R. E. GINNA

IPSAR SECTION 3.3.1.1

PIPE BREAK OUTSIDE CONTAINMENT

I. INTRODUCTION

In Section 3.3.1.1 of the Integrated Plant Safety Assessment Report (IPSAR) for the R. E. Ginna Nuclear Power Plant, NUREG-0821, December 1982 (Reference 1), Rochester Gas & Electric Corporation, the licensee, committed to provide jet impingement shielding in the intermediate building for main steam line safety and relief valves and to protect these valves from the effects of failure of turbine building block walls. These modifications were to be coordinated with the structural upgrade program discussed in IPSAR Section 4.8. By letters dated June 16, 1983 (Reference 2) and July 20, 1983 (Reference 3), the licensee provided an assessment of the consequences of pipe breaks in the intermediate building if the shielding is not provided. Based on this assessment, the licensee concluded that protection for these valves is not necessary.

II. EVALUATION

As discussed in the staff safety evaluation of Topic III-5.B, Pipe Break Outside Containment (Reference 4), the licensee has instituted an augmented radiographic inspection program for the main steam and feedwater lines in the intermediate and turbine buildings. This program was designed to provide added assurance that large breaks will not occur in these lines. Plant modification, such as installation of the standby auxiliary feedwater system, were also made to ensure plant safe shutdown capability after such events.

A. Pipe Failures in the Intermediate Building

The topic evaluation concluded that cracks in the main feedwater lines could result in jet impingement on main steam safety and relief valves. Therefore, it was concluded that jet impinement shielding should be provided.

Following the integrated assessment, the licensee concluded that such shielding was not necessary based on the following considerations (Reference 2): The jet from a crack in the "B" main feedwater line (upstream of the check valve) could impinge on the "A" main steam safety valves and atmospheric relief valves such that the valves inadvertently open. The opening of these valves would be roughly equivalent to a 1 ft^2 steam line break size, which is much smaller than the design basis break. The "A" feedwater line would be isolated to limit the blowdown and the standby auxiliary feedwater system would be actuated to provide feedwater to the "B" steam generator. The check valve would prevent the flow from being diverted out the cracked portion of the feedwater line. All necessary equipment to mitigate the event and reach safe shutdown is outside the intermediate building and thus would be unaffected by either the feedwater line failure or the steam blowdown. The cooldown could be controlled by operation of the steam safety or relief valves off the (unaffected) "B" main steam line.

Another scenario considered was a postulated crack in the "A" main feedwater line (upstream of the check valve). It is possible, but not likely, for the resulting jet to impinge on safety and/or relief valves for both the "A" and "B" steam lines. The "A" steam line is closer to the "A" feedwater line than is the "B" steam line and thus may provide some shielding. The nearest steam relief components are 60 ft. from the feedwater line. If, as a bounding case, all valves on both steam lines are assumed to fail open, the break area (2 ft^2) and blowdown are enveloped by the design-basis break (4.37 ft^2). In this case, decay heat removal would have to be controlled by the rate of auxiliary feedwater addition since valves on both steam generators could be open. This scenario is outside the range of anticipated transients normally considered for Ginna. The capability of the Ginna facility to cope with an intermediate-sized blowdown from both steam generators is addressed in Section C.

B. Pipe Failures in the Turbine Building

Rupture of a main steam or main feedwater line in the turbine building could lead to building pressurization in excess of the capacity of the block wall between the turbine and intermediate buildings. Failure of the wall could result in blocks falling on nearby equipment and piping in the intermediate building. The licensee will ensure that the main steam and feedwater lines, the main steam isolation valves and the auxiliary feedwater piping connections remain intact. However, the blocks could cause sufficient damage to main steam safety and relief valves that they open. The licensee's assessment of the consequences of block wall failure is presented in Reference 3.

The initiating event is failure of either a main steam or main feedwater line in the turbine building. The pressurization then knocks over the block wall onto the main steam components causing steam release through the valves opening. It should be noted that other events such as tornado or seismic events could also fail the block wall. The response for these events would be similar since the required mitigating equipment will be capable of withstanding these events too, when the structural upgrade program is complete. The consequences of block wall failure are then similar to those of the second scenario discussed above, that is, steam blowing down from both steam generators.

C. Decay Heat Removal Following Blowdown From Both Steam Generators

As discussed above, postulated breaks in the turbine or intermediate buildings could, in the worst case, result in opening steam safety and relief valves on both main steam lines. The rate of emptying of the steam generator would depend on how many valves open, plant initial conditions and availability of the normal auxiliary feedwater system.

It is possible that the steam generators could be emptied in this event. In order to depressurize and cool the primary system sufficiently to permit operation of the residual heat removal system, decay heat removal through the steam generators must be reestablished.

The effect of adding auxiliary feedwater to a hot, dry steam generator has been considered. In Reference 5, the licensee presented results that showed that with 40 cycles of such feedwater addition, the usage factor on the tubes is still very low. This analysis provides assurance that the primary-secondary boundary will be maintained.

Should the normal auxiliary feedwater system be unavailable due to the break effects (steam environment in the intermediate building) the standby auxiliary feedwater system would be manually actuated. Should the steam generator become ineffective as a heat sink, the capability exists to establish feed and bleed through the reactor coolant system for decay heat removal. The Westinghouse Owners Group Emergency Response Guidelines, recently approved by the staff in Reference 6, provide for such a contingency. As part of TMI TAP I.C.1, the Ginna emergency procedures will be modified in accordance with these guidelines.

These guidelines are structured to cope with multiple failures and beyond design-basis events. As noted in Reference 6, instructions for treatment of multiple secondary side pressure boundary failures will be addressed in a revision to the guidelines.

It is the staff's position that when the plant-specific emergency procedures based on these guidelines are established, the licensee should ensure that the necessary responses to these scenarios are covered by operator training and the revised procedures.

D. Licensee Commitment

As a result of the above discussed assessment, the licensee has revised its earlier commitment to provide the following:

1. Main steam lines and main feedwater lines do not lose structural integrity due to failure of the block wall.

2. The main steam isolation valves (MSIVs) remain operable.

3. The normal auxiliary feedwater connections to the main feedwater lines, up to and including the check valves, are protected. This is needed to prevent the standby auxiliary feedwater addition from flowing out into the intermediate building instead of to the steam generators.

The licensee's analysis and/or modifications to accomplish these goals will be evaluated as part of the staff review of the structural upgrade program.

III. CONCLUSIONS

The licensee has demonstrated that given a postulated pipe failure in the intermediate or turbine building that damages main steam relief and/or safety valves, the consequences can be mitigated and a safe shutdown condition can be attained. Therefore, the staff concludes that jet impingement shielding or protection from the effects of block wall failure for these components is not required.

As part of the emergency procedures upgrade for TMI I.C.1, the licensee should ensure that the required responses for these events are included in the emergency procedures and operator training. Staff review of the licensee's analysis of structural integrity of the main steam and feedwater lines, MSIVs and auxiliary feedwater line connections will be performed as part of the review of the licensee's structural upgrade program (IPSAR Section 4.8).

IV. REFERENCES

1. Integrated Plant Safety Assessment Report, Systematic Evaluation Program, R. E. Ginna Nuclear Power Plant, NUREG-0821, December 1982.

2. Letter from J. E. Maier (RG&E) to D. M. Crutchfield (NRC), dated June 16, 1983.

3. Letter from J. E. Maier (RG&E) to D. M. Crutchfield (NRC), dated July 20, 1983.

4. Letter from D. M. Crutchfield (NRC) to J. E. Maier (RG&E), dated September 4, 1981.

5. Letter from J. E. Maier (RG&E) to D. M. Crutchfield (NRC), dated May 24, 1983.

6. Generic Letter 83-22, Safety Evaluation of Emergency Response Guidelines, June 3, 1983.