DAIRYLAND POWER COOPERATIVE • P.O. BOX 817 • 2615 EAST AV SOUTH • LA CROSSE, WISCONSIN 54601
(608) 788-4000

August 31, 1982

In reply, please
refer to LAC-8546

DOCKET NO. 50-409

Director of Nuclear Reactor Regulation
ATTN: Mr. Dennis M. Crutchfield
Operating Reactors Branch #5
Division of Operating Reactors
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

SUBJECT: DAIRYLAND POWER COOPERATIVE
LA CROSSE BOILING WATER REACTOR (LACBWR)
PROVISIONAL OPERATING LICENSE NO. DPR-45
STATUS OF GENERIC ITEM B-24, CONTAINMENT
PURGING/VENTING DURING NORMAL OPERATIONS

REFERENCES: (1) NRC Letter, Crutchfield to Linder, dated March 19, 1982
(2) DPC Letter, Linder to Crutchfield, LAC-8335, dated June 9, 1982

Gentlemen:

Your request for additional information on Containment Venting (Enclosure 3 to Reference 1) required DPC to forward additional information needed to complete your review. The information requested was identified as questions 1-4 in Enclosure 3 to Reference 1 and our response is Attachment 1 to this submittal.

The request for Technical Specifications on testing for seal deteriorization has been forwarded in a separate license amendment letter (Reference 2).

An extension until August 31, 1982 to respond to this request for information was granted by R. Dudley NRR/NRC.

If there are any questions, please contact us.

Very truly yours,

DAIRYLAND POWER COOPERATIVE

James W Taylor
for Frank Linder, General Manager

FL:JDP:eme

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Attachments

cc: NRC Resident Inspector
J. G. Keppler, Regional Administrator, NRC-DRO III

ATTACHMENT 1

NRC REQUEST 1:

Provide an analysis of airborne radiation released to the environment prior to purge system isolation following a LOCA.

DPC RESPONSE 1:

The following analysis has been performed of the offsite dose equivalent rates out to three miles from the site boundary which would result from Containment Building activity released to the environment prior to closure of the ventilation dampers following a LOCA.

A. The following assumptions were made:

(1) All primary coolant is released to the Containment atmosphere.

(2) The coolant activity was at the Technical Specification limit of 0.2 μ Ci/gm of Dose Equivalent I-131.

(3) Coolant noble gas activity was at 4.0 μ Ci/gm, which corresponds proportionally to Iodine at 0.2 μ Ci/gm.

(4) Worst case meteorological conditions (per Regulatory Guide 1.145) of:

Wind Speed: 2.0 mph
$\Delta T = +10°F$
Pasquil Stability Category G (Extremely Stable)
Wind Direction - from 216° (Towards Genoa, WI)

(5) Containment Building Exhaust Flow Rate: 2.36×10^6 cc/sec.

(6) Stack Flow Rate (2 Blowers) 2.96×10^7 cc/sec

(7) Containment Building Activity Monitor detects activity and isolates containment within 99.5 sec of LOCA. (This was obtained by testing to determine the summation of the travel time from the Containment Building vent header to a meter response on the monitor, the meter response time to an alarmed condition, and damper closure time).

B. Calculations:

(1) Total Activity in Containment following LOCA:

Σ Noble Gases - 523.2 Ci, concentration of 0.07 μ Ci/cc
Σ Radioiodines - 26.16 Ci, concentration of 3.5×10^{-3} μ Ci/cc

(2) Dilution of Containment exhaust air by stack exhaust;

$$\frac{2.926 \times 10^{7} \text{ cc/sec}}{2.36 \times 10^{6} \text{ cc/sec}} = 12.4 \text{ Dilution Factor}$$

(3) Source Term from Stack:

Noble Gases:

$$\frac{2.36 \times 10^{6} \text{ cc/sec} \times 0.07\ \mu \text{ Ci/cc}}{12.4 \times 10^{6}\ \mu \text{ Ci/Ci}} = 0.01 \text{ Ci/sec}$$

Radioiodines:

$$\frac{2.36 \times 10^{6} \text{ cc/sec} \times 3.5 \times 10^{-3}\ \mu \text{ Ci/cc}}{12.4 \times 10^{6}\ \mu \text{ Ci/Ci}} = 6.66 \times 10^{-4} \text{ Ci/sec}$$

(4) Offsite Dose Equivalents:

Noble Gases:

Range	χ/Q-(sec/m^3)	χNG(μCi/cc)	Immersion γ Dose Rates (mR/hr)
400m	1.00 E-30	1.00 E-32	0
1600m	4.03 E-23	4.03 E-25	0
2000m	4.37 E-04	4.37 E-06	1.35*
4800m	1.30 E-09	1.30 E-11	4.03 E-06

Radioiodines:

Range	χ/I-(μCi/cc)	Child Thyroid Dose (Rem/hr)	Adult Thyroid Dose (Rem/hr)
400m	6.66 E-34	0	0
1600m	2.68 E-26	0	0
2000m	2.92 E-07	0.21	0.11*
4800m	8.69 E-13	1.51 E-07	7.55 E-08

* Due to terrain height exceeding stack height, and subsequent plume impactment, the Exclusion Area Boundary does not represent the most restrictive dose for elevated releases. Approximately 2000 meters is most restrictive for adverse meteorological conditions.

(5) Evaluation of highest offsite dose equivalents in terms of % of 10 CFR 100 release limits. Assume maximum exposure period to be 2 hours.

External Exposure:

$$\frac{1.35 \text{ mR/hr} \times 2 \text{ hr}}{25 \text{ Rem} \times 10^3 \text{ mR/R}} \times 100\% = 0.01\% \text{ of 10 CFR 100 Limits}$$

Thyroid Dose Equivalent:

(a) Child

$$\frac{0.21 \text{ Rem} \times 2 \text{ hr}}{300 \text{ Rem}} \times 100\% = 0.14\% \text{ of 10 CFR Limits}$$

(b) Adult

$$\frac{0.11 \text{ Rem} \times 2 \text{ hr} \times 100\%}{300 \text{ Rem}} = 0.07\% \text{ of 10 CFR Limits}$$

NRC REQUEST 2:

Provide information concerning the provisions to protect structures and safety-related equipment (e.g. SBGT) located downstream of the purge isolation valves against loss of function from the environment created by the escaping air and steam following a LOCA.*

DPC RESPONSE 2:

No provisions are required to protect downstream equipment against escaping air and steam following a LOCA. The reactor containment ventilation inlet piping is routed directed from the outside. It would, therefore; not discharge into any structure containing equipment performing safety-related functions.

The reactor containment ventilation discharge piping is connected directly to a tunnel leading to the base of the stack. The containment ventilation is diluted by mixture with the ventilation from the turbine hall and with stack dilution air. The tunnel into which the containment ventilation discharge line empties does contain several containment isolation valves, including the Reactor Vent Header External Isolation Valve, the Heating Steam Condensate Return Isolation Valve, the Heating Steam Check Valve, the Resin Sluice Line Check Valve, and the Reactor Cavity Purge Check Valve. The air and steam environment would have no effect on the check valves. The Heating Steam Condensate Return line is only potentially needed during primary system heatup for a hydrostatic test and for heating the Containment Building during a long winter outage. Therefore, a procedure change will be submitted, requiring that a manual isolation valve in the line, 73-24-057, "Containment Building Condensate Return Shutoff", be locked closed during Operating Conditions 1 and 2, so that operation of the Heating Steam Condensate Return Isolation Valve will not be necessary during the Post-LOCA conditions. The Reactor Vent Header's primary isolation valve is the Reactor Vent Header Internal Isolation Valve, which automatically closes upon receipt of a high reactor pressure, low water level, high containment building pressure or high containment building activity signal. The internal isolation valve is located inside the Containment Building, and so is not in the pathway of the Ventilation Damper's discharge.

No other equipment performing any safety-related function is exposed to the air and steam of a LOCA prior to the isolation of the ventilation system.

NRC REQUEST 3:

Although we previously approved your piping design with regard to debris protection in our December 12, 1980 letter, further consideration of the system design by our technical reviewers has caused us to conclude that this original position was not correct. Provide a discussion of the provisions to ensure that isolation valve closure will not be prevented by debris which could potentially become entrained in the escaping air and steam. Installation of debris screens is one acceptable method of accomplishing this function. If no provisions are considered necessary provide information to justify this conclusion.

DPC RESPONSE 3:

The reactor containment ventilation inlet is connected directly (via duct work) to the air supply to the two air conditioners. There exists no pathway to admit debris directly to the ventilation damper area should a reverse flow occur during a LOCA. Past experience has shown that the duct work would collapse inward on sudden over-pressure and restrict (by cross-section reduction) the discharge flow path. As there is no apparent source of debris and no pathway to the area of the isolation valves the addition of a debris screen would accomplish nothing.

The reactor containment ventilation discharge is connected to a series of duct work which takes a suction on the atmosphere in the forced circulation pump cavities, the reactor building (at several elevations) and the 4" containment vessel off-gas header.

All of these flow paths are directed through the exhaust fan. The exhaust fan would provide restriction to any debris entering. As the exhaust fan is not environmentally qualified and provides no post-accident function, protection of the fan from debris impingement is not necessary.

NRC REQUEST 4:

It is our recommendation that you commit to limiting the use of the purge/vent system to a specified annual time commensurate with plant operational safety needs. Provide such a commitment or provide a quantitative justification why such a limitation is considered unnecessary.

DPC Response 4:

DPC is not able to commit to limiting the use of the Containment Ventilation System. The need to routinely enter the containment to perform maintenance and operational functions, the need to remove heat load and the need to monitor primary system leakage rates all conflict with any commitment to cease ventilation. A quantitative review of these issues is related below. The cost of modification in the broadest of estimates is attached. The remoting of this many functions is an effort of great complexity and cost figures are difficult to predict.

Remote Readings Outside of Containment

The readings listed would have to be remoted outside of containment if personnel entry was to be restricted.

Control Rod Drive Gas Pressure (29)
Control Rod Drive Effluent Temperature (29)
Forced Circulation Pump Leakoff Flow
Purification Resin Bed Differential Pressure (2)
Shield Cooling Filter differential Pressure
Seal Injection Supply to Forced Circulation Pump Filter
  Differential Pressure
Seal Injection Supply to Control Rod Drive Filter Differential Pressure
Control Rod Drive Effluent Flow
Retention Tanks (2)
Overhead Storage Tank Level
Reactor Cavity Radiation Monitor
Hydraulic Valve Accumulator System Pressure
Hydraulic Valve Accumulator System Level
Purification Filter Differential Pressure
Fuel Element Storage Well Filter Differential Pressure

The cost of remoting these readings if it is possible to rewire the existing containment electrical penetration plates is $400,000.

Heat Removal Capacity Upgrade

The containment building air conditioners were sized to provide adequate heat removal while ventilating the containment during operation. Experience in time periods when ventilation is interrupted indicated forced circulation pump cubicles temperatures as high as 140°F in February.

A 5 hour ventilation period dropped the temperature about 3°F. These temperatures are equal to the maximum for summertime operation with ventilation. The higher temperatures expected without ventilation would lead to degradation of the reactor forced circulation pump motors. The cost of substantially upgrading air conditioning capability by 50% is approximately $40,000 for the hardware plus installation, rewiring, etc.

Primary System Leakage Detection

The reactor lower cavity contains most of the reactor vessel and associated piping. The primary system leak detention sensitivity is based on a measured air sweep through the cavity being routed past a monitor. This air is supplied by the plant control air system external to containment.

The reactor cavity leak detection system was installed in March 1969, following the Atomic Energy Commission review of LACBWR's primary leak detection capabilities. The system was first described in an Addendum to Amendment No. 3 to the Application for Transfer of Provisional Operating Authorization DPRA-6 for LACBWR, dated March 17, 1970. Its usage in detecting a small primary leak of less than 2 ml/hr was described in Technical Report DPC-851-21, "LACBWR Primary Piping and Reactor Vessel Leak Detection System Performance," February, 1971. This system is necessary to meet the requirements of SEP Topic V-5, "Reactor Coolant Pressure Boundary Leakage Detection."

If the containment building can not continue venting, air can no longer be introducted into the reactor cavity, since it would pressurize the building. The sensitivity of the detection system is directly proportional to the air flow past the monitor. Therefore, decreasing the air flow would increase the size leak which could be detected. If air is not introduced into the cavity, the area will no longer be pressurized with respect to the remainder of the building. Therefore, leakage into the cavity from other sources, such as the retention tanks, would occur, which would increase the activity the monitor is detecting and mask small leaks. Discontinuation of the air sweep would also decrease the likelihood of the activity generated by a small leak and increase the time for activity released by any leak to reach the monitor to be detected.

In addition to the decrease in detection sensitivity resulting from discontinuation of the cavity air sweep, not venting the containment building would result in increased background activity, which would further limit the ability to detect small primary leaks.

Other Concerns

The ability to enter containment for regular inspection tours has proved valuable throughout LACBWR operating history. Operators have observed incipient fires and have taken corrective action prior to the occurrence of major problems and before the fire detection system provided warning. The operators have detected trends in equipment performance and provide excellent loose parts detection capability. Elimination or reduction of entries into the containment would reduce the safety which was designed into the plant with the provision of an accessible Containment Building.

The Nuclear Regulatory Commission in letters, Heishman to Linder, dated December 10, 1980 and March 5, 1981 expressed its concerns over supervisors not making sufficient tours of the Containment Building, in addition to the six daily scheduled auxiliary operator tours. Without Containment Building venting, there will have to be at least a reduction in all personnel entries into the containment to reduce radiation exposure and the hazard to the health and safety of plant personnel.

If the ventilation system was totally isolated, the activity buildup (assuming steady state power operation, with coolant activity and leakage similar to normal operation) would result in personnel stay times, without supplied air breathing apparatus, being limited to approximately 3.5 hours per week, after 1 day without venting; 0.9 hour per week, after 7 days without venting; and 0.7 hour per week after 9 or more days without venting. These limited stay times would not permit adequate maintenance or surveillance of the plant, since the majority of primary and reactor auxiliary systems' equipment is located within the Containment Building.

This is not consistent with the goal of As-Low-As-Reasonably-Achievable program of the NRC or the need to reduce the likelihood of Loss-of-Coolant Accident through diligent observation of plant equipment.

ADDITIONAL NRC REQUEST 1:

The following request was made during a telephone conversation on August 26, 1982 between R. Dudley, NRC Project Manger, and L. Goodman, LACBWR Operations Engineer:

> *Install a keyswitch for the 4-inch vent header external valve and maintain it closed at all times; or show that it is operable.*

DPC RESPONSE:

The Containment Building heatup and pressurization experienced during periods the ventilation dampers were closed were experienced when the vent header was in service. Heatup and pressurization of the building would be faster if the vent header was isolated. The reactor vent header has an internal isolation ball valve, 55-25-003, which automatically closes on receipt of a high building pressure, high reactor pressure, high containment building activity or low reactor water level signal, the same signals which isolate the ventilation dampers. An environmentally qualified solenoid has been installed to operate the valve. The internal vent header isolation valve fails closed on loss of power or air.

The reactor vent header external isolation valve, 55-25-004 can be closed manually from the Control Room. It fails closed on loss of power or air. The question was raised as to whether this valve can close under pressure. A test procedure has been written in which blank flanges will be installed in the reactor vent header line. The line will be pressurized to 55 psig with both isolation valves open. An attempt will be made to close each valve to see if it can close against a pressurized line.

If the valves do not close, a system modification will be made. If the valves do close, they will be considered operable and the external valve will be returned to its original open position. The test of the internal isolation valve's automatic closure on containment isolation signals is performed prior to each cold plant startup, if not performed within the preceeding thirty days. The test was last successfully performed during August, 1982.

ADDITIONAL NRC REQUEST 2:

The following request was made during a telephone conversation on August 24, 1982 between R. Dudley and J. Parkyn, LACBWR Superintendent:

> *An SER of December 12, 1980 requested a commitment to the replacement of seals based on the manufacturer's PM recommendations.*

DPC RESPONSE:

Replacement of the Containment Building ventilation dampers' seals has been placed on a 5-year PM schedule.