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CRUTCHFIELD,D. Operating Reactors Branch 5

SUBJECT: Responds to 830223 ltr re operability of containment purge valves.Valves stops set to restrict valves to max of 50 degrees open in Dec 1979 to ensure structural integrity following closure from postulated LOCA.

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March 11, 1983

Director of Nuclear Reactor Regulation
Attention: Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch No. 5
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Containment Purge Valves - 15 Day Response
R. E. Ginna Nuclear Power Plant
Docket No. 50-244

Dear Mr. Crutchfield:

Your letter dated February 23, 1983, which was received on February 25, 1983, requested that we assess the operability of the purge valves in light of the concerns outlined in your letter and commit to maintain the purge valves closed where the reactor is not at cold shutdown or refueling until acceptable information demonstrating operability is submitted.

In response to NRC concerns relative to containment purge valve operability in the event of a LOCA, the Ginna valves were modified to accept travel stops in December 1979. At that time the stops were set to restrict the valves to a maximum of 50° open. This restriction was intended to ensure the structural integrity of the valves following closure from a postulated LOCA. Later detailed stress analyses performed by Quadrex Corporation in 1980 confirmed the valves were acceptable in this position, although at ASME Code Service Level D allowable stresses. Quadrex used as a basis for their analysis a table of torque values developed by Henry Pratt Co. as applicable to the Ginna valves. These torques are those expected in the valves while closing during a LOCA and were generated by Pratt using test data obtained with smaller valves and scaled up to the 48" purge valves. These torques and thus the 1980 Quadrex analysis did not take into account any changes in the torques due to upstream elbows.

In the fall of 1981, in light of renewed concerns relative to these valves, the previous stress analysis was reviewed by RG&E and Quadrex. Based on applying ASME Code Service Level B allowable stresses to the weakest component of the valve, the travel stops were readjusted to a reduced opening of 40°.

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During 1982, Pratt issued a report addressing the Ginna valves. This report included a new torque table which was based on a "worst case" upstream elbow configuration as defined by Pratt. Based on these "worst case" torques, Pratt evaluated the valve and determined that it was not overstressed at valve opening angles of 50° or less.

In order to reevaluate the effects of these torques on valve/operator assembly, Quadrex reviewed their 1980 analysis based on the latest values. This review resulted in the preliminary conclusions that the valve assembly is able to meet ASME Code Service Level B allowables at a valve opening angle of 30° and that at the current 40° setting, the valve shaft would be overstressed in the event of a closure during a postulated LOCA. This determination was based on the torque data reflecting a "worst case" upstream elbow.

Several areas of conservatism exist in Pratt's generation of LOCA induced torques as compared to the actual Ginna configuration. The Pratt "worst case" configuration is based on an upstream elbow oriented 90° out of plane with respect to the valve shaft with the leading edge of the valve disc closing toward the outer wall of the elbow. At Ginna one valve has no upstream elbow, although it is partially restricted by a sheet metal hood, and the other valve has a 90° elbow but the orientation results in the valve disc closing toward the inner wall of the elbow. Thus, while no quantification exists, the torques would be less than the "worst case" orientation. The Pratt report is based on the valves closing at their slowest response time with a containment pressure in excess of 62 psia. Evaluations of LOCA pressures done as part of the Systematic Evaluation Program have shown actual pressures at the time of valve closing would be significantly less than assumed by Pratt. The Pratt report also assumes the downsteam valve to have failed in a fully open position. This assumption is very conservative for Ginna since the downstream valve is mechanically blocked in a restricted position of 40° open and cannot reach a full open position.

The requirement to restrict purging until after the reactor has reached cold shutdown/refueling is unnecessary since it can be shown that a LOCA occurring at hot shutdown conditions would result in considerable margin to 10 CFR 100 limits.

The potential for fuel failures as a result of a LOCA occurring at hot zero power has been assessed. If the reactor has been subcritical for at least one hour, then the decay heat level is less than 2% of full power. At that point, the fuel centerline temperature would be only slightly higher than the clad temperature which would, in turn, be only slightly higher than primary coolant temperature. Since the energy stored in the primary system at

HZP is less than the stored energy at full power, the HZP LOCA transient blowdown and reflood would be bounded by the full power blowdown and reflood. The heatup portion of the LOCA at HZP would be driven by decay heat only since the stored heat in the fuel rods at HZP is negligible (fuel rods are approximately isothermal at HZP). A 2 minute adiabatic heatup of the peak rod with 2% decay heat results in a peak cladding temperature substantially less than the value at which fuel failure would be expected. The 2 minute adiabatic heatup is justified because it conservatively bounds the heatup which occurs during the full power LOCA. Therefore, no fuel failures are expected to occur during the HZP LOCA.

Based on these results an analysis was performed to evaluate the potential radiological consequences of a postulated release of primary coolant activity into the Ginna containment building atmosphere, and then out to the environment via open purge valves. The analysis assumed the sudden LOCA release of 100% of the radioiodine and noble gas equilibrium activity contained in the primary coolant. The primary coolant activity was based upon 1 percent fuel defects, consistent with the Ginna FSAR. The current Ginna Technical Specifications for iodine activity are a factor of 15 lower than the FSAR values. Whole body and thyroid doses were calculated for an individual located at the Ginna site boundary during the entire passage of the release plume. The atmospheric dispersion value (X/Q) was assumed to be 4.8×10^{-4} sec/m^3 for the entire event. The resultant whole body and thyroid doses were calculated to be 0.5 rem and 70 rem, respectively. These dose estimates are considered to be highly conservative, but are still are substantially below the dose limits of 10 CFR Part 100.

Experience has indicated that it is necessary to purge containment prior to major work being conducted in containment during a refueling shutdown in order to minimize exposure to personnel. The consequences of limiting purging to cold shutdown would impact the current refueling outage scheduled to begin on March 26, 1983. The present refueling schedule has cold shutdown conditions being reached approximately 35 hours after core subcriticality. Due to radiation levels in containment which would exist prior to purging, personnel exposure considerations preclude major work inside containment until the containment has been purged for a few hours. Thus impact of restricting purging until cold shutdown conditions had been reached would be to extend the outage by up to 2 days which would increase the cost to up to $500,000.

After assessing the operability of the purge valves in light of the concerns outlined in your letter, RG&E believes a conservative position is to commit, on an interim basis, to maintain the purge valves closed while the reactor is critical. In addition, the valves will not be opened until the reactor has been subcritical for at least one hour. This position is based on:

The conservatism in the Pratt analysis.

The fact that there are two valves in series each with mechanical stops which prevent the valve from going to the full open position. There is no active failure which could cause the valve to go to the full open position.

The probability of a LOCA occurring while the purge valves are open but the plant has not been brought to cold or refueling conditions is very small.

The radiological consequences of a LOCA at HZP are substantially below the 10 CFR Part 100 limits with primary coolant activity at the Technical Specification limit.

Maintaining personnel radiation exposure to as low as reasonably achievable while minimizing costs to the RG&E rate payers.

The above commitment will remain in effect until acceptable information demonstrating operability is submitted. We will be reviewing the revised Pratt data in detail to assess its applicability to the Ginna purge system. While we had previously committed to replace the existing valves and operators by Spring 1985, based on the new restrictions on purging, we will be investigating alternative approaches to determine whether design or schedule improvements can be accomplished. We will inform you of the results of our evaluations.

Very truly yours,

John E. Maier

J. E. Maier

Subscribed and sworn to before me

on this 11th day of March 1983

Lynn I. Hauck

LYNN I. HAUCK
NOTARY PUBLIC, State of N.Y., Monroe County
My Commission Expires March 30, 1984