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U. S. Nuclear Regulatory Commission
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Subject: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Response To Questions Regarding Pressurizer Code Safety Valves

Gentlemen:

NRC Inspection Report 94-14 cited an Unresolved Item (313/9424-02) regarding the reportability of the failure of both ANO-1 pressurizer code safety valves to pass their 'as found' set pressure tests during refueling outage 1R11.

As requested in the referenced inspection report, ANO reviewed this issue utilizing a Nuclear Reactor Regulation (NRR) memorandum issued to licensees dated December 8, 1993, and responded in writing with our position regarding the reportability of the issue.

Subsequent to that response, NRR forwarded (via Telefax) a list of questions to ANO regarding the pressurizer code safety valves. The attachment to this letter reiterates those questions and provides ANO's response.

ANO pursued this issue thoroughly in order to accurately characterize its potential impact on plant safety and evaluate it for potential reportability in accordance with existing NRC regulations and guidance. We believe our actions in determining the subject condition non-reportable were consistent with that guidance.

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If you have additional questions or need additional information regarding this issue, we would be pleased to discuss it further with you.

Very truly yours,

Dwight C. Mims

Dwight C. Mims
Director, Nuclear Safety

DCM/rhs

Attachment

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NRR Questions Regarding the Pressurizer Code Safety Valves

1. NRC

EOI states that "[a]n analysis was performed which verified that the valves were capable of performing their specified functions during the worst case accident scenario assuming they lifted at their 'as-found' setpoints. Therefore, the valves remained operable"

a) NRC

In a fax to NRR (received at NRR November 13, 1995), EOI stated that the worst case transient scenario is an uncontrolled reactivity addition during startup. The overpressure protection analysis for Arkansas Nuclear One, Unit 1, is found in Topical Report BAW-10043, May 1972. BAW-10043 identifies the most severe transients as control rod withdrawal at low power and turbine trip from full power. For both cases, the RCS appears to peak at approximately 2650 psig. SG pressure appears to peak at about 1140 psig for the turbine trip overpower conditions. What is EOI's justification for not reanalyzing the turbine trip transient as well as the low power rod withdrawal transient?

ANO RESPONSE

The startup accident is considered the limiting pressurization event for the ANO-1 reactor coolant system (RCS) and bounds other pressure induced transients. Safety Analysis Report (SAR) Section 4.3.8 delineates:
"The combined capacity of the pressurizer code safety valves is based on the hypothetical case of withdrawal of a regulating control rod assembly bank from a relatively low initial power." The same SAR section also notes that BAW-10043, Overpressure Protection for B&W's Pressurized Water Reactors is a summary technical report prepared in accordance with the ASME code. In that report, the startup accident is described and a turbine trip transient is also assessed.

A review of BAW-10043 provides insight into ANO-1's overpressure protection and those events that are considered most severe. It should be noted that overpressure protection consists of the reactor protection system, the pressurizer safety valves and the main steam safety valves in order to mitigate both primary and secondary system transients. The most severe primary system pressure transient results from a control rod withdrawal event. In this event, the RCS pressure increases rapidly (approximately 100 psi/sec) while the secondary side remains essentially unchanged. The impact on the secondary system, on the other hand, is maximized following a turbine trip from overpower conditions. The RCS peak pressure for the turbine trip event is similar in magnitude to the rod withdrawal, but the rate of increase is significantly lower (approximately 7 psi/sec). Therefore, the conclusions of the report were that the control rod withdrawal event from low power and the turbine trip from overpower conditions produce the most severe pressure transients. The report also states that the turbine trip event from overpower conditions produces the most severe <u>combined</u> primary and secondary pressure transient. In other words, both the primary and secondary systems will be

substantially impacted in the event of a turbine trip. However, the startup accident is the most limiting event for primary system pressure.

Since the rod withdrawal event from low power is the limiting RCS pressure transient, ANO verified that the pressurizer safety valves would perform their safety function under the conditions identified during 1R11 for the postulated transient. The turbine trip from overpower conditions was not reanalyzed, since it would be bounded by the results of the startup event.

b) NRC

The November 13, 1995, fax states that a "PSV flowrate of 324,000 lbm/hr/valve was assumed for the analysis run of interest." The ANO-1 PSAR, FSAR, and the SER indicate that the PSVs have a rated capacity of 300,000 lbm/hr each. What is EOI's justification for 324,000 lbm/hr/valve used in the reanalysis?

ANO RESPONSE

The original Pressurizer Safety Valve (PSV) flowrate that was utilized in the design and licensing of ANO-1 was 300,000 lbm/hr. During the 1980's, however, the valve ring settings were changed such that an ASME rated flow rate was determined to be 324,000 lbm/hr. This information was documented in the ANO system, and a decision was made to incorporate the new value into the PSV evaluation.

As part of the reanalysis, however, a sensitivity study was performed utilizing relief flow rates of 300,000 lbm/hr, 324,000 lbm/hr, 600,000 lbm/hr and 648,000 lbm/hr to determine the impact on peak reactor coolant system pressure. The four flowrates were chosen to assess one or two valves lifting in the event of a startup accident. The results are tabulated below.

PSV Flow Rate	**Peak RCS Pressure (psig)**
300,000	2737.4
324,000	2736.9
600,000	2733.9
648,000	2733.6

From the analysis results, it can be concluded that there is 0.5 psi difference between the 300,000 and 324,000 lbm/hr cases and 3.8 psi difference between the highest and lowest flowrate values (300,000 and 648,000 lbm/hr). The increased flowrate, therefore, had little impact on the peak RCS pressure for the postulated event.

2. NRC

Prior to September, 1993, it appears that the setpoint criteria of +/- 1% were considered the operability limits. It appears that the February, 1995 letter represents a new interpretation of the basis for the Technical Specifications (TS), and thus represents a modification to the plant that would require a 50.59 analysis. Was a 50.59 analysis performed perhaps for a change to the implementing procedures and/or TS bases that contain the setpoint acceptance criteria for

complying with the requirements of the ASME code and 50.55a? What were the results of the 50.59? Was the margin as defined in the basis for a technical specification reduced?

ANO RESPONSE

The bases for Technical Specifications 2.2 describes the actions necessary when the pressurizer code safety valves are found outside the stated tolerances. Specifically, if found outside of a +/-1% tolerance band, they shall be reset to within +/-1%. This has been and continues to be ANO's procedure since initial operation. Operability of the valves in their as-found condition was determined in accordance with Generic Letter 91-18 guidance and the Technical Specifications, which do not state a limit of operability for setpoint tolerance. The analysis referenced in this discussion was not performed to justify a physical change to the valves' setpoint tolerance, but only to determine their ability to perform their design function of maintaining reactor coolant system pressure less than 2750 psig (TS 2.2.1) in their as-found condition.

Since the allowable 'as-left' setpoints of the valves have not been changed since initial plant operation, there has been no "modification to the plant" regarding code safety setpoints and no evaluation under 50.59 is needed.

3. NRC

EOI's letter states that the ASME Code referenced by TS 2.2.2 does not contain any "required action range limits." In fact, the referenced paragraph does contain limits for the setpoint of the PSVs (one at nominal design pressure of 2500 psig and additional valves at nominal settings not to exceed 2500 psig x 1.05). The issue is not whether the code defines the limits, which it clearly does, but how the term "nominal" is interpreted. The TS bases appear to define nominal as ± 1% of 2500 psig. The guidance in GL 91-18 allows analysis as one method of corrective action, but at the same time, new action ranges are to be determined. What are the new acceptance criteria established for the PSVs? How were these determined? How were the code noncompliances in the test acceptance dispositioned?

ANO RESPONSE

The pressurizer code safety setpoints and tolerances have not changed since initial operation. The original safety analyses assumed the nominal value of 2500 psig setpoint for both code safety valves. This value corresponds to the reactor coolant system's design pressure. The plus-or-minus one percent tolerance depicted in the Technical Specification bases is allowed by the ASME code in setting the valve. The nominal setpoint is therefore 2500 psig which meets the ASME criteria of one set at design pressure and additional valves at settings not to exceed 105 percent of design. The new analysis did not change this nominal setpoint, but merely assessed the peak reactor coolant system (RCS) pressure should the safeties drift coincident with a startup accident. The analysis demonstrated that when one code safety is found to be at 103.12 percent of setpoint and the other at 104.52 percent of setpoint, the valves can still perform their safety function, which is to ensure the RCS pressure will not challenge the safety limit in the event of a startup accident. As indicated in the bases, the valves must still be reset to 2500 psig with a tolerance of plus-or-minus one percent. As a result, no new action ranges were developed.

After discovering the PSV setpoints were above the one percent tolerance, condition reports were written to investigate the condition and acknowledge the non-compliance. A past operability assessment was then initiated to determine whether the valves would have fulfilled their safety function in the as-found condition. In parallel with the analysis effort, the valves were reset to 2500 psig ± 1%, as stated in the Technical Specification bases. Although the as-found setpoints would have limited ANO-1's postulated accident transients to below the safety limit and therefore the valves were deemed operable, the PSVs were reset to 2500 psig ± 1% prior to operation.

4. **NRC**
Question on TS 2.2.2 Bases Change for -3% Tolerance of PSVs

Please give the basis for "the 'as-found' setpoint may be 2500 psig + 1, -3%" as related to the -3% in light of NUREG-0737 Item II.K.3.2 and a PORV setpoint increase to 2450 psig.

ANO RESPONSE
In 1991, an "as-found" lift setpoint tolerance was incorporated into the bases of Technical Specification 2.2. The intent of this "as-found" value was to provide guidance in the event a pressurizer code safety valve drifts. Assessments had been performed which indicated that should a safety's setpoint drift as much as 3% below setpoint that the valve would perform its safety function and thus be operable. The incorporation of the "as-found" value, however, did not change the design basis of the plant. The valve must always be reset to 2500 psig ± 1%.

NUREG-0737 Item II.K.3.2, Report of Overall Safety Effect of Power-Operated Relief Valve Isolation System, considered options for decreasing the probability of a small break LOCA due to a stuck open power-operated relief valve. The B&W position was that the reduction in the high pressure reactor trip setpoint below the electromatic relief valve (ERV) setting would decrease the probability of the valve being challenged. Additionally, with the ERV setpoint below the pressurizer safety valves' settings, the PSVs would be less likely to lift. The conclusions of this work have not changed with the incorporation of an "as-found" tolerance. The ERV and PSV setpoints continue to be 2450 psig and 2500 psig respectively, and the PSVs must be set within 1% of 2500 psig.

In conclusion, the "as-found" lift tolerance of 2500 psig -3% is acceptable from an operability standpoint only. The valve will perform its safety function if it drifts 3% below its 2500 psig setpoint. It will always, however, be reset to 2500 psig ± 1%. The probability of a PSV being challenged is the same as it was when NUREG 0737 Item II.K.3.2 was resolved. Therefore, the change to Technical Specification 2.2 Bases to incorporate an "as-found" tolerance is acceptable, since neither the design basis nor licensing basis assumptions were impacted.