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SUBJECT: Forwards response to Generic Ltr 86-06 re implementation of TMI Action Item II.K.3.5, "Automatic Trip of Reactor Coolant Pumps," per 870417 request for addl info. Info will expedite review & approval of implementation of trip criterion.

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July 7, 1987

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Subject: Docket Nos. 50-361 and 50-362
San Onofre Nuclear Generating Station
Units 2 and 3

NRC Generic Letter 83-10a requested that licensees provide justification for the operation of Reactor Coolant Pumps (RCPs) during transients and accidents either on an individual utility basis or by reference to a generic CE Owners Group (CEOG) submittal. By letter dated May 31, 1983, SCE indicated that San Onofre Units 2 and 3 would operate RCPs consistent with the CEOG "trip two, leave two" strategy. NRC Generic Letter 86-06 subsequently endorsed the generic information provided by the CEOG in support of this strategy. It further requested information regarding the implementation of TMI Action II.K.3.5, "Automatic Trip of Reactor Coolant Pumps." A formal response to this specific request was prepared and submitted to the NRC on October 31, 1986.

Last November the CEOG identified that it is no longer justifiable to rely on the expected response of containment radiation monitors as a key parameter for determining the trip logic of the second set of RCPs. SCE was then requested by the NRC on April 17, 1987 to provide additional information showing whether it is necessary to confirm the applicability of the original analysis or to implement new guidelines exemplified in the new CEOG analysis.

SCE has reviewed again all applicable Emergency Operating Instructions (EOIs) and concluded that the high containment radiation alarm does not have to be used as a deterministic factor for identifying a LOCA event. The said alarm is incorporated in the diagnostic procedures as a supportive parameter and its setpoint selection is therefore irrelevant to determine when the second set of RCPs should be tripped. As a result, SCE complies with the new CEOG analysis without any particular reliance upon the high containment radiation alarm in the EOIs.

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The October 31, 1986 submittal has been revised and updated accordingly to reflect this new technical position of CEN-268. Enclosure I provides a new submittal in response to Generic Letter 86-06. It supersedes the previous one submitted on October 31, 1986. SCE believes that the submittal of this requested information will expedite the review and approval of the implementation of the RCP trip criterion.

If you have any questions, please contact me.

Very truly yours,

M O Medford

Enclosure

cc: H. Rood, NRR Senior Project Manager, San Onofre Units 2 and 3
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SCE RESPONSE TO GENERIC LETTER 86-06
IMPLEMENTATION REQUIREMENTS

Question 1

Identify the instrumentation to be used to determine the RCP trip setpoints, including the degree of redundancy of each parameter signal needed for the criteria chosen.

Response

SONGS 2 and 3 Emergency Operating Instructions (EOIs) require at least two channels of instrumentation to be operational to provide an adequate reading substantiated with an independent verification. Instrumentation for identification of the RCP trip setpoints is discussed below:

A. For tripping of the first two RCPs in opposite loops, the following instrumentation is used to determine the RCP pressure setpoint at 1430 psia:

Pressurizer Pressure

PT-0102-1,2,3 and 4;
0-3000 psia; Quality Class 2; Environmentally Qualified

SONGS 2 and 3 Technical Specifications require that at least three channels be operable. Hence, this parameter can be monitored at all times with a sufficient degree of redundancy.

B. For determination of LOCA or non-LOCA events in order to conclude whether or not the remaining two RCPs should be tripped, the following instrumentation is used:

1. Subcooling Margin Monitor (SMM) - Subcooling >20°F

RCS Subcooling Margin available on page 611 of the Qualified Safety Parameter Display System (QSPDS) Menu; Channels A and B;
Quality Class 2

RCS Subcooling Margin is used only as a precursor to diagnose a LOCA event in the Safety Functions mode. Both Channels A and B must be operable.

2. Secondary Side Radiation

Secondary Side Radiation is used mainly in the Diagnostic mode to determine whether an identified event is a LOCA or a non-LOCA.

a. Condenser Evacuation System - Setpoint per Offsite Dose Calculation Manual (ODCM)

Preferred

RE-7870-1; Low Range, 10E-7 to 10E-1 μCi/cc; Gross gamma
Medium Range, 10E-4 to 10E+2 μCi/cc; Gross gamma
High Range, 10E-1 to 10E+5 μCi/cc; Gross gamma
Quality Class 2

Backup

RE-7818-1; Low Range, 10E-6 to 10E-1 μCi/cc; Gross gamma
High Range, 10E-3 to 10E+2 μCi/cc; Gross gamma
Quality Class 3

SONGS 2 and 3 Technical Specifications require that either the preferred channel for off-gas radiation monitoring or its backup must be operable. This provision will ensure the degree of redundancy required for off-gas monitoring.

b. Main Steam Line Area Monitor - Setpoint Low 1mR/hr
Setpoint High 1R/hr

RE-7874A1, B1; Low Range, 10E-1 to 10E+4 mR/hr
Quality Class 2

RE-7875A1, B1; High Range, 10E-1 to 10E+4 R/hr
Quality Class 2

SONGS 2 and 3 Technical Specifications require that both low and high range area monitors for at least one steam line (A or B) must be operable. Thus, it is possible to maintain the degree of redundancy for this parameter.

3. Other Supportive Instrumentation

a. Containment Radiation - Setpoint per Technical Specification Requirements

Airborne Radiation

RE-7804-1; Range, 10E-9 to 10E-4 μCi/cc; Gross gamma
Range, 10E-9 to 10E-1 μCi/cc; Gross beta
Quality Class 2

RE-7807-2; Range, 10E-9 to 10E-4 μCi/cc; Gross gamma
Range, 10E-9 to 10E-1 μCi/cc; Gross beta
Quality Class 2

Low Range Area Radiation

RE-7856-1; Range, 10E-1 to 10E+5 mR/hr; Gross gamma,
Quality Class 2

RE-7857-2; Range, 10E-1 to 10E+5 mR/hr; Gross gamma,
Quality Class 2

High Range Area Radiation

RE-7820-1; 1 to 10E+8 R/hr;
Quality Class 2; Environmentally Qualified

RE-7820-2; 1 to 10E+8 R/hr;
Quality Class 2; Environmentally Qualified

b. Reactor Coolant System Temperature

T-Hot

TE-0911-X1; Wide Range, 0-710°F; Quality Class 2
TE-0921-X2; Wide Range, 0-710°F; Quality Class 2

T-Cold

TE-0915-2; Wide Range, 0-710°F; Quality Class 2
TE-0925-1; Wide Range, 0-710°F; Quality Class 2

c. Steam Generator Pressure

PT-1013-1, 2, 3 and 4; Range 0-1200 psia; Quality Class 2
PT-1023-1, 2, 3 and 4; Range 0-1200 psia; Quality Class 2

d. Steam Generator Blowdown Monitor

RE-6753; Range, 10E-1 to 10E+4 mR/hr
Quality Class 3

RE-6759; Range, 10E-1 to 10E+4 mR/hr
Quality Class 3

C. Further decision for tripping the remaining two RCPs for non-LOCA events is based on the following instrumentation:

1. NPSH requirement for each RCP - Compare P/T curve located in each Emergency Operating Instruction.

2. Motor current - Verify RCP motor ammeters to be greater than 200 amps and not fluctuating greater than 400 amps.

3. RCP seal cooling water - Setpoint 400-500 gpm

   FIT 9127; FIT 9128; FIT 9129; FIT 9130;
   0-600 gpm; Quality Class 3

4. CCW Temperature in Seal Heat Exchanger - Setpoint < 200°F

   TE 9144; TE 9154; TE 9164; TE 9174;
   0-650°F; Quality Class 3

5. RCP Seal Staging - NORMAL

Question 2

Identify the instrumentation uncertainties for both normal and adverse containment conditions. Describe the basis for the selection of the adverse containment parameters. Address, as appropriate, local conditions such as fluid jets or pipe whip which might influence the instrumentation reliability.

Response

There are no vendor supplied instrumentation uncertainties for both normal and adverse containment conditions. However, it is feasible to compensate for uncertainties with some adequate conservatism used in the generic analyses of the Trip 2/Leave 2 strategy reported in CEN-268 since the preferred instruments used for tripping in Question 1 are highly qualified and reliable to provide the required information for operator actions. The instruments meet the applicable codes and standards consistent with the quality of the instrument as defined in the FSAR Sections 3.2 and 7.5. The listing shown in Question 1 also denotes the Quality Class of the instruments. Quality Class 1 and 2 instruments are 1E and safety related. In addition to the preferred instruments which are channelized and redundant, other instruments are available to measure the desired parameter as listed in Question 1. The instruments, which are used in a harsh environment, are environmentally qualified and are part of the SCE EQ Program.

The instrument characteristics of Quality Class 2, Safety Related, and Environmentally Qualified assures that the instruments will properly function under normal and the most adverse containment conditions as outlined in the SCE EQ Program.

SCE has not reviewed local conditions such as fluid jets or pipe whip which might influence the instrumentation reliability.

Question 3

In addressing the selection of the criterion, consideration of uncertainties associated with the CEOG supplied analyses values must be provided. These uncertainties include both uncertainties in the computer program results and uncertainties resulting from plant specific features not representative of the CEOG generic data group.

Response

The selection of the RCP trip criterion employs the plant specific data to SONGS 2 and 3. The selection described below has taken into account the uncertainties associated with the CEOG supplied analysis. The instrumentation setpoint also accounts for the manufacturer's recommendations and specifications.

A. The first tier of the RCP operating strategy calls for tripping of the first two RCPs in opposite loops when the RCP pressure decreases below a certain setpoint.

All LOCA and many non-LOCA events will result in RCS depressurization. Large break LOCAs will undergo a rapid and drastic RCS depressurization at or below 300 psia. Small break LOCAs in the range of concern for reactor coolant pump operation will result in a depressurization below 1361 psia. LOCAs which are smaller than this range of concern and many non-LOCA events (steam line breaks and SG tube rupture) will not result in depressurization below 1361 psia. Unless the rate of energy removal from the RCS is quite high, most transients will have a tendency to plateau in pressure at or above RCS saturation conditions which are somewhat higher than steam generator saturation conditions. Best estimate analysis has shown this pressure to be 1361 psia for 3410 MWt plants (CEN-268). The wide range pressurizer pressure instruments, in a non-degraded containment environment, have an estimated instrument loop accuracy of approximately $\pm$75 psi which is a differential pressure not affected by the unit (psia or psig) used. The resultant depressurization setpoint can then be chosen at 1361 psia + 75 psi or approximately 1430 psia. A non-degraded containment environment instrument loop accuracy was chosen because it is not anticipated that the instrument accuracy will be adversely affected during the first few minutes of an accident when the decision to trip the RCP would be made.

The referenced uncertainty of $\pm$75 psi is applicable to the preferred pressurizer pressure sensors shown in Response A of Question 1 and is plant specific to SONGS 2 and 3. This uncertainty value is comparable with but not representative of the CEOG generic data reported in CEN-268. Since the nominal RCS pressure setpoint of 1361 psia for tripping the first two RCPs in opposite loops is based on the conservative best estimate analyses, it reflects the maximum uncertainties in various assumptions used to obtain the result. Thus, it is conservative to include this uncertainty in the computer program results in the selection of the RCP trip criterion.

B. The second tier of the RCP operating strategy calls for tripping of the remaining two RCPs on the basis of various combinations of plant specific criteria similar to those discussed in Section 4 of CEN-268. Responses B and C of Question 1 identify those instruments. The selection of the trip criterion is further discussed in the following:

1. The determination of LOCA or non-LOCA events is mainly based on the RCS subcooling. The loss of RCS subcooling is a prime indication of a LOCA event, although it is also indicative of a SGTR event. The LOCA event would be further confirmed by the absence of secondary radiation alarms with or without the presence of containment radiation alarms. Thus, the remaining two RCPs will be tripped when the RCS subcooling goes below 20°F in the absence of Secondary Side Radiation.

   As with the RCS pressure setpoint, an estimate of instrumentation errors must be factored into the selection of the subcooling setpoint. The 20°F subcooling limit accounts for uncertainties associated with the use of the RCS subcooled margin monitor (SMM) which is one of the three components in QSPDS. This particular SMM for the RCS employs the RCS temperature and pressure inputs in the calculation of the subcooled margin. The temperature inputs are obtained from the resistance thermocouple detector (RTD) readings in one hot leg and two cold legs. The accuracy of these RTDs is $\pm$ 1% in the range of 0-710°F. This is equivalent to $\pm$7°F approximately in uncertainties. However, the Subcooled Margin calculations for the RCS are based on a conservative factor of $\pm$ 15°F for temperature and $\pm$ 75 psi for the pressurizer pressure.

   Secondary Side Radiation is primarily dependent on monitoring of the condenser evacuation system and main steam line area monitors. Alarms on the steam jet air ejector exhaust serve as first indication of secondary side radiation. RE-7870-1 is a safety grade, Quality Class 2 monitor; whereas RE-7818-1 is a non-safety grade, Quality Class 3 monitor. Their alarm/trip setpoints are determined in accordance with the Offsite Dose Calculation Manual (ODCM). In addition, the SG secondary side is monitored by the radiation monitors on the main steam lines. Two monitors per steam line include a high and low scale. These sensors are not required to be safety grade, however, they are Quality Class 2. The alarm/trip setpoints are specified in SONGS 2 and 3 Technical Specification 3/4.3.3 and are set at 1 mR/hr (low) and 1 R/hr (high), respectively. The settings of the condenser evacuation system and main steam line area monitors thus account for the operator's ability to easily detect the pointer setting and the instrument's capacity to record the quantity accurately.

   All other supportive instruments are not specifically required to diagnose a LOCA event. They are used only in the Diagnostic mode to supplement the indication of LOCA as determined by Secondary Side Radiation. Since the CEOG generic analysis for Trip 2/Leave 2 does

not take into account any readings of these instruments, there is no need to specify their uncertainties. These instruments are not used as deterministic factors of a LOCA event.

2. For non-LOCA events associated with the steam line breaks, steam generator tube ruptures, and standard post trip actions, the remaining two RCPs will continue in operation to provide forced circulation during recovery. However, they will be tripped to prevent RCP damages and possible uncovery of the reactor core when any of the following conditions is detected:

   a. NPSH requirements for the RCPs are not met.

   b. Motor running current is low or fluctuating abnormally.

   c. RCP seal cooling water is inadequate.

   d. CCW temperature is greater than the setpoint.

   e. RCP seal staging is not normal.

   As identified in Response C of Question 1, the setpoint determination and action requirement in the selection of these conditions do not account for any instrumentation uncertainties.

Question 4

Identify all plant procedures (except for those concerning normal operations such as normal cooldown) which require RCP trip guidelines. Reference to the CEOG EPGs is acceptable if endorsed by the licensee. Include training and procedures which provide direction for use of individual steam generators with and without operating RCPs.

Response

SCE endorses the CEOG EPG's guidelines on Trip 2/Leave 2. The Trip 2/Leave 2 strategy has been incorporated specifically in the Standard Post-Trip Actions (SO23-12-1), LOCA Guideline (SO23-12-3), SLB Guideline (SO23-12-5), SGTR Guideline (SO23-12-4), and Functional Recovery Guideline (SO23-12-8). The strategy is not applicable to the Reactor Trip Recovery Guideline (SO23-12-2), Loss of Forced Circulation Guideline (SO23-12-7), or the Loss of Feedwater Guideline (SO23-12-6). The development of the EOIs from EPGs are addressed in a SONGS Nuclear Training Department Lesson Plan which is presented as a part of the operator's initial licensing training. All SONGS EOIs are covered extensively in the classroom and during the simulator training, and practiced by San Onofre Operations Department personnel prior to and following NRC licensing.

It is believed that the current Trip 2/Leave 2 strategy in these EOIs will provide the most effective method of plant cooldown during those specific emergency conditions discussed in Question 3 even though plant operations are bounded by FSAR analyses.

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