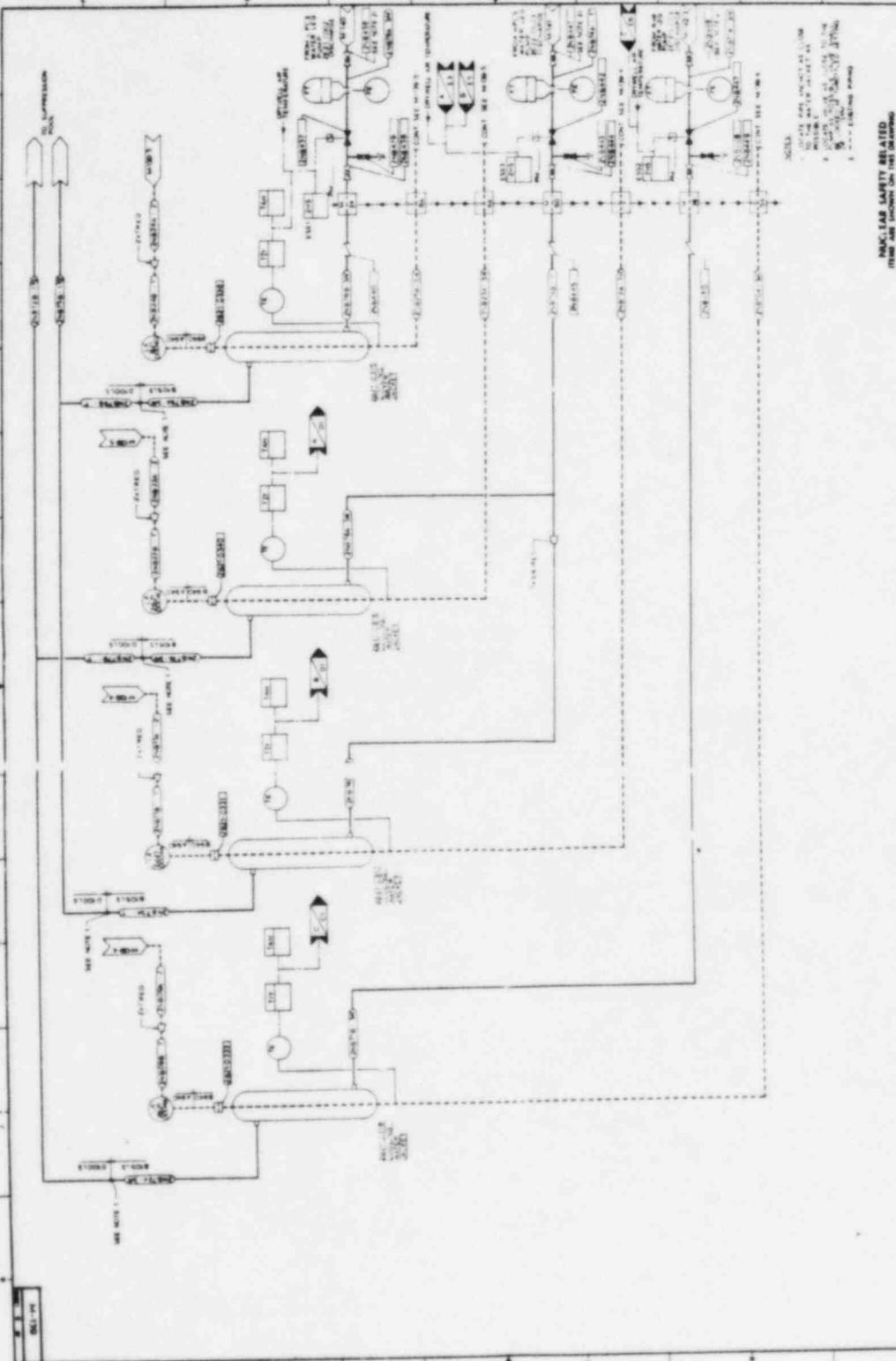
- A. Containment ambient temperature has increased to 220°F or
- B. The temperature of the water in the reference leg itself has exceeded 220°F.

The reference leg cooling water will be manually shut-off by the operator in the control room after it has been ascertained that the containment ambient temperature and the reference leg water temperature have decreased to normal levels.

Instrumentation Requirements

Instrumentation is provided in the control room to monitor the reference leg-water temperature and the drywell ambient temperature. The instrumentation necessary for control and to monitor operating status of the Reference Leg Cooling System is designed to function under Seismic Category I and environmental loading conditions corresponding to their installed locations. The control circuits are designed to satisfy separation criteria included in Chapter 8 of the LaSalle County Station Final Safety Analysis Report.

P&ID M-139-06 also attached.



SCALE
 1" = 10' HORIZONTAL
 1" = 10' VERTICAL

NUCLEAR SAFETY RELATED
 REACTOR WATER LEVEL
 DETECTION AND COOLING SYSTEM

PROJECT NO.	100-100000
DATE	10/15/58
DESIGNED BY	W. J. ...
CHECKED BY	...
APPROVED BY	...
REVISIONS	
NO.	DESCRIPTION
1	...
2	...
3	...
4	...
5	...
6	...
7	...
8	...
9	...
10	...
11	...
12	...
13	...
14	...
15	...
16	...
17	...
18	...
19	...
20	...
21	...
22	...
23	...
24	...
25	...
26	...
27	...
28	...
29	...
30	...
31	...
32	...
33	...
34	...
35	...
36	...
37	...
38	...
39	...
40	...
41	...
42	...
43	...
44	...
45	...
46	...
47	...
48	...
49	...
50	...
51	...
52	...
53	...
54	...
55	...
56	...
57	...
58	...
59	...
60	...
61	...
62	...
63	...
64	...
65	...
66	...
67	...
68	...
69	...
70	...
71	...
72	...
73	...
74	...
75	...
76	...
77	...
78	...
79	...
80	...
81	...
82	...
83	...
84	...
85	...
86	...
87	...
88	...
89	...
90	...
91	...
92	...
93	...
94	...
95	...
96	...
97	...
98	...
99	...
100	...

W. J. ...

LA SALLE COUNTY STATION
 COMMONWEALTH Edison CO.

DOCUMENT/ PAGE PULLED

ANO. _____

NO. OF PAGES 1

REASON:

PAGE ILLEGIBLE.

HARD COPY FILED AT. PDR _____ CF
OTHER _____

BETTER COPY REQUESTED ON _____

PAGE TOO LARGE TO FILM.

HARD COPY FILED AT. PDR _____ CF
OTHER _____

FILMED ON APERTURE CARD NO _____