Omaha Public Power District

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September 17, 1981

Mr. Robert A. Clark, Chief
U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Division of Licensing
Operating Reactors Branch No. 3
Washington, D.C. 20555

Reference: Docket No. 50-285

Dear Mr. Clark:

The District's letter to the Commission dated July 1, 1981 provided the District's response to Task II.B.1, Reactor Coolant Gas Vent System, of NUREG-0737. A recent review of the July 1, 1981 submittal revealed that it contained several paragraphs in the wrong sequence within the discussion section of the letter due to a word processing error. Therefore, enclosed please find a corrected discussion section of the July 1, 1981 submittal. The affected paragraphs and their proper location in the corrected submittal are identified by a vertical black line on the right margin of the page. Please note that Enclosures 1 and 2, and the attached drawings and diagrams in the July 1, 1981 submittal, were accurate and do not require resubmittal.

Sincerely,

W. C. Jones

W. C. Jones
Division Manager
Production Operations

WCJ/KJM/TLP/RWS:jmm

Enclosures

cc: LeBoeuf, Lamb, Leiby & MacRae
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Response to Document Requirements of Section II.B.1
of NUREG 0737 Reactor Coolant System Vents

1. RESPONSE TO NRC POSITION

POSITION:

Submit a description of the design, location, size, and power supply for the vent system along with results of analyses for loss-of-coolant accidents initiated by a break in the vent pipe. The results of the analyses should demonstrate compliance with the acceptance criteria of 10 CFR 50.46.

RESPONSE:

A description of the design, location, size, and power supply for the Reactor Coolant Gas Vent System (RCGVS) along with results of analyses for loss-of-coolant accidents initiated by a break in the vent pipe may be found in enclosure (1) Combustion Engineering's transmittal to Omaha Public Power District, number 18074-940. This system description is enclosed for NRC staff review.

POSITION:

Submit procedures and supporting analysis for operator use of the vents that also include the information available to the operator for initiating or terminating vent usage.

RESPONSE:

Procedural guidelines and supporting analyses for operator use of the RCGVS may be found in enclosure (2) Combustion Engineering's transmittal to Omaha Public Power District, number 18074-940. The procedural guidelines are enclosed for NRC staff review.

2. DISCUSSION OF DESIGN WITH RESPECT TO NRC "CLARIFICATIONS".

a) The important safety function enhanced by this venting capability is core cooling. For events beyond the present design basis, this venting capability will substantially increase the plant's ability to deal with large quantities of noncondensible gas which could interfere with core cooling.

   Procedures addressing the use of the reactor coolant system vents should define the condition under which the vents should be used as well as the conditions under which the vents should not be used. The procedures should be directed toward achieving a substantial increase in the plant being able to maintain core cooling without loss of containment integrity for events beyond the design basis. The use of vents for accidents within the normal design basis must not result in a violation of the requirements of 10 CFR 50.44 or 10 CFR 50.46.

Discussion - At present a procedural guideline has been drafted and included in this response. Detailed procedures will be based on these guidelines.

b) The size of the reactor coolant vents is not a critical issue. The desired venting capability can be achieved with vents in a fairly broad spectrum of sizes. The criteria for sizing a vent can be developed in several ways. One approach, which may be considered, is to specify a volume of noncondensible gas to be vented and in a specific venting time. For containments particularly vulnerable to failure from large hydrogen releases over a short period of time, the necessity and desireability for contained venting outside the containment must be considered (e.g., into a decay gas collection and storage system).

Discussion - The basic purpose of the vent system is to remove non-condensible gases from the RCS in a timely manner. Since the system may be required to operate under a variety of post-accident conditions to remove gases from the RCS, the system is designed to vent non-condensible gas from the RCS in a reasonable period of time without reference to a specific bubble size or to reactor coolant temperature and pressure conditions. Over the range of conditions considered, (pressure from 250 psia to 2250 psia and temperatures from 200 F to 700 F), the system is designed to remove 5000 standard cubic feet of gas-roughly the size of the entire reactor vessel- in a maximum of approximately ½ hours. Stated somewhat differently, the system is designed to vent one-half of the vessel volume in one hour with the vented volume expressed in standard cubic feet of gas over the range of venting conditions considered.

c) The reactor coolant vent system shall be operable from the control room. A positive indication of valve position should be provided in the control room.

Discussion - The system is designed to permit the operator to vent the reactor vessel head or pressurizer steam space from the control room with positive open/close position indication for all remotely operated solenoid valves.

d) The probability of a vent path failing to close, once opened, should be minimized; this is a new requirement. Each vent must have its power supplied from an emergency bus. A single failure within the power and control aspects of the reactor coolant vent system should not prevent isolation of the entire vent system when required.

Discussion - The solenoid valves are powered from emergency bus. Parallel valves assure a vent flow path to containment in the event of single active failure. A single failure within the power or control aspects of the system will not prevent isolation of the entire vent system when required. This has been accomplished by having two electrical operated valves in series (powered from different power services) for isolation. Valves are qualified for LOCA environment.

e) Vent paths from the primary system to within containment should go to those areas that provide good mixing with containment air.

Discussion - The vent path to containment is located in an open area of containment where good mixing with containment air is assured.

f) Provisions to test for operability of the reactor coolant vent system should be a part of the design. Testing should be performed in accordance with subsection IWV of Section XI of the ASME Code for Category B valves.

Discussion - The valves will be full-stroke exercised during cold shutdowns. Valves shall be leak-tested at the same (or greater) frequency as scheduled refueling outages, but not less than once every two years. A pressure transmitter has been provided to facilitate leak testing.

g) It is important that the displays and controls added to the control room as a result of this requirement not increase the potential for operator error. A human-factor analysis should be performed taking into consideration:

(a) the use of this information by an operator during both normal and abnormal plant conditions;

(b) integration into emergency procedures,

(c) integration into operator training, and

(d) other alarms during emergency and need for prioritization of alarms.

Discussion - To reduce potential for operator error a human factor analysis has been performed on the location and placement of displays and controls added to the control room as a result of this design.

h) Where practical, the reactor coolant system vents should be kept smaller than the size corresponding to the definition of LOCA (10 CFR 50, Appendix A). This will minimize the challenges to the emergency core cooling system (ECCS) since the inadvertent opening of a vent smaller than the LOCA definition would not require ECCS actuation, although it may result in leakage beyond technical specification limits. On PWRs, the use of new or existing lines whose smallest orifice is larger than the LOCA definition will require a valve in series with a vent valve that can be closed from the control room to terminate the LOCA that would result if an open vent valve could not be reclosed.

Discussion - Coolant liquid loss through the vent shall not exceed makeup capacity. This limits the mass loss to below the definition of a LOCA in 10 CFR 50, Appendix A. This has been accomplished by placing two flow restricting orifices of 7/32" diameter by 1" long. These are located at both vent points for the reactor vessel and pressurizer.

i) Since the reactor coolant system vent will be part of the reactor coolant system pressure boundary, all requirements for the reactor pressure boundary must be met, and, in addition, sufficient redundancy should be incorporated into the design to minimize the probability of an inadvertent actuation of the system. Administrative procedures, may be a viable option to meet the single-failure criterion. For vents larger than the LOCA definition, an analysis is required to demonostrate compliance with 10 CFR 50.46.

Discussion - The vent path shall be safety grade meeting the same or better qualifications as were accepted for the RCS at time of licensing. The power operated valves shall be class 1E powered with key locked valve control switches and administrative controls on valve operation to minimize the possibility of inadvertent operation of the system.

j) The reactor coolant vent system (i.e., vent valves, block valves, position indication devices, cable terminations, and piping), shall be seismically and environmentally qualified in accordance with IEEE 344-1975 as supplemented by Regulatory Guide 1.100, 1.92, and SEP 3.92, 3.43, and 3.10. Environmental qualifications are in accordance with the May 23, 1980 Commission Order and Memorandum (CLI-80-21).

Discussion - Electrical equipment required for the operation of this system is qualified for IEEE 323-1974 and IEEE 344-1975.

k) Each PWR licensee should provide the capability to vent the reactor vessel head. The reactor vessel head vent should be capable of venting noncondensible gas from the reactor vessel hot legs (to the elevation of the top of the outlet nozzle) and cold legs (through head jets and other leakage paths).

Discussion - Capability has been provided.

l) Venting of the pressurizer is required to assure its availability for system pressure and volume control. These are important considerations, especially during natural circulation.

Discussion - Capability has been provided.

m) Additional venting capability is required for those portions of each hot leg that cannot be vented through the reactor vessel head vent or pressurizer. It is impractical to vent each of the many thousands of tubes in a U-tube steam generator; however, the staff believes that a procedure can be developed that assures sufficient liquid or steam can enter the U-tube region so that decay heat can be effectively removed from the RCS. Such operating procedures should incorporate this consideration.

Discussion - Venting of the hot legs will be accomplished by this system.

3. ENCLOSED DRAWINGS AND DIAGRAMS

a)	Reactor Coolant Gas Vent System Piping Isometric and Plan	Nuclear Structures 2002-04-1	Rev. 1
b)	Pipe Supports	Nuclear Structures 2002-04-2	Rev. 1
c)	Pipe Supports	Nuclear Structures 2002-04-3	Rev. 1
d)	Schematic, Elementary, Wiring Diagram and Switch Development	OPPD 11405-E-144	Rev. 0
e)	Reactor Coolant Gas Vent System. Instrumentation and Control Equipment List.	OPPD 11405EM 176/182	Rev. 0