R. E. GINNA NUCLEAR POWER PLANT

IPSAR SECTION 4.13

EFFECTS OF PIPE BREAK ON STRUCTURES, SYSTEMS AND COMPONENTS INSIDE CONTAINMENT

I. INTRODUCTION

The Integrated Plant Safety Assessment Report (IPSAR) for R. E. Ginna (NUREG-0821, December 1982) (Reference 1), included under IPSAR Section 4.13 three subsections concerning pipe break inside containment which required further evaluation. By letter dated March 16, 1983 (Reference 2), the licensee provided information for the first two subsections, and by letter dated April 22, 1983 (Reference 3), on the third subsection. Each subsection is discussed below.

II. EVALUATION

A. Subsection 4.13.1

For some incoming lines, credit was taken for closure of check valves to prevent primary system blowdown in the event of a pipe break. The staff position was that the licensee should periodically test these normally open check valves to ensure they would isolate the line. The licensee has elected instead to consider the consequences of failure of these valves. The lines to be considered are the two charging lines, the alternate charging line and the pressurizer auxiliary spray line. The effect on safety-related equipment would be the same (with one exception) as those resulting from breaks in the letdown line, which are discussed below. The proposed solution for the letdown line break interactions will also resolve these cases.

The one additional interaction to consider is a break in the alternate charging line which could affect cabling for one of the two low pressure injection valves. A postulated independent failure of the other valve would defeat the low pressure injection system but the high pressure safety injection system would still be available to mitigate this small break (2" line). This case is considered to be resolved.

B. Subsection 4.13.2, Small Lines

(1) Letdown Piping

Breaks in letdown piping could affect instrumentation circuits for pressurizer pressure, pressurizer level and RCS pressure. The solution proposed by the licensee is to reroute the instrumentation

away from the high energy line. This modification will be integrated with fire protection modifications. As noted above, the cabling rerouting will ensure that instrumentation is available following pipe breaks in the charging system as well.

(2) Accumulator Taps

Failure of the tap on the "A" accumulator could affect instrumentation circuits similarly to the above case. The rerouting described above will be performed such that adequate safe shutdown monitoring instrumentation is available.

(3) Steam Generator Blowdown Piping

With an effects-oriented approach, breaks in the "B" steam generator blowdown line could affect safety-related instrumentation. The licensee has reanalyzed this line with the mechanistic approach. Since all of the stresses were below the limit of 0.8 (1.25 Sh + Sa), breaks were postulated at the terminal ends and at the two intermediate locations of highest stresses. None of these break locations would result in damage to the instrumentation. Therefore, this item is resolved.

C. Subsection 4.13.3, Fracture Mechanics

With the effects-oriented approach, breaks in two large diameter piping systems could result in unacceptable interactions with safety-related equipment. The staff has developed guidance on an approach that can be used to resolve pipe break issues when system modifications are impractical. This guidance was provided to the licensee in Enclosure 3 to Reference 4.

The approach consists of a fracture mechanics analysis to demonstrate that crack instability will not occur under faulted loads for a given crack size and that smaller flaws can be detected by leakage detection systems and/or inservice inspection programs.

For the pressurizer surge and the "A" accumulator lines, the licensee has provided such fracture mechanic analyses. The licensee demonstrated, using conservative assumptions about material properties, that adequate margin exists between the size of cracks that result in a one gpm leak and the size of cracks that result in a pipe break. The staff has also evaluated the existing leak detection capabilities at Ginna and has determined that, although not meeting the explicit recommendations of Regulatory Guide 1.45, the leak detection systems will be capable of detecting a one gpm leak well in advance of any

substantial crack growth. Also, the pressurizer surge line and accumulator line are part of the regular Inservice Inspection Program at Ginna.

Therefore, based on the conservative fracture mechanics analysis, the leak detection systems and the Inservice Inspection Program, the staff concludes that adequate protection against the effects of pipe break for the two subject lines has been provided.

III. CONCLUSIONS

The fracture mechanics evaluation has shown that the present leakage detection systems are adequate to detect primary system leaks before any substantial crack growth. The effects of other break locations under consideration will be resolved when cable rerouting of instrumentation circuits is performed as part of the fire protection modifications. Therefore, this IPSAR section is complete.

IV. REFERENCES

1. NUREG-0821, Integrated Plant Safety Assessment Report for the R. E. Ginna Nuclear Power Plant, December 1982.

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

3. Letter from J. E. Maier (RG&E) to D. M. Crutchfield (NRC), dated April 22, 1983, transmitting NUTECH report, "Fracture Mechanics Evaluation of High Energy Piping Lines at the R. E. Ginna Nuclear Power Plant."

4. Letter from D. M. Crutchfield (NRC) to J. E. Maier (RG&E), dated February 22, 1982. (LS05-82-02-091).