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PG&E Letter DCL-01-002

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
Response to NRC Request for Additional Information Regarding License Amendment Request 00-05, "Revise Improved Technical Specification 3.5.5, Emergency Core Cooling System (ECCS) – Seal Injection Flow"

Dear Commissioners and Staff:

In a letter dated October 18, 2000, the NRC staff identified additional technical information required in order to complete their evaluation associated with License Amendment Request 00-05, which proposed changes to Technical Specification 3.5.5, "Emergency Core Cooling System – Seal Injection Flow." PG&E's response to the request for additional information is included in Enclosure 1. Revised mark-ups of the Technical Specification pages are contained in Enclosure 2. Revised Technical Specification pages are included in Enclosure 3. This additional information does not affect the results of the safety evaluation and no significant hazards determination previously transmitted in PG&E Letter DCL-00-083, "License Amendment Request 00-05, Revise Improved Technical Specification 3.5.5, "Emergency Core Cooling System – Seal Injection Flow,"" dated June 8, 2000.

If you have any questions regarding this response, please contact Patrick Nugent at (805) 545-4720.

Sincerely,

Gregory M. Rueger

cc: Edgar Bailey, DHS
Girija S. Shukla
Ellis W. Merschoff
David L. Proulx
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Enclosures

A001

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

	)	Docket No. 50-275
In the Matter of	)	Facility Operating License
PACIFIC GAS AND ELECTRIC COMPANY	)	No. DPR-80
	)	
Diablo Canyon Power Plant	)	Docket No. 50-323
Units 1 and 2	)	Facility Operating License
	)	No. DPR-82

AFFIDAVIT

Gregory M. Rueger, of lawful age, first being duly sworn upon oath says that he is Senior Vice President - Generation and Chief Nuclear Officer of Pacific Gas and Electric Company; that he has executed this response to the request for additional information on License Amendment Request 00-05 on behalf of said company with full power and authority to do so; that he is familiar with the content thereof; and that the facts stated therein are true and correct to the best of his knowledge, information, and belief.

Gregory M. Rueger
Senior Vice President – Generation
Chief Nuclear Officer

Subscribed and sworn to before me this 4th day of January 2001.
County of San Francisco
State of California

Notary Public

IRENE F. RICE
Commission # 1173580
Notary Public - California
San Francisco County
My Comm. Expires Feb 13, 2002

PG&E Response to Request for Additional Information Regarding License Amendment Request (LAR) 00-05, Revise Improved Technical Specification 3.5.5, "Emergency Core Cooling System (ECCS) – Seal Injection Flow"

Question 1

Proposed Limiting Condition for Operation (LCO) 3.5.5,"Reactor coolant pump seal injection flow resistance shall be within limits" is incomplete because the word "limits" is undefined by the LCO. Although you further define the word "limits" in the Bases, 10 CFR 50.36(a) states that, "...A summary statement of the bases or reasons for such specifications...shall not become part of the technical specifications." Therefore, you may not rely on the Bases sections to complete the LCO. Please provide the limit you are proposing (i.e., 0.2117 ft/gpm2) in the LCO to make it complete.

PG&E Response to Question 1

The Limiting Condition for Operation (LCO) 3.5.5 limit has been revised to state "Reactor coolant pump seal injection flow resistance shall be $\geq$ 0.2117 ft/gpm^2." A revised mark-up of the Technical Specification (TS) page 3.5-8 containing the defined LCO 3.5.5 limit and Surveillance Requirement 3.5.5.1 is contained in Enclosure 2. A revised proposed TS page 3.5-8 is contained in Enclosure 3. This revised TS page 3.5-8 supersedes that previously provided in PG&E Letter DCL-00-083, "License Amendment Request 00-05, Revise Improved Technical Specification 3.5.5, "Emergency Core Cooling System (ECCS) – Seal Injection Flow,"" dated June 8, 2000.

Question 2

On Page 3 of Enclosure A to your submittal, you stated that "the minimum reactor coolant pump (RCP) seal flow resistance analyses is based on the RCP seal injection flow rate of 40 gpm." However, in other places in your submittal, including Page 3 of Enclosure A, you stated that "the emergency core cooling system (ECCS) model utilizes a hydraulic flow resistance for the RCP seal injection flow path to determine the seal flow rather than specifying an actual flow rate." Please provide a description of the RCP seal flow resistance analyses and how they are used in development of the ECCS model.

PG&E Response to Question 2

The ECCS analysis provides injection flow profiles credited for core cooling and reactor coolant system (RCS) responses under various accident scenarios. These injection flow profiles are calculated with the PEGISYS ECCS flow network computer model originally developed by Westinghouse. The ECCS model utilizes maximum and minimum hydraulic flow resistances bounded by the maximum / minimum ECCS pump performance curves and the maximum / minimum allowable flow distributions as specified in Final Safety Analysis Report (FSAR), Section 6.3.4.4. Worst-case flows are calculated considering several conditions which are combined to provide the limiting maximum and minimum ECCS injection flow profiles used in FSAR Chapter 15 accident analyses.

The ECCS methodology does not credit reactor coolant pump (RCP) seal flow for core cooling in the minimum ECCS analysis. More RCP seal flow (i.e., minimum seal flow resistance) results in less flow that can be credited for core cooling since water is diverted from the ECCS flow path to the seals. In the maximum ECCS analysis, RCP seal flow is credited as additional flow and is combined with the ECCS injection flow to pressurize the RCS. For the maximum ECCS case, as RCP seal flow resistance decreases, RCP seal flow increases and the total combined RCP and ECCS injection flow increases. Therefore, the minimum RCP seal flow resistance imposes the most limiting conditions for both the minimum and maximum ECCS analysis.

Line resistances used in the ECCS model are in the form of head loss per unit flow rate squared, or ft/gpm^2. The total head loss in the RCP seal flow path is the summation of pressure losses due to piping resistances, filter resistance, valve resistance, and fitting resistances between the centrifugal charging pump (CCP) discharge and the RCP balance chamber. To obtain the minimum line resistance, total head loss is minimized while the flow rate is maximized.

The minimum RCP seal flow resistance of 0.2117 ft/gpm^2 assumed in the ECCS analyses was provided by Westinghouse. It is based on a minimum FSAR allowable CCP discharge pressure of 2,400 psi, a maximum RCP balance chamber pressure of 2,253.4 psi, and a maximum flow rate of 40 gpm. The use of these maximum and minimum values results in a conservatively calculated minimum flow resistance. Thus the minimum RCP seal flow resistance is:

$$R_{seal} = ((2400 - 2253.4) \times 144 / 62.32) / 40^2 = 0.2117 \text{ ft/gpm}^2$$

For Surveillance Requirement (SR) 3.5.5.1, the actual RCP seal flow resistance is obtained by calculating the difference between the measured CCP discharge pressure and the RCP balance chamber pressure, based on a correction to the measured pressurizer pressure (detailed in the response to question 3), and dividing by the measured RCP seal flow rate squared. This resistance calculation is performed monthly to verify that the actual seal resistance, including uncertainties, is greater than or equal to the minimum RCS seal flow resistance (0.2117 ft/gpm^2) assumed in the ECCS analyses. This assures that no more than the assumed ECCS flow is diverted to the RCP seals.

Question 3

On Page 3 of Enclosure A to your submittal, you stated that "the differential pressure across the manual seal injection throttle valves is measured using the pressurizer pressure corrected to the discharge of the RCP seal injection flow path at the RCP balancing chamber." Please provide a description of how this correction is made. On Page 4 you provided a value of 31.8 psid to account for the pressure difference between the reactor coolant pressure (RCP) seal injection and the measured pressurizer pressure due to frictional losses and elevation change. Please provide a description of how this value is derived. Please explain the relationship of the two differential pressures discussed in this item.

PG&E Response to Question 3

The discharge pressure, P_{RCP}, of the RCP seal injection flow path at the RCP balance chamber is corrected for pressure difference between the discharge of the RCP balancing chamber (the area above the thermal barrier and around the radial bearing) and the measured pressurizer pressure P_{PZR}. The RCP seal injection discharge pressure is given by the following formula:

$$P_{RCP} = P_{PZR} - \Delta P_{piping} - \Delta P_{S/G} + \Delta P_{RCP\_BC} + \Delta P_{ele}$$

P_{PZR} = pressurizer vapor space pressure, a measured value via the surveillance test procedure for SR 3.5.5.1.

ΔP_{piping} = frictional pressure loss in reactor coolant system piping.

$\Delta P_{S/G}$ = frictional pressure loss through the steam generator.

ΔP_{RCP_BC} = pressure gradient developed in RCP balancing chamber. The balancing chamber head is 168 ft as an upper bound for both units. The density is 47.49 lbm/ft^3 corresponding to 2250 psia and 540 °F. Therefore,
ΔP_{RCP_BC} = 168 ft x (47.49 lbm/ft^3 / 144 ft) = 55.41 psi.

ΔP_{ele} = elevation head (static head) from pressurizer water level to RCP balancing chamber. The higher the assumed pressurizer level the more conservative this value becomes. An 80 percent pressurizer level is assumed which corresponds to the high level alarm plus 10 percent uncertainty. So, pressurizer level would be 153.28 ft (Unit 1) and 153.09 ft (Unit 2). The RCP seal injection pump connection is at elevation 109.94 ft. The saturation density of water is 37.07 lbm/ft^3 at 2250 psia. Hence, the elevation head in psi is
ΔP_{ele} = (153.28' – 109.94') x 37.07 lbm/ft^3 / 144 = 11.16 (Unit 1)
ΔP_{ele} = (153.09' – 109.94') x 37.07 lbm/ft^3 / 144 = 11.11 (Unit 2)

Summary of Terms:

Correction Terms	Unit 1	Unit 2
ΔP_{piping}	2.76 (1)	2.76(1)
$\Delta P_{S/G}$	32.13(1)	32.02(1)
ΔP_{RCP_BC}	55.41	55.41
ΔP_{ele}	11.16	11.11

Note (1): Values corrected for flows for DCPP (i.e., 92,000 gpm). Original values provided by Westinghouse.

For the above correction term values, the pressure correction term is:

$$[- \Delta P_{piping} - \Delta P_{S/G} + \Delta P_{RCP\_BC} + \Delta P_{ele}] = 31.68 \text{ psi (Unit 1)}$$
$$= 31.74 \text{ psi (Unit 2)}$$

For use in the surveillance procedure for SR 3.5.5.1, a higher value is conservative, so a pressure correction term of 31.8 psi is used. Thus, the discharge pressure of the RCP seal injection path is calculated using the formula $P_{RCP} = P_{PZR} + 31.8$ psi. As an example, for RCS pressurizer pressure of 2235 psig, P_{RCP} = 2235 psig + 31.8 psi = 2266.8 psig, which is higher than the maximum RCP balance chamber pressure of 2253.4 psig assumed by Westinghouse as discussed in the response to question 2. This conservative correction results in a lower calculated differential pressure for the RCP seal path and causes operations to further throttle closed the RCP seal injection throttle valves (i.e., more resistance added which is conservative in the ECCS analysis) in order to verify that the RCP seal resistance is greater than or equal to 0.2117 ft/gpm^2.

Question 4

On Page 4 of Enclosure A to your submittal, you provided the formula that you use to calculate the RCP seal injection line resistance. The formula includes three measured parameters (charging header pressure, RCS pressure, and RCP seal injection flow). Please discuss how instrumentation uncertainty for instrumentation used in the surveillance is accounted for in your calculation.

PG&E Response to Question 4

The calculated RCP seal injection line resistance is as follows:

$$R_{seal} = \frac{DP_{seal}}{Q_{Total}^2} \times 2.31 \frac{FT}{GPM^2}$$

DP_{seal} is the RCP seal injection line differential pressure $= (P_{chg} - P_{RCP}) = (P_{chg} - P_{PZR}) - 31.8$ psid where P_{chg} is the CCP discharge pressure and P_{PZR} is the pressurizer vapor space pressure. P_{chg} and P_{PZR} are measured values via the surveillance procedure for SR 3.5.5.1.

Q_{Total} is the sum of all four RCP seal injection flow paths and is a measured value via the surveillance procedure for SR 3.5.5.1.

The uncertainty in the calculated RCP seal injection line resistance consists of flow channel uncertainty, pressure channel uncertainty, resistance uncertainty (function of flow rate, differential pressure, density), and friction coefficient uncertainty.

The flow channel uncertainty is calculated using a square root of the sum of the squares method and takes into account the following factors:

- flow element sensitivity to manufacturer random variance and fluid conditions. These were evaluated as independent variables as function of outer diameter, inner diameter, temperature, differential pressure, discharge coefficient, and pressure,
- flow transmitter sensor calibration accuracy, measurement and test equipment accuracy, drift, temperature and pressure effects, and readability,
- process rack sensor calibration accuracy, measurement and test equipment accuracy, drift, temperature and pressure effects, and readability,
- plant process computer indication and readability, and
- measured flow bias for effects of the piping geometry.

The pressure channel uncertainty is calculated using a square root of the sum of the squares method and takes into account the following factors:

- sensor calibration accuracy,
- measurement and test equipment accuracy,
- senor drift,
- temperature and pressure effects,
- environmental effects,
- rack calibration accuracy,
- rack drift, and
- plant process computer indication accuracy and readability.

Resistance is a function of flow, RCP seal differential pressure, and density which allows use of partial differential equations based on the flow and pressure channel uncertainties. The partial differential equation method provides a means to convert known independent flow and pressure instrument uncertainty variables into the required resistance uncertainty value. $R_{seal\ flow/pressure} = 0.0661\ ft/gpm^2$.

The friction coefficient effects are directly proportional to resistance. The hydraulic friction coefficient varies with the Reynolds Number (Re) and the roughness of the inside piping surface (ε). Both variables are evaluated and added to the total RCP seal resistance uncertainty. $R_{friction\ coeff} = 0.01366\ ft/gpm^2$.

To demonstrate that the accident analysis assumptions for RCP seal injection flow are met, the difference between the CCP discharge pressure and the pressurizer vapor space pressure, along with the RCP seal injection flow rates are used to calculate the seal injection line resistance. The minimum resistance of the RCP seal modeled in the ECCS analysis is 0.2117 ft/gpm^2 (0.0916035 psi/gpm^2) at 70°F fluid where:

$R_{seal} = (P_{chg} - P_{PZR} - \Delta P_{ele} - \Delta P_{RCP\_BC} + \Delta P_{piping} + \Delta P_{S/G}) / (Q_{RCP})^2 \geq 0.2117$ ft/gpm^2

The allowable resistance value used to perform the SR 3.5.5.1 resistance surveillance is the total resistance uncertainty, due to flow channel uncertainty, pressure channel uncertainty, resistance uncertainty, and friction coefficient uncertainty, added to the minimum resistance modeled in the ECCS analysis.

Thus, for the assumed resistance uncertainties identified above, the current allowable resistance value for surveillance testing per SR 3.5.5.1 is:

$R_{seal\ allowable} \geq$ TS 3.5.5 LCO value + uncertainties

≥ 0.2117 ft/gpm^2 + 0.0661 ft/gpm^2 + 0.01366 ft/gpm^2 ≥ 0.292 ft/gpm^2.

Question 5

On Page 4 of Enclosure A to your submittal, you stated that "if it is necessary to change the RCP seal injection line hydraulic flow resistance, the position of the manual seal injection throttle valves are adjusted to provide the desired resistance value." As stated earlier in the submittal, the flow resistance is an assumed value in the ECCS model. Please explain why/when a change to the RCP seal injection line hydraulic flow resistance would be necessary.

PG&E Response to Question 5

In March 1996, Byron Nuclear Power Station had an event which resulted in RCP seal injection flow rates outside the TS "Controlled Leakage" allowed limit. The root cause was determined to be associated with increasing of RCP seal injection filter differential pressure. As differential pressure across the filter increased over the life of the filter element, certain operating adjustments had been made to maintain RCP seal flow within the allowed limits. The effect on the system flow resulting from valving in a "clean" standby filter after adjusted the system over time was not addressed. The station did not realize that controlled leakage flow rates were outside the TS allowed limit, and went beyond the time limits imposed by the LCO action statement before actions were initiated to correct the problem.

Therefore, the intent of the statement is to provide understanding that when a filter is removed from or returned to service, there may be a need to adjust the manual seal injection throttle valves to ensure flow characteristics of the seal injection water flow path satisfy the accident analysis assumption. When placing a filter in service, a surveillance test is performed to verify compliance with the TS 3.5.5 limit.

<u>Question 6</u>

On Page 5 of Enclosure A to your submittal, you stated that "for both the minimum and maximum ECCS analyses, a higher filter dP is more conservative." Your submittal provides sufficient information to support this statement as related to the minimum ECCS analyses (e.g., LOCA). However, you did not provide an explanation of how the RCP seal injection line hydraulic flow resistance is modeled in the maximum ECCS analyses (e.g., inadvertent safety injection and steam generator tube rupture). Please provide an explanation of how seal injection flow is accounted for (modeled) in the maximum ECCS analyses to support your statement that a higher filter dP is more conservative for both the minimum and maximum ECCS analyses.

<u>PG&E Response to Question 6</u>

The ECCS methodology does not credit RCP seal flow in the minimum ECCS analysis. More RCP seal flow (i.e., minimum seal flow resistance) results in less ECCS flow which can be credited for core cooling. In the maximum ECCS analysis, RCP seal flow is credited as additional flow that is combined with the ECCS injection flow to pressurize the RCS. Lower RCP seal flow resistance (i.e., more RCP seal flow) results in more total ECCS flow to the RCS and a higher resultant RCS pressure.

As differential pressure (dP) increases across the filters, more line resistance is added to the RCP seal flow path. In the case of the minimum ECCS analysis, this results in a net reduction in the flow lost to the RCP seals (flow that is assumed to be unavailable for core cooling). For the maximum ECCS case the actual RCP seal flow decreases, as a result of dP increases across the filters, and results in less total combined injection flow than calculated in the maximum ECCS analysis and the analysis remains bounding. A higher dP across the RCP seal injection flow path results in more margin for the minimum ECCS analysis (which excludes the RCP seal flow), and more margin for the maximum ECCS analysis (which includes the RCP seal flow). Thus a minimum RCP seal flow resistance imposes the most limiting conditions in both the minimum and maximum ECCS flow analyses.

<u>Question 7</u>

The change to LCO 3.5.5, Required Action A.1, and SR 3.5.5.1 to delete the reference to the charging flow control valve being full open appears incomplete. The methodology described in your submittal requires the pressure of the CCP discharge header to be measured downstream of the flow control valve to ensure that the measurement is not biased in the non-conservative direction due to the additional resistance that the flow control valve would contribute. Therefore, while the staff agrees that you could delete the reference to the valve being fully open to make the requirement consistent with your methodology, the staff believes that you should also include wording regarding what measurements need to be taken and where the measurements should be taken (e.g., CCP discharge header pressure downstream of *charging flow control valve FCV-128) to more accurately describe the required measurements in your methodology.*

PG&E Response to Question 7

As part of the conversion of the TS issued with the original operating licenses for Diablo Canyon Units 1 and 2 to the improved TS (ITS), based on NUREG-1431, "Standard Technical Specifications [STS], Westinghouse Plants," Revision 1, dated April 1995, procedural details for performing surveillance requirements were relocated to the ITS Bases, the FSAR, the equipment control guidelines (ECGs), station procedures required by ITS 5.4.1, or programmatic documents required by ITS 5.5. Relocation of the procedural details for meeting TS surveillance requirements is acceptable because locating such details in the ITS Bases, FSAR, ECGs, station procedures required by ITS 5.4.1, and programmatic documents required by ITS 5.5, will maintain an effective level of regulatory control while providing for a more appropriate change control process, such as 10 CFR 50.59 and ITS 5.5.14, "Technical Specification Bases Control Program." Changes of these type were addressed in the NRC safety evaluation report, "Conversion to Improved Technical Specifications for Diablo Canyon Power Plant, Units 1 and 2 – Amendment No. 135 to Facility Operating License Nos. DPR-80 and DPR-82 (TAC Nos. M98984 and M98985)," dated May 28, 1999, Enclosure 3, "Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Amendment No. 135 to Facility Operating License No. DPR-80 and Amendment No. 135 to Facility Operating License No. DPR-82, Pacific Gas and Electric Company, Diablo Canyon Power Plant, Units 1 and 2, Docket Nos. 50-275 and 50-323," section 4.C subsection "Relaxation of CTS Surveillance Requirement Acceptance Criteria (Category V)," and section 4.D subsection "Procedural Details for Meeting TS Requirements (Type 3)."

For example, details for the surveillance of the ECCS pumps were relocated to the TS Bases. Prior to Amendments 135/135, the TS 4.5.2.f SR for verification of the ECCS pumps differential pressure explicitly identified the required differential pressure values (e.g. 2400 psid). With implementation of ITS, the ECCS pump differential pressure surveillance is contained in SR 3.5.2 which states, "Verify each ECCS pump's developed head at the test flow point is greater than or equal to the required developed head." The required developed head values are now contained in the TS 3.5.2 Bases.

PG&E believes that including details on the measurement method and measurement location for the CCP discharge header pressure in SR 3.5.5.1 is inconsistent with the NUREG-1431 approach of relocating procedural details to meet TS SR requirements to licensee-controlled regulatory related documents. Including details on the measurement method and measurement location for the CCP discharge header pressure in SR 3.5.5.1 would also be inconsistent with ECCS SR 3.5.2.4, which does not contain details of the method or location for determining ECCS pump head performance. It is noted that ECCS flow which is diverted through the RCP seal injection flow path is a small fraction of the total injected ECCS flow verified by SR 3.5.2.4. PG&E believes that providing details on the measurement method and measurement location for the CCP discharge header pressure in the Bases of TS 3.5.5

and SR 3.5.5.1 provides an effective level of regulatory control while providing for a more appropriate change control process.

Question 8

The note in Surveillance Requirement (SR 3.5.5.1) allows you to not perform the SR until 4 hours after RCS pressure has stabilized between 2215 and 2255 psig. Your change to the note would allow you to not perform the SR until 4 hours after RCS pressure has stabilized at exactly 2235 psig. RCS pressure may not be controlled at exactly 2235 psig during plant operation. RCS pressure may vary within a range around the nominal value of 2235 psig. Therefore, your change to the note, if strictly interpreted, could lead to situations where you may never be required to perform the surveillance (e.g., if RCS pressure is not kept at exactly 2235 psig for a four hour period). It is not clear why you need to change the wording in the note. Please explain why you feel that a change to the note is necessary and, if you believe that a change is necessary, please revise your requested change to address the situation discussed.

PG&E Response to Question 8

The proposed seal injection flow resistance limit is independent of RCS pressure and can be verified over a range of RCS pressures. This is a departure from the current TS 3.5.5 seal injection flow limit of ≤ 40 gpm, which must be verified at an RCS pressure ≥ 2215 psig and ≤ 2255 psig. Thus for the proposed seal injection flow resistance limit, the RCS pressure range of ≥ 2215 psig and ≤ 2255 psig has been removed from LCO 3.5.5, Action A.1, and SR 3.5.5.1. In order to prevent any potential confusion on when the note in SR 3.5.5.1 is required, the note will be revised to the current TS wording which states: "Not required to be performed until 4 hours after the Reactor Coolant System pressure stabilizes at ≥ 2215 psig and ≤ 2255 psig." Revised mark-ups of TS pages 3.5-8 and B 3.5-30 containing the revised SR 3.5.5.1 note are contained in Enclosure 2. Revised proposed TS pages 3.5-8 and B 3.5-32 are contained in Enclosure 3. These revised proposed TS pages 3.5-8 and B 3.5-32 supersede those previously provided in PG&E Letter DCL-00-083, "License Amendment Request 00-05, Revise Improved Technical Specification 3.5.5, "Emergency Core Cooling System (ECCS) – Seal Injection Flow,"" dated June 8, 2000.

Question 9

You proposed changes to the Bases section that discuss a situation which may result in the need for performing SR 3.5.5.1 (i.e., valving in a clean filter). Per 10 CFR 50.36, surveillance requirements are to be included in the technical specifications, not in the Bases to the technical specifications. Please include a SR to cover the identified situation. In addition, please identify any other changes in the flow path that could result in a similar potential need to perform SR 3.5.5.1 (e.g., other valves in the flow path which, if repositioned, could invalidate the results of a previous surveillance) and include these situations in the proposed SR as well.

PG&E Response to Question 9

Plant procedures governing the restoration of equipment after maintenance specify the requirements for determining the appropriate postmaintenance testing. If the operability of a system or component has been affected by repair, maintenance, or replacement of a component, postmaintenance testing is required to demonstrate operability of the system or component. As such, changes in the flow path, which could invalidate a previous surveillance, do not need to be specifically identified in SR 3.5.5.1 to provide adequate protection of the public health and safety.

During the conversion of the TS for Diablo Canyon Units 1 and 2, to the ITS, procedural details for performing surveillance requirements were relocated to the ITS Bases, the FSAR, the ECGs, station procedures required by ITS 5.4.1, or programmatic documents required by ITS 5.5. Relocation of the procedural details for meeting TS surveillance requirements is acceptable because locating such details in the ITS Bases, FSAR, ECGs, station procedures required by ITS 5.4.1, and programmatic documents required by ITS 5.5 will maintain an effective level of regulatory control while providing for a more appropriate change control process.

For example, the requirement to perform a flow balance test following completion of modifications to the ECCS subsystems that alter the subsystem flow characteristics was relocated to the FSAR. Prior to Amendment 135, SR 4.5.2.h required performance of an ECCS flow balance test, following completion of modifications to the ECCS systems that alter the subsystem flow characteristics, which verified subsystem flows. With implementation of ITS, the ECCS flow balance test requirement was deleted from the ECCS TS SRs. The requirements for a ECCS flow balance test following ECCS modifications are now contained in FSAR Section 6.3.4.4.

PG&E believes that including details on the changes in the RCP seal flow path to SR 3.5.5.1, which could invalidate a previous surveillance, is inconsistent with the NUREG-1431 approach of relocating procedural details to meet TS SR requirements to licensee-controlled regulatory related documents. Including details on the changes in the RCP seal injection flow path, which would require a surveillance, would be inconsistent with ECCS SR 3.5.2.4, which does not contain details on changes to the ECCS system which would require performance of a surveillance.

Enclosure 2
PG&E Letter DCL-01-002

MARKED-UP IMPROVED TECHNICAL SPECIFICATIONS

Remove Page	Insert Page
3.5-8	3.5-8
B 3.5-32	B 3.5-32

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.5 Seal Injection Flow

LCO 3.5.5 Reactor coolant pump seal injection flow (resistance) shall be ≤ 40 gpm with RCS pressure ≥ 2215 psig and ≤ 2255 psig and the charging flow control valve full open. (≥ 0.2117 ft/gpm²)

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Seal injection flow (resistance) not within limit.	A.1	Adjust manual seal injection throttle valves to give a flow (resistance) within limit. with RCS pressure ≥ 2215 psig and ≤ 2255 psig and the charging flow control valve full open.	4 hours
B. Required Action and associated Completion Time not met.	B.1	Be in MODE 3.	6 hours
	AND		
	B.2	Be in MODE 4.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.5.1	-------------------------NOTE------------------------------ Not required to be performed until 4 hours after the Reactor Coolant System pressure stabilizes at ≥ 2215 psig and ≤ 2255 psig. -- Verify manual seal injection throttle valves are adjusted to give a flow (resistance) within limit with RCS pressure ≥ 2215 psig and ≤ 2255 psig and the charging flow control valve full open. resistance ≥ 0.2117 ft/gpm².	31 days

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.5 Seal Injection Flow

BASES

BACKGROUND

Insert A

This LCO is applicable because the CCPs are utilized for high head safety injection (SI). The function of the seal injection throttle valves during an accident is similar to the function of the ECCS throttle valves in that each restricts flow from the CCP pump header to the Reactor Coolant System (RCS).

The restriction on reactor coolant pump (RCP) seal injection flow limits the amount of ECCS flow that would be diverted from the injection path following an accident. This limit is based on safety analysis assumptions that are required because RCP seal injection flow is not isolated during SI.

APPLICABLE SAFETY ANALYSES

All ECCS subsystems are taken credit for in the large break loss of coolant accident (LOCA) at full power (Ref. 1). The LOCA analysis establishes the minimum flow for the ECCS pumps while the inadvertent SI and the SGTR analyses establish the maximum flow for the ECCS pumps. The CCPs are also credited in the small break LOCA analysis. The SGTR and main steam line break event analyses also credit the CCPs, but are not limiting in their requirements. for RCP seal flow and are

Maximum ECCS flow analyses

Reference to these analyses is made in assessing changes to the Seal Injection System for evaluation of their effects in relation to the acceptance limits in these analyses.

The ECCS flow balance assumes a minimum resistance of 0.2117 ft/gpm² in the RCP seal injection path is limited to 40 gpm with the flow control valve fully open. This LCO ensures that total seal injection flow of ≤ 40 gpm, with RCS pressure ≥ 2215 psig and ≤ 2255 psig and charging flow control valve full open resistance is OPERABLE. will be sufficient for Seal injection flow RCP seal integrity but limited so that the ECCS trains will be capable of delivering sufficient water to match boiloff rates soon enough to minimize uncovering of the core following a large LOCA. It also ensures that the CCPs will deliver sufficient water for a small LOCA and sufficient boron to maintain the core subcritical. For smaller LOCAs, the charging pumps alone deliver sufficient fluid to overcome the loss and maintain RCS inventory.

Seal injection flow satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The intent of the LCO limit on seal injection flow resistance is to make sure that flow through the RCP seal water injection line is low enough to ensure that sufficient centrifugal charging pump injection flow is directed to the RCS via the cold legs (Ref. 1). This is accomplished by limiting the line resistance in the RCP seal injection lines to a value consistent with the assumptions in the accident analysis.

(continued)

Insert A - Bases 3.5.5

This LCO is applicable because the centrifugal charging pumps (CCPs) are utilized for High Head Safety Injection (SI) while at the same time supplying flow to the reactor coolant pump (RCP) seals. The intent of the LCO is to ensure that the seal injection flow resistance remains within limit. This in turn will assure that flow through the RCP seal injection line during an accident is restricted. The seal injection flow is restricted by the injection line hydraulic flow resistance which is adjusted through positioning of the manual seal injection throttle valves.

The hydraulic resistance limits the amount of emergency core cooling system (ECCS) flow that would be diverted from the injection path to the reactor coolant system (RCS) into the RCP seal injection line. This limit supports safety analyses assumptions that are required because the RCP seal injection is not isolated by a SI signal and RCP seal injection is not credited for core cooling.

The flow resistance is determined by measuring the pressurizer pressure, the CCP discharge header pressure, and the RCP seal injection flow rate. If it is necessary to change the RCP seal injection line hydraulic flow resistance, the position of the injection throttle valves is adjusted to provide the desired resistance value.

The charging flow control valve FCV-128 throttles the centrifugal charging pump discharge flow as necessary to maintain the programmed level in the pressurizer. The flow control valve fails open to ensure that, in the event of either loss of air or loss of control signal to the valve, when the CCPs are supplying charging flow, seal injection flow to the RCP seals is maintained. Positioning of the charging flow control valve may vary during normal plant operating conditions, resulting in a proportional change to RCP seal injection flow. The hydraulic resistance of the RCP seal injection throttle valves will remain fixed when FCV-128 is repositioned provided the throttle valve(s) position are not adjusted. To avoid plant perturbation, the charging flow control valve may be positioned in a manner which is required to support periodic surveillance and normal plant operation.

The accident analysis model assumes CCP header pressure is measured at the discharge of the CCP, upstream of the charging flow control valve. The flow control valve, which provides a modulating flow restriction to maintain pressurizer level during operation, is assumed to fail open during an accident. Any system resistance provided by the flow control valve during normal operation would result in non-conservative throttle valve settings if the CCP header pressure was measured at the discharge of the CCP upstream of the flow control valve. To avoid this problem, the CCP discharge header pressure is measured downstream of the flow control valve. This conservative measurement location also avoids the need to place the flow control valve in a full open test position during operation, thus avoiding perturbations in pressurizer water level.

Seal injection flow to the RCP seals is maintained during the injection phase of an SI following the occurrence of a design accident. The ECCS analyses provide no core cooling credit for that portion of the safety injection flow that enters the RCP through the seal injection flow path under minimum safeguards conditions. The limitation on seal injection flow ensures that in the event of an accident, the safety injection flow will be controlled within the constraints assumed in the accident analyses. The ECCS model utilizes a hydraulic flow resistance for the RCP seal injection flow path to determine the seal flow rather than specifying an actual flow rate. The hydraulic flow resistance is established by positioning the manual seal injection throttle valves and does not change if the valves are not adjusted. The accident analyses assumptions (based on hydraulic resistance) are satisfied notwithstanding changes in charging flows even though the indicated RCP seal injection flow may exceed 40 gpm for plant operation.

The accident analysis model assumes that RCS pressure is referenced to the RCP balance chamber. The RCP balancing chamber is the area above the thermal barrier and around the radial bearing. The pressure within the RCP balancing chamber is in a location which is not instrumented. Therefore, to establish the proper RCP seal injection flow line resistance, the differential pressure across the manual seal injection throttle valves is measured using the pressurizer pressure corrected to the discharge of the RCP seal injection flow path at the RCP balancing chamber.

≥ 2215 psig and ≤ 2255 psig.

The limitation set on RCP seal injection line hydraulic flow resistance is verified at a nominal pressurizer pressure of 2235 psig. However, resistance flow can be measured and established within the ECCS safety analysis limit anytime there is a differential pressure between the charging header and the RCS. The surveillance will normally be performed at nominal pressurizer pressure which is considered the pressure required to support plant operation.

PROPOSED IMPROVED TECHNICAL SPECIFICATION PAGES

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.5 Seal Injection Flow

LCO 3.5.5 Reactor coolant pump seal injection flow resistance shall be $\geq$ 0.2117 ft/gpm^2.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Seal injection flow resistance not within limit.	A.1	Adjust manual seal injection throttle valves to give a flow resistance within limit	4 hours
B. Required Action and associated Completion Time not met.	B.1	Be in MODE 3.	6 hours
	<u>AND</u>		
	B.2	Be in MODE 4.	12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.5.1	-------------------------NOTE------------------------------ Not required to be performed until 4 hours after the Reactor Coolant System pressure stabilizes at $\geq$ 2215 psig and $\leq$ 2255 psig. --	
	Verify manual seal injection throttle valves are adjusted to give a flow resistance $\geq$ 0.2117 ft/gpm^2.	31 days

BASES

BACKGROUND (continued)	the proper RCP seal injection flow line resistance, the differential pressure across the manual seal injection throttle valves is measured using the pressurizer pressure corrected to the discharge of the RCP seal injection flow path at the RCP balancing chamber. The limitation set on RCP seal injection line hydraulic flow resistance is verified at a nominal pressurizer pressure ≥ 2215 psig and ≤ 2255 psig. However, resistance flow can be measured and established within the ECCS safety analysis limit anytime there is a differential pressure between the charging header and the RCS. The surveillance will normally be performed at nominal pressurizer pressure which is considered the pressure required to support plant operation.
APPLICABLE SAFETY ANALYSES	All ECCS subsystems are taken credit for in the large break loss of coolant accident (LOCA) at full power (Ref. 1). The LOCA analyses establish the minimum flow for the ECCS pumps while the inadvertent SI and the SGTR analyses establish the maximum flow for the ECCS pumps. The CCPs are also credited in the small break LOCA analysis. Maximum ECCS flow analyses credit the CCPs and are limiting in their requirements for RCP seal flow. Reference to these analyses is made in assessing changes to the Seal Injection System for evaluation of their effects in relation to the acceptance limits in these analyses. The ECCS flow balance assumes a minimum resistance of 0.2117 ft/gpm^2 in the RCP seal injection path with the flow control valve fully open. This LCO ensures that seal injection flow resistance is operable. Seal injection flow will be sufficient for RCP seal integrity but limited so that the ECCS trains will be capable of delivering sufficient water to match boiloff rates soon enough to minimize uncovering of the core following a large LOCA. It also ensures that the CCPs will deliver sufficient water for a small LOCA and sufficient boron to maintain the core subcritical. For smaller LOCAs, the charging pumps alone deliver sufficient fluid to overcome the loss and maintain RCS inventory. Seal injection flow satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).
LCO	The intent of the LCO limit on seal injection flow resistance is to make sure that flow through the RCP seal water injection line is low enough to ensure that sufficient centrifugal charging pump injection flow is directed to the RCS via the cold legs (Ref. 1). This is accomplished by limiting the line resistance in the RCP seal injection lines to a value consistent with the assumptions in the accident analysis. The limit on RCP seal injection line hydraulic flow resistance must be met to

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