

Selected Operating Reactor Issues Program II

Reactor Coolant System Vents (NUREG-00737, Item II.B.1.)
NRC FIN A0250 - Project 9

FINAL TECHNICAL EVALUATION REPORT FOR NINE MILE POINT 1

Docket Number 50-220
NRC TAC Number 44387

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TF-383/0823a

April 6, 1983

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TECHNICAL EVALUATION REPORT ON REACTOR COOLANT SYSTEM VENTS FOR NINE MILE POINT I

INTRODUCTION

The requirements for reactor coolant system high point vents are stated in paragraph (cX3Xiii) of 10 CFR 50.44, "Standards for Combustible Gas Control System in Light Water Cooled Power Reactors," and are further described in Standard Review Plan (SRP) Section 5.4.12, "Reactor Coolant System High Point Vents," and Item II.B.1 of NUREG-0737, "Clarification of TMI Action Plan Requirements." In response to these and previous requirements, the Niagara Mohawk Power Corporation has submitted information in References 1 through 5 in support of the vent system on Nine Mile Point Unit 1.

EVALUATION

The function of the reactor coolant system (RCS) vent system is to vent noncondensable gases from the high points of the RCS to assure that core cooling during natural circulation will not be inhibited. The Boiling Water Reactor (BWR) Owners' Group has submitted documentation (References 6 through 9) on how the RCS venting requirements are met in General Electric (GE) BWRs. The BWR Owners' Group position has been endorsed by the licensee.

In accordance with the BWR Owners' Group position, the means of venting noncondensable gases from the reactor pressure vessel at Nine Mile Point I are six 6-inch power-operated, safety-related electromechanical relief valves which alone provide adequate venting. Each relief valve is provided with positive position indication in the main control room derived from individual acoustic monitors and is operable from the main control room. In addition, the licensee has stated that no protection system that is necessary to maintain adequate core cooling, with the exception of the emergency condensers, requires remote venting since none is susceptible to the buildup of a large amount of noncondensable gas that could cause a loss of function of the system.

The licensee has modified the emergency condenser vent system to provide venting capability from the high point of the primary side of each of the four emergency condensers to the suppression pool. Previous LOCA analyses have considered and found acceptable pipe breaks equivalent in size to a break in the new emergency condenser vent path. Hence, the licensee's previously demonstrated compliance with 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors," is not affected and remains acceptable. A degree of redundancy has been provided by powering the emergency condenser vent valves and the electromechanical relief valves from different emergency buses and powering the air-operated and motor-operated emergency condenser vent valves from separate DC and AC power trains.

We have reviewed the licensee's modified emergency condenser vent system design to assure an acceptably low probability exists for inadvertent or irreversible actuation of the vent system. The common discharge path from the emergency condensers to the suppression pool has two AC-powered motor-operated valves in series and a DC-powered air-operated block valve is located on each branch upstream coming from the two banks of emergency condensers. These valves all receive emergency power, are individually operable from the main control room, and are provided with position indication in the main control room. Valve position indication is provided by way of position indication switches located on the valve stems. The air-operated block valves fail to the closed position in the event of loss of power. The previously existing discharge path that discharges to a main steam line downstream of the main steam isolation valve is provided with two air-operated fail-closed automatic isolation valves to prevent inadvertent venting outside containment under accident conditions. The licensee has stated that all displays and controls added to the main control room as a result of emergency condenser modifications will be considered in the human factors analysis required by NUREG-0737 Item I.D.1, "Control-Room Design Reviews," in order to reduce the potential for operator error. We therefore find that no single active component failure or human error should result in inadvertent opening or failure to close after intentional opening of the emergency condenser vent.

The portion of each emergency condenser vent path up to and including the second normally closed valve forms a part of the reactor coolant pressure boundary, and thus must meet reactor coolant pressure boundary requirements. The licensee has stated that

the modified vent system is designed to safety and seismic criteria consistent with the original system design, which is Seismic Category I. The emergency condenser vent system is designed for pressures and temperatures corresponding to the RCS design pressure and temperature. In addition, newly installed vent system materials are consistent with the original system design. Valve seat leakage from the modified emergency condenser vent will be directed to the suppression pool and detected by existing methods for the detection of unidentified reactor coolant pressure boundary leakage. We therefore conclude that the design and construction of the modified portion of the emergency condenser vent system up to and including the second normally closed valve conforms to all applicable reactor coolant pressure boundary requirements.

The emergency condenser vent system discharges to the suppression pool at a point below the minimum water level. Hence, no safety-related equipment will be adversely impacted by its use. Also, the accumulation of combustible concentrations of gases is precluded by an inerted atmosphere.

The design of the emergency condenser vents provides for individual test and open/closed indication of each valve. However, the licensee has not committed to include the emergency condenser vent valves in his pump and valve in-service inspection program and limit valve exercising to cold shutdown or refueling rather than every three months. This is a confirmatory item.

CONCLUSION

We conclude, based on the applicability of the BWR Owners' Group position to Nine Mile Point I and our specific review of the Nine Mile Point I design, that the existing systems and the licensee's modifications to the emergency condenser vents at Nine Mile Point I are sufficient to vent noncondensable gases from the RCS and emergency condensers without leading to an unacceptable increase in the probability of a LOCA or a challenge to containment integrity, meets the design requirements of NUREG-0737 Item II.B.1, and conforms to the requirements of paragraph (c)(3)(iii) of 10 CFR 50.44. We therefore recommend that the Nine Mile Point I RCS venting capability be found acceptable with the following confirmatory item. The licensee must commit to exercise the emergency condenser vent valves during cold shutdown or refueling in accordance with the requirements of subsection IWV of Section XI of the ASME Code for Category B valves. In addition, it should be noted that the following items were excluded from the scope of

our review: seismic and environmental qualification of the RCS vent system, RCS vent system operating guidelines and procedures, and required modifications to the plant technical specifications and in-service inspection program for the RCS vent system.

1. Letter, G.K. Rhode (Niagara Mohawk Power Corporation) to D.G. Eisenhut (NRC), dated October 18, 1979, with Attachment, "Table I, Nine Mile Point Unit 1 Commitment to Meet NUREG-0578 Requirements."
2. Letter, D.P. Dise (Niagara Mohawk Power Corporation) to H.R. Denton (NRC), dated December 31, 1979, with Enclosure, "NUREG-0578 Recommendation, Reactor Coolant System Venting."
3. Letter, D.P. Dise (Niagara Mohawk Power Corporation) to D.G. Eisenhut (NRC), dated March 31, 1981, with Enclosure, "TMI Action Plan Item No. II.B.1, Reactor Coolant System Vents."
4. Letter, D.P. Dise (Niagara Mohawk Power Corporation) to D.B. Vassallo (NRC), dated March 16, 1982, with Enclosure, "Request for Additional Information, Nine Mile Point 1, NUREG-0737 Item II.B.1 Reactor Coolant System Vents."
5. Niagara Mohawk Power Corporation Drawing No. C-18017-C, "Nine Mile Point Nuclear Station - Emergency Cooling System, P&I Diagram," Rev. 14 dated September 16, 1981.
6. Letter, T.D. Keenan (BWR Owners' Group) to D.G. Eisenhut (NRC), "BWR Owners' Group Positions on NUREG-0578," dated October 17, 1979.
7. Letter, D.B. Waters (BWR Owners' Group) to NRC (Attn: D.G. Eisenhut), "Preliminary Clarification of TMI Action Plan Requirements - BWR Owners' Group Comments," dated October 8, 1980.
8. General Electric Report NEDO-24708A, Revision 1, "Additional Information Required for NRC Staff Generic Report on Boiling Water Reactors," dated December 1980.
9. Letter, D.B. Waters (BWR Owners' Group) to NRC (Attn: D.G. Eisenhut), "NUREG-0660/0737 Requirement II.B.1: Reactor Coolant System Vents," dated April 24, 1981.