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MARTIN,J.B. Region 5 (Post 820201)

SUBJECT: Provides NRC w/early info re actions taken by util to address existence of noncondensible gases in reactor pressure vessel narrow range instrumentation.Condition identified during review of 930121 reactor scram.

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Docket No. 50-397

March 2, 1993
G02-93-051

Mr. J. B. Martin
Regional Administrator
US NRC, Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

Dear Mr. Martin:

Subject: **WNP-2, OPERATING LICENSE NPF-21**
EXISTENCE OF NONCONDENSABLE GASES IN THE REACTOR PRESSURE VESSEL NARROW RANGE INSTRUMENTATION

On January 21, 1993 following a reactor scram, WNP-2 detected symptoms of the presence of dissolved noncondensable gases in the reference legs of instrumentation used to measure Reactor Pressure Vessel (RPV) level. At the beginning of our initial evaluation of this event it was believed to be not reportable to the NRC as it did not appear to provide any new understanding of the issue. In addition, adequate mitigating actions had been taken prior to the event based upon BWR Owners' Group (BWROG) guidance and the results of WNP-2 plant specific evaluation of this potential condition. Upon completion of the reportability evaluation on February 17, 1993 it was concluded that the condition was reportable to the NRC under 10CFR50.72(b)(2) when it was recognized that the existence of the noncondensable gases could inhibit the RPV level 3 isolation trip used to mitigate a postulated moderate energy line crack during shutdown cooling. The report was made on that day. As required by 10CFR50.73, a follow-up Licensee Event Report (LER) will be submitted by March 19, 1993.

The purpose of this letter is to provide the NRC with early information regarding actions taken by the Supply System to deal with this condition. Additional detail will be provided in the LER.

EXPERIENCE TO DATE

Generic Letter 92-04, Information Notice 92-54 and various General Electric and BWROG correspondence discuss the potential for noncondensable gases that may become dissolved in the reference leg of BWR RPV water level instrumentation leading to false high level indication during and after depressurization.

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EXISTENCE OF NONCONDENSABLE GASES IN THE REACTOR PRESSURE VESSEL NARROW RANGE INSTRUMENTATION

In response to concerns stated in these documents and to support BWROG activities, in August 1992 WNP-2 personnel created a designated data acquisition file for the plant computer system to allow for high resolution recording of narrow range level data that could be used to assist in determining if the RPV level indication concern existed at WNP-2. Following the scram of January 21, 1993, degassing and notching level indication were experienced as indicated on RPV level traces obtained by the computer system.

The notching and degassing are both believed to have been initiated by the build up of noncondensable gases in the level instrumentation reference legs during the approximately 140 day run prior to the scram. During operation, these gases migrate into the reference legs by either 1) leakage at the instrument racks, which allows the water with the dissolved gases to be drawn down the reference legs, 2) thermal mixing within the reference leg, or 3) gas diffusion down the reference legs. For WNP-2 it is believed that system leakage is the most dominant cause of the gas migration. The term notching is used to describe indicated alternating step increases in level indication of about 6 inches lasting for about one minute. It is believed to be a result of gas bubbles that accumulate and are released as relatively large bubbles during depressurization and eventually propagate to the vertical sections resulting in momentary water head perturbations. The notching is repetitive and may reflect the instrument piping geometry. The term degassing is used to describe erratic noise like pulses that can result in an increased level biased error. It is a result of the noncondensable gases coming out of solution forming many small bubbles that propagate to vertical sections resulting in momentary water head perturbations. The quantity of noncondensable gases released during depressurization by this mechanism, possibly in combination with the phenomenon resulting in notching, can displace water from the reference leg as the bubbles move up the reference leg lines. A reference leg level water volume decrease results in a higher than actual water level indication.

Observed Notching Following the reactor scram on January 21, notching on narrow range channels B and C was observed by high resolution recording provided by the computer system. No notching was detected on channel A and channel D is not recorded. The first notch occurred on channel C about 7.7 hours after the scram when reactor pressure was about 120 psig. The notch gave a false high level indication of about 4 inches lasting for about one minute. Channel C notching indications reappeared at ten to fifteen minute intervals until they were masked by significant degassing at about 10.7 hours after the scram. Notching appeared on channel B about 8.6 hours after the scram with pressure about 50 psig. Channel B showed repeated double notches of about 7 inches in height with the first notch having duration of about one minute followed by a second notch of about 0.8 minute duration. The channel B notching continued throughout the monitored period.

Observed Degassing Some degassing was observed on all narrow range channels monitored by the computer starting about 8 hours after the scram when pressure was about 80 psig. The degassing for channels A and B did not produce an appreciable bias; the indicated increase was less than about 2 inches. Channel C showed increased degassing of about 10 inches at about 9 hours after the scram when pressure was 35 psig. At about 10.7 hours after the scram, coincident with the initiation of shutdown cooling and a pressure drop from 20 to 10 psig, significant degassing occurred on channel C. The degassing resulted in a peak level offset of about 32 inches within 4 minutes of the pressure reduction. Within about 25 minutes channel C recovered to an average value of about 6 inches above the expected level and within two hours it had fully recovered to the expected level; probably in response to the condensing chamber refilling the reference leg.

At all times RPV level indication was available to the operators and, except for the degassing on channel C, the computer data demonstrated that vessel level indication was adequate.

SHORT TERM MITIGATING ACTIONS TAKEN

The following mitigating actions have been taken, or are planned, in response to this issue.

1. Procedures have been revised to accomplish the following: a) provide the operators instructions for enhanced monitoring of the narrow range RPV level data to facilitate the identification of notching and degassing; b) provide the operators with guidance on how to recognize these conditions; and c) describe the actions to take if they are observed.

2. Operator training on the recognition of degassing and notching and on the determination of RPV water level during depressurization has been completed.

3. Currently a continuous flood watch is in place for the RHR pump rooms in response to an unrelated issue requiring replacement of wall penetration seals used for flood mitigation. For the RPV level indication concern discussed in the first paragraph, this watch will provide for early indication of a crack in the RHR system that would necessitate manual isolation of shutdown cooling normally provided by the level 3 signal. Should the seal replacement activities be completed and the need for continuous coverage be eliminated, an hourly tour will be put in place while the plant is in Mode 3 with an inoperable instrument channel. The pump rooms are provided with flood monitors that alarm in the control room. The flood watch was put in place because these monitors are not single failure proof.

4. A plant walkdown to visually identify any leaks was completed.

5. An effort to bag all connections of the instrument lines of concern is nearly complete. The purpose of this effort is to quantify any suspected leaks that could not be detected visually.

6. Procedures and methods are being developed to provide for instrument line backfilling while pressurized so that a channel can be restored while in Mode 3.

7. Attempts to deal with any leaks identified by actions 4 and 5 will be made when the reactor is next in cold shutdown.

CONCLUSIONS REGARDING OPERABILITY

It is the Supply System's position that channels A through D are operable in Modes 1 and 2 as the phenomenon observed can only exist during depressurization. It is also the Supply System's position that channels A, B and D are operable in Mode 3. This is based upon the recognition that the notching observed in these channels is well defined, of short duration, produces a small error in RPV level indication and is much different from what would be expected for actual loss of RPV inventory that would put the plant at risk.

We believe that channel C is currently inoperable in Mode 3 for Technical Specification 3/4.3.2, Trip Function 5.a. Therefore, we have provided instruction to the control room operators that channel C of this function is to be declared inoperable when the plant enters Mode 3 and that the required response of the Technical Specification Action Statement (3.3.2.b.2) is to be taken promptly without regard to the 12 hours allowed by the Action Statement. We have also provided the operators instructions that a notch that exceeds 6 inches in height and 2 minutes duration is deemed unacceptable and the trip channel must be assumed to be inoperable. Channel A, B, or D can be recovered and considered operable when its level indication is consistent with the other channels for a period of at least 5 minutes.

Should channel C recover normal indication we will communicate this information to an NRC resident inspector prior to declaring the channel operable.

Sincerely,

J. W. Baker (M/D 927M)
WNP-2 Plant Manager

AGH

cc: NRC Document Control Desk
Mr. J. W. Clifford - NRC
Mr. R. Barr, NRC Resident Inspector - (M/D 901A)
Mr. D. L. Williams, BPA (M/D 399)