Pacific Gas and Electric Company®

Paula Gerfen
Station Director

Diablo Canyon Power Plant
Mail code 104/5/502
P.O. Box 56
Avila Beach, CA 93424

805.545.4596
Internal: 691.4596
Fax: 545.4234

March 23, 2016

PG&E Letter DCL-16-028

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

10 CFR 50.90

Diablo Canyon Units 1 and 2
Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
License Amendment Request 16-02
License Amendment Request to Revise Technical Specification 3.4.12, "Low Temperature Overpressure Protection (LTOP) System"

Dear Commissioners and Staff:

Pursuant to 10 CFR 50.90, Pacific Gas and Electric Company (PG&E) hereby requests approval of the enclosed proposed amendment to the Diablo Canyon Power Plant (DCPP) Facility Operating License Nos. DPR-80 and DPR-82 for Units 1 and 2, respectively. The enclosed license amendment request (LAR) proposes to modify Technical Specification (TS) 3.4.12, "Low Temperature Overpressure Protection (LTOP) System."

The Enclosure provides a detailed description and technical evaluation of the proposed request, including PG&E's determination that the proposed changes involve no significant hazards.

The Enclosure also provides an evaluation of the proposed change. Attachment 1 to the Enclosure provides markup pages of existing TS to show the proposed change. Attachment 2 provides retyped TS pages. Attachment 3 provides the marked up TS Bases for information only. Attachment 4 provides the key design features of the LTOP orifice. Attachment 5 provides the additional information associated with the technical evaluation of the proposed request.

The changes in this LAR are not required to address an immediate safety concern. PG&E requests approval of this LAR by no later than March 23, 2017. PG&E requests the license amendments be made effective upon NRC issuance, to be implemented within 120 days from the date of issuance.

PG&E makes no new or revised regulatory commitments (as defined by NEI 99-04) in this letter.

In accordance with DCPP administrative procedures and the Quality Assurance Program, the proposed amendment has been reviewed by the Plant Staff Review Committee.

Pursuant to 10 CFR 50.91, PG&E is sending a copy of this proposed amendment to the California Department of Public Health.

If you have any questions or require additional information, please contact Mr. Hossein Hamzehee at (805) 545-4720.

I have been delegated the authority of James M. Welsch, Vice President – Nuclear Generation, during his absence. I declare under penalty of perjury that the foregoing is true and correct.

Executed on March 23, 2016.

Sincerely,

Paula Gerfen
Station Director

RNTT/4231/50575894
Enclosure
cc: Diablo Distribution
cc/enc: Marc L. Dapas, NRC Region IV Administrator
Binesh K. Tharakan, NRC Acting Senior Resident Inspector
Balwant K. Singal, NRC Project Manager
Gonzalo L. Perez, Branch Chief, California Department of Public Health

Evaluation of the Proposed Change

License Amendment Request 16-02

License Amendment Request to Revise Technical Specification 3.4.12, "Low Temperature Overpressure Protection (LTOP) System"

ATTACHMENTS:

1. Technical Specification Markup Pages
2. Technical Specification Retyped Pages
3. Technical Specification Bases Markups
4. LTOP Orifice - Key Design Features
5. Additional Information

EVALUATION

1. SUMMARY DESCRIPTION

This letter is a request to amend the Diablo Canyon Power Plant (DCPP) Facility Operating Licenses DPR-80 and DPR-82 for Units 1 and 2, respectively. The proposed license amendment request (LAR) requests approval to revise Technical Specification (TS) 3.4.12, "Low Temperature Overpressure Protection (LTOP) System." The proposed change revises TS 3.4.12 to reflect the mass input transient analysis that assumes an emergency core cooling system (ECCS) centrifugal charging pump (CCP) and the normal charging pump (NCP) capable of simultaneously injecting into the reactor coolant system (RCS) during the TS 3.4.12 Applicability.

2. DETAILED DESCRIPTION

The proposed changes to TS 3.4.12 differentiate between the ECCS CCPs and the non-safety-related NCP, and provide a restriction on alignment of the NCP (i.e., the NCP must be aligned to the LTOP orifice) during applicability of TS 3.4.12. Attachment 1 to the Enclosure provides markup pages of existing TS to show the proposed change. Attachment 2 to the Enclosure provides retyped TS pages.

The proposed TS changes are described below.

Limiting Condition for Operation (LCO) 3.4.12 currently states, in part:

> An LTOP System shall be OPERABLE with no safety injection pumps and a maximum of one centrifugal charging pump capable of injecting into the RCS and the accumulators isolated and one of the following pressure relief capabilities:

LCO 3.4.12 is revised to state, in part:

> An LTOP System shall be OPERABLE with:
>
> a. no safety injection pumps capable of injecting into the RCS;
> b. a maximum of one Emergency Core Cooling System (ECCS) centrifugal charging pump capable of injecting into the RCS;
> c. the normal charging pump (NCP) aligned to the LTOP orifice when it is capable of injecting into the RCS;
> d. the accumulators isolated; and
> e. one of the following pressure relief capabilities;
>
> 1. Two Class I power operated relief valves (PORVs) with lift settings within the limits specified in the PTLR, or

2. The RCS depressurized and an RCS vent of ≥ 2.07 square inches.

Note 1 to LCO 3.4.12 currently states:

> Two charging pumps may be made capable of injecting for ≤ 1 hour for pump swap operation.

Note 1 is revised to state:

> The NCP aligned to the LTOP orifice and two ECCS centrifugal charging pumps may be made capable of injecting for ≤ 1 hour for pump swap operation.

Condition B and the Required Action B.1 currently state:

> Condition B:
> Two centrifugal charging pumps capable of injecting into the RCS.
> Required Action B.1:
> Initiate action to verify a maximum of one centrifugal charging pump is capable of injecting into the RCS.

Condition B and the Required Action B.1 are revised to state:

> Condition B:
> Two ECCS centrifugal charging pumps capable of injecting into the RCS.
> OR
> The NCP is not aligned to the LTOP orifice when it is capable of injecting into the RCS.
> Required Action B.1:
> Initiate action to verify the NCP is aligned to the LTOP orifice and a maximum of one ECCS centrifugal charging pump is capable of injecting into the RCS.

Surveillance Requirement (SR) 3.4.12.2 currently states:

> Verify a maximum of one centrifugal charging pump is capable of injecting into the RCS.

SR 3.4.12.2 is revised to state:

> Verify a maximum of one ECCS centrifugal charging pump is capable of injecting into the RCS and the NCP is aligned to the LTOP orifice when it is capable of injecting into the RCS.

Operating Conditions that the Proposed Amendment is Intended to Resolve

In 2007, Pacific Gas and Electric Company (PG&E) replaced the Unit 1 non-safety-related positive displacement pump (PDP) with a non-safety-related CCP, called NCP in order to alleviate operational issues associated with the PDP. In 2008, PG&E performed the replacement on Unit 2. PG&E also designed, tested and installed a flow choking orifice (FCO) called "LTOP orifice" to be used during LTOP operation to ensure that the total maximum mass injection capability with the NCP remained bounded by the LTOP mass injection analysis.

In 2013, the Nuclear Regulatory Commission (NRC) issued an interpretation of the current licensing bases to Wolf Creek Generating Station concluding that the TS 3.4.12 LCO requirement is also applicable to the non-ECCS CCP (Reference 1). In 2013, DCPP revised its operating procedures associated with the NCP (i.e., non-ECCS CCP) to comply with the requirements of TS 3.4.12 LCO.

The specific wording of Tech Spec 3.4.12 currently allows operation of only one CCP at a time (whether the CCP is a safety-related pump or non-safety-related pump) when the LTOP system is operable. This is overly restrictive to plant operations and therefore, this LAR is revising the DCPP Technical Specifications to allow combined operation of the NCP that is capable of injecting into the RCS only through the LTOP orifice and one safety-related CCP (i.e., one ECCS CCP) that is also capable of injecting into the RCS, when the LTOP system is operable.

3. TECHNICAL EVALUATION

3.1. Maximum Mass Injection Capability

The design features of the LTOP orifice are presented in Attachment 4. As discussed in Section 2, the LTOP orifice was designed to ensure that the total maximum mass injection capability with the NCP remained bounded by the original NRC approved LTOP mass injection analysis with the PDP (Reference 2). Therefore, this section delineates how the current LTOP mass injection analysis, based on the PDP, still bounds the NCP operation that injects into the RCS only through the LTOP orifice such that no new mass injection analysis is required to support this LAR.

When DCPP still operated with the PDP, the TS 3.4.12 wording allowed the operation of one safety-related CCP in conjunction with the PDP when the LTOP system is operable. The maximum calculated combined flow of one safety-related CCP and the PDP were established over the LTOP range of system pressures as shown in Table 1. As part of the PDP replacement project, calculations were performed to establish that the limiting LTOP orifice design characteristics in conjunction with the limiting NCP design characteristics would result in maximum flows that were significantly less than already analyzed with the PDP. This provided a high degree of assurance that the final NCP installed

configuration would not result in any additional loss of LTOP margin associated with the existing LTOP PDP mass injection limits. Table 1 also compares the current LTOP analysis assumed mass injection capability for one safety-related CCP with the PDP, with the limiting calculated values for one safety-related CCP and the NCP with the LTOP orifice installed.

As described above, after the installation of each NCP on Unit 1 and Unit 2, test data was obtained and verified to ensure the actual operating performance of the NCP aligned to the LTOP orifice remained bounded by that assumed for the calculated values in Table 1. Figure 1 plots the limiting NCP mass injection capability aligned to the LTOP orifice and shows that the maximum flows are well below the values for the safety-related CCP with the PDP that are already assumed in the LTOP analysis. This confirms that the current LTOP analysis bounds the combined operation of one safety-related CCP and the NCP aligned to the LTOP orifice in support of this LAR.

3.2. Additional Information

In Reference 3, Wolf Creek Generating Station submitted a LAR for NRC approval. In References 4 and 5, the NRC Staff provided a request for additional information (RAI). Attachment 5 to this Enclosure provides PG&E responses to those RAI questions, for completeness.

4. REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

Section 182a of the Atomic Energy Act requires applicants for nuclear power plant operating licenses to include TS as part of the license. The Commission's regulatory requirements related to the content of the TS are contained in 10 CFR 50.36, "Technical specifications." The TS requirements in 10 CFR 50.36 include the following categories: (1) safety limits, limiting safety systems settings, and control settings, (2) limiting conditions for operation (LCO), (3) surveillance requirements, (4) design features, and (5) administrative controls.

The LTOP system controls RCS pressure at low temperatures so the integrity of the reactor coolant pressure boundary is not compromised by violating the pressure and temperature limits of 10 CFR 50, Appendix G, "Fracture Toughness Requirements."

4.2 Precedent

The proposed amendment is consistent with Wolf Creek Nuclear Operating Company License Amendment 207 that was approved by NRC, in December 2013 (Reference 6).

4.3 Significant Hazards Consideration

PG&E has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below.

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The proposed change revises TS 3.4.12 to allow an ECCS CCP and the NCP aligned to LTOP orifice to be capable of injecting into the RCS during low RCS pressures and temperatures. The LCO provides RCS overpressure protection by having a minimum coolant input capability and have adequate pressure relief capability. Analyses have demonstrated that one power operated relief valve (PORV) or an RCS vent of at least 2.07 square inches is capable of limiting the RCS pressure excursions below the 10 CFR 50, Appendix G limits for the design basis LTOP limits.

   The proposed change does not adversely affect accident initiators or precursors, nor alter the design assumptions, conditions, and configuration of the facility or the manner in which the plant is operated and maintained. The proposed change does not adversely affect the ability of structures, systems, and components to perform their intended safety function to mitigate the consequences of an initiating event within the assumed acceptance limits. The proposed change does not affect the source term, containment isolation, or radiological release assumptions used in evaluating the radiological consequences of any accident previously evaluated. Further, the proposed change does not increase the types and amounts of radioactive effluent that may be released offsite, nor significantly increase individual or cumulative occupational/public radiation exposure.

   The NRC has previously evaluated a similar LAR related to Wolf Creek Generating Station. In Amendment No. 207, the NRC concluded that the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated (Reference 6).

   In 2007, PG&E replaced the Unit 1 non-safety related PDP with a non-safety-related CCP, called the NCP, in order to alleviate operational issues associated with the PDP. In 2008, PG&E performed the replacement on Unit 2. PG&E also designed, tested, and installed an FCO called the LTOP orifice to be used during LTOP operation to ensure that the total maximum mass injection capability with the NCP remained bounded by the LTOP mass injection analysis. These changes were implemented under 10 CFR 50.59.

However, no physical changes are being made to the plant as a result of the proposed license amendment.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different accident from any accident previously evaluated?

   Response: No.

   The proposed change revises TS 3.4.12 to allow an ECCS CCP and the NCP aligned to LTOP orifice to be capable of simultaneously injecting into the RCS during low RCS pressures and temperatures. The LCO provides RCS overpressure protection by having a minimum coolant input capability and have adequate pressure relief capability. Analyses have demonstrated that one PORV or an RCS vent of at least 2.07 square inches is capable of limiting the RCS pressure excursions below the 10 CFR 50, Appendix G limits for the design basis LTOP limits.

   The proposed change will not physically alter the plant (no new or different type of equipment will be installed) or change the methods governing normal plant operation. The proposed change does not introduce new accident initiators or impact assumptions made in the safety analysis. Testing requirements continue to demonstrate that the LCOs are met and the system components are functional.

   Therefore, the proposed change does not create the possibility of a new or different accident from any accident previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

   Response: No.

   The proposed change does not alter the manner in which safety limits, limiting safety system settings, or limiting conditions for operation are determined. The safety analysis acceptance criteria are not impacted by this change. The proposed change will not result in plant operation in a configuration outside the design basis.

   Therefore, the proposed change does not involve a significant reduction in a margin of safety.

   Based on the above evaluation, PG&E concludes that the proposed change does not involve a significant hazards consideration under the standards

set forth in 10 CFR 50.92(c), and accordingly, a finding of "no significant hazards consideration" is justified.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5. ENVIRONMENTAL CONSIDERATION

PG&E has evaluated the proposed amendment and has determined that the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6. REFERENCES

1. NRC Letter, "Wolf Creek Generating Station – Interpretation of Technical Specification Limiting Condition For Operation 3.4.12, 'Low Temperature Overpressure Protection (LTOP) System,' (TAC No ME9037)," dated January 3, 2013 [ADAMS Accession No. ML12341A083]

2. NRC Letter, "Diablo Canyon Power Plant, Unit No. 1 (TAC No. MB5796) and Unit No. 2 (TAC No. MB5797) – Issuance of Amendment Revising Technical Specification 5.6.6 – Reactor Coolant System Pressure Temperature Limits Report," dated May 13, 2004 [ADAMS Accession No. ML041400243]

3. Wolf Creek Generating Station Letter, "Docket No. 50-482: License Amendment Request To Revise Technical Specification 3.4.12, 'Low Temperature Overpressure Protection (LTOP) System,'" dated November 21, 2012 [ADAMS Accession No. ML12334A406]

4. NRC Letter, "Wolf Creek Generating Station – Request for Additional Information Re: Revision to Technical Specification 3.4.12, 'Low Temperature Overpressure Protection (LTOP) System' (TAC No. MF0309)," dated February 1, 2013 [ADAMS Accession No. ML13030A062]

5. NRC Letter, "Wolf Creek Generating Station – Request for Additional Information Re: Revision to Technical Specification 3.4.12, 'Low Temperature Overpressure Protection (LTOP) System' (TAC No. MF0309)," dated April 30, 2013 [ADAMS Accession No. ML13116A075]

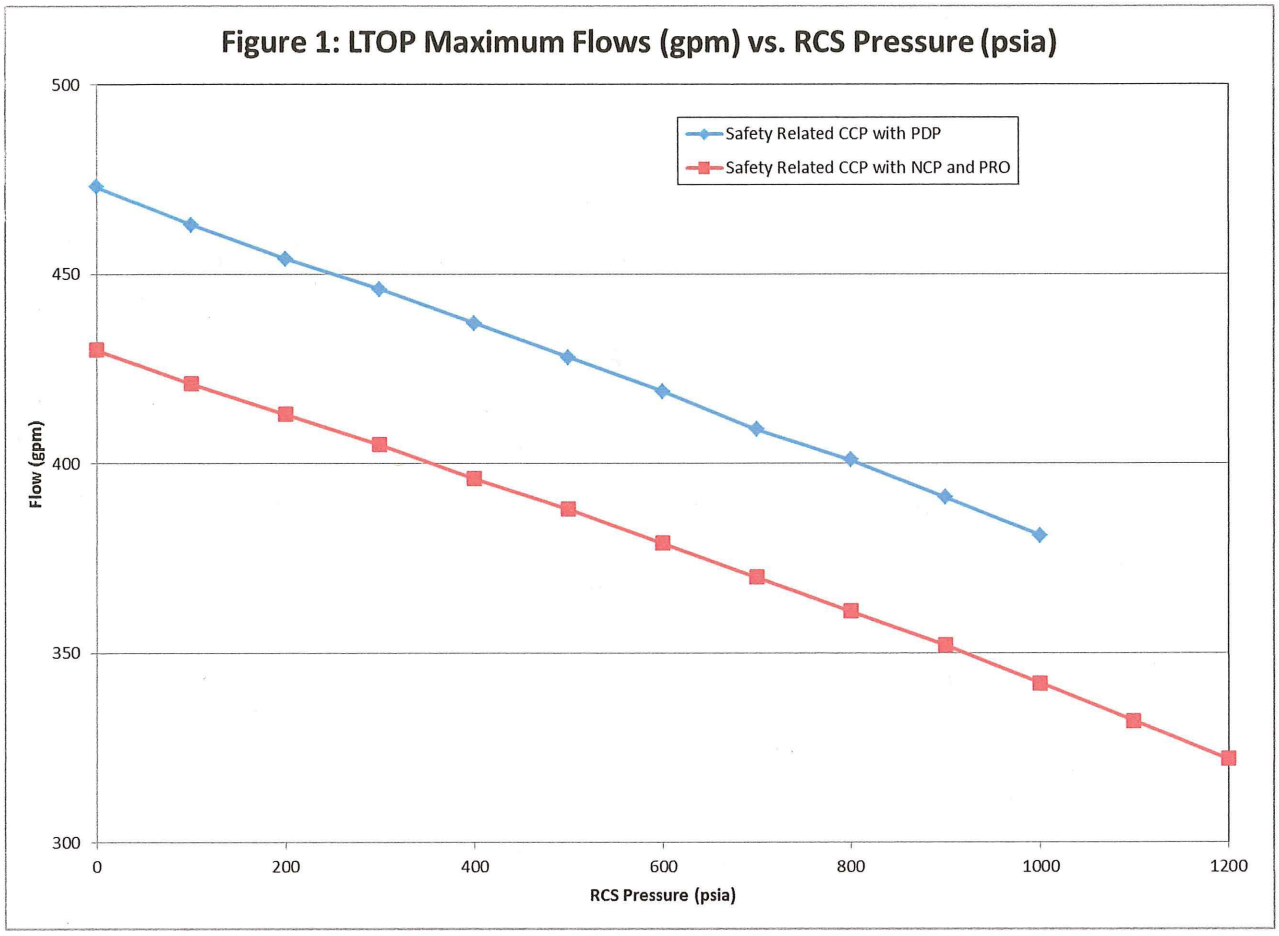
6. NRC Letter "Wolf Creek Generating Station - Issuance of Amendment Re: Revise Technical Specification 3.4.12, 'Low Temperature Overpressure Protection (LTOP) System' (TAC No. MF0309)," dated December 6, 2013 [ADAMS Accession No. ML13282A534]

7. TABLES

Table 1 – LTOP Maximum Injection Flows

RCS Pressure (psig)	Safety Related CCP and PDP Maximum Flow (gpm)	Safety Related CCP and NCP aligned to LTOP Orifice Maximum Flow (gpm)
0	473	430
100	463	421
200	454	413
300	446	405
400	437	396
500	428	388
600	419	379
700	409	370
800	401	361
900	391	352
1000	381	342

8. FIGURES



Note: PRO refers to the LTOP Orifice

Enclosure
Attachment 1
PG&E Letter DCL-16-028

Technical Specification Markup Pages

Insert 1

An LTOP System shall be OPERABLE with:

a. no safety injection pumps capable of injecting into the RCS;
b. a maximum of one Emergency Core Cooling System (ECCS) centrifugal charging pump capable of injecting into the RCS;
c. the normal charging pump (NCP) aligned to the LTOP orifice when it is capable of injecting into the RCS;
d. the accumulators isolated; and
e. one of the following pressure relief capabilities;
    1. Two Class I power operated relief valves (PORVs) with lift settings within the limits specified in the PTLR, or
    2. The RCS depressurized and an RCS vent of ≥ 2.07 square inches.

Insert 2

1. The NCP aligned to the LTOP orifice and two ECCS centrifugal charging pumps may be made capable of injecting for ≤ 1 hour for pump swap operation.

Insert 3

B. Two ECCS centrifugal charging pumps capable of injecting into the RCS.
OR
The NCP is not aligned to the LTOP orifice when it is capable of injecting into the RCS.

Insert 4

B.1 Initiate action to verify the NCP is aligned to the LTOP orifice and a maximum of one ECCS centrifugal charging pump is capable of injecting into the RCS.

Insert 5

SR 3.4.12.2 Verify a maximum of one ECCS centrifugal charging pump is capable of injecting into the RCS and the NCP is aligned to the LTOP orifice when it is capable of injecting into the RCS.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.12 Low Temperature Overpressure Protection (LTOP) System

LCO 3.4.12 ~~An LTOP System shall be OPERABLE with no safety injection pumps and a maximum of one centrifugal charging pump capable of injecting into the RCS and the accumulators isolated and one of the following pressure relief capabilities:~~

Insert 1

~~a. Two Class I power operated relief valves (PORVs) with lift settings within the limits specified in the PTLR, or~~

~~b. The RCS depressurized and an RCS vent of ≥ 2.07 square inches.~~

----------NOTES----------

Insert 2

~~1. Two charging pumps may be made capable of injecting for ≤ 1 hour for pump swap operation.~~

2. Accumulator may be unisolated when accumulator pressure is less than the maximum RCS pressure for the existing RCS cold leg temperature allowed by the P/T limit curves provided in the PTLR.

APPLICABILITY: MODE 4, when any RCS cold leg temperature is ≤ LTOP arming temperature specified in the PTLR,

MODE 5,

MODE 6, when the reactor vessel head is on and the vessel head closure bolts are not fully de-tensioned.

ACTIONS

----------NOTE----------
LCO 3.0.4b is not applicable when entering MODE 4

Moved to page 3.4-24

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more safety injection pumps capable of injecting into the RCS.	A.1 Initiate action to verify zero safety injection pumps are capable of injecting into the RCS.	Immediately
~~B. Two centrifugal charging pumps capable of injecting into the RCS.~~	~~B.1 Initiate action to verify a maximum of one centrifugal charging pump is capable of injecting into the RCS.~~	Immediately

Insert 3

Insert 4

~~(continued)~~

ACTIONS ~~(continued)~~

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. An accumulator not isolated when the accumulator pressure is greater than or equal to the maximum RCS pressure for existing cold leg temperature allowed in the PTLR.	C.1 Isolate affected accumulator.	1 hour
D. Required Action and associated Completion Time of Condition C not met.	D.1 Increase RCS cold leg temperature to > LTOP arming temperature specified in the PTLR. OR D.2 Depressurize affected accumulator to less than the maximum RCS pressure for existing cold leg temperature allowed in the PTLR.	12 hours 12 hours
E. One required RCS Class I PORV inoperable in MODE 4.	E.1 Restore required RCS Class I PORV to OPERABLE status.	7 days
F. One required RCS Class I PORV inoperable in MODE 5 or 6, with the vessel head closure bolts not fully de-tensioned.	F.1 Restore required RCS Class I PORV to OPERABLE status.	24 hours
G. Two required RCS Class I PORVs inoperable. OR Required Action and associated Completion Time of Condition A, B, D, E, or F not met. OR	G.1 Depressurize RCS and establish RCS vent of ≥ 2.07 square inches.	8 hours

Moved to page 3.4-25

(continued)

~~(continued)~~

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
G. ~~(continued)~~ LTOP System inoperable for any reason other than Condition A, B, C, D, E, or F.		

Moved to 3.4-26

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.12.1	Verify a maximum of zero safety injection pumps are capable of injecting into the RCS.	In accordance with the Surveillance Frequency Control Program
~~SR 3.4.12.2~~	~~Verify a maximum of one centrifugal charging pump is capable of injecting into the RCS.~~	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.3	Verify each accumulator is isolated when accumulator pressure is greater than or equal to the maximum RCS pressure for the existing RCS cold leg temperature allowed by the P/T limit curves provided in the PTLR.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.4	Not used	
SR 3.4.12.5	Verify required RCS vent ≥ 2.07 square inches open.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.6	Verify PORV block valve is open for each required Class I PORV.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.7	Not used	

Insert 5

~~(continued)~~

SURVEILLANCE REQUIREMENTS ~~(continued)~~

	SURVEILLANCE	FREQUENCY
SR 3.4.12.8	----------NOTE---------- Not required to be performed until 12 hours after decreasing any RCS cold leg temperature to ≤ LTOP arming temperature specified in the PTLR. ---------- Perform a COT on each required Class 1 PORV, excluding actuation.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.9	Perform CHANNEL CALIBRATION for each required Class I PORV actuation channel.	In accordance with the Surveillance Frequency Control Program

Enclosure
Attachment 2
PG&E Letter DCL-16-028

Technical Specification Retyped Pages

Remove Page	Insert Page
3.4-23	**3.4-23**
3.4-24	**3.4-24**
3.4-25	**3.4-25**
3.4-26	**3.4-26**

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.12 Low Temperature Overpressure Protection (LTOP) System

LCO 3.4.12 An LTOP System shall be OPERABLE with:

a. no safety injection pumps capable of injecting into the RCS;

b. a maximum of one Emergency Core Cooling System (ECCS) centrifugal charging pump capable of injecting into the RCS;

c. the normal charging pump (NCP) aligned to the LTOP orifice when it is capable of injecting into the RCS;

d. the accumulators isolated; and

e. one of the following pressure relief capabilities;

1. Two Class I power operated relief valves (PORVs) with lift settings within the limits specified in the PTLR, or

2. The RCS depressurized and an RCS vent of ≥ 2.07 square inches.

----------NOTES----------

1. The NCP aligned to the LTOP orifice and two ECCS centrifugal charging pumps may be made capable of injecting for ≤ 1 hour for pump swap operation.

2. Accumulator may be unisolated when accumulator pressure is less than the maximum RCS pressure for the existing RCS cold leg temperature allowed by the P/T limit curves provided in the PTLR.

APPLICABILITY: MODE 4, when any RCS cold leg temperature is ≤ LTOP arming temperature specified in the PTLR,

MODE 5,

MODE 6, when the reactor vessel head is on and the vessel head closure bolts are not fully de-tensioned.

ACTIONS

----------NOTE----------
LCO 3.0.4b is not applicable when entering MODE 4

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more safety injection pumps capable of injecting into the RCS.	A.1 Initiate action to verify zero safety injection pumps are capable of injecting into the RCS.	Immediately
B. Two ECCS centrifugal charging pumps capable of injecting into the RCS. OR The NCP is not aligned to the LTOP orifice when it is capable of injecting into the RCS.	B.1 Initiate action to verify the NCP is aligned to the LTOP orifice and a maximum of one ECCS centrifugal charging pump is capable of injecting into the RCS.	Immediately
C. An accumulator not isolated when the accumulator pressure is greater than or equal to the maximum RCS pressure for existing cold leg temperature allowed in the PTLR.	C.1 Isolate affected accumulator.	1 hour
D. Required Action and associated Completion Time of Condition C not met.	D.1 Increase RCS cold leg temperature to > LTOP arming temperature specified in the PTLR. OR D.2 Depressurize affected accumulator to less than the maximum RCS pressure for existing cold leg temperature allowed in the PTLR.	12 hours 12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. One required RCS Class I PORV inoperable in MODE 4.	E.1 Restore required RCS Class I PORV to OPERABLE status.	7 days
F. One required RCS Class I PORV inoperable in MODE 5 or 6, with the vessel head closure bolts not fully de-tensioned.	F.1 Restore required RCS Class I PORV to OPERABLE status.	24 hours
G. Two required RCS Class I PORVs inoperable. OR Required Action and associated Completion Time of Condition A, B, D, E, or F not met. OR LTOP System inoperable for any reason other than Condition A, B, C, D, E, or F.	G.1 Depressurize RCS and establish RCS vent of ≥ 2.07 square inches.	8 hours

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.4.12.1	Verify a maximum of zero safety injection pumps are capable of injecting into the RCS.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.2	Verify a maximum of one ECCS centrifugal charging pump is capable of injecting into the RCS and the NCP is aligned to the LTOP orifice when it is capable of injecting into the RCS.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.3	Verify each accumulator is isolated when accumulator pressure is greater than or equal to the maximum RCS pressure for the existing RCS cold leg temperature allowed by the P/T limit curves provided in the PTLR.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.4	Not used	
SR 3.4.12.5	Verify required RCS vent ≥ 2.07 square inches open.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.6	Verify PORV block valve is open for each required Class I PORV.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.7	Not used	
SR 3.4.12.8	----------NOTE---------- Not required to be performed until 12 hours after decreasing any RCS cold leg temperature to ≤ LTOP arming temperature specified in the PTLR. ---------- Perform a COT on each required Class 1 PORV, excluding actuation.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.9	Perform CHANNEL CALIBRATION for each required Class I PORV actuation channel.	In accordance with the Surveillance Frequency Control Program

Enclosure
Attachment 3
PG&E Letter DCL-16-028

Technical Specification Bases Markups

(for information only)

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.12 Low Temperature Overpressure Protection (LTOP) System

BASES

BACKGROUND

The LTOP System controls RCS pressure at low temperatures so the integrity of the reactor coolant pressure boundary (RCPB) is not compromised by violating the pressure and temperature (P/T) limits of 10 CFR 50, Appendix G (Ref. 1). The reactor vessel is the limiting RCPB component for demonstrating such protection. The PRESSURE TEMPERATURE LIMITS REPORT (PTLR) (Reference 12) provides the allowable actuation logic setpoints for the power operated relief valves (PORVs) and the maximum RCS pressure for the existing RCS cold leg temperatures during cooldown, shutdown, and heatup to meet the Reference 1 requirements during the LTOP MODES. The PTLR also provides LTOP temperature restrictions for operation of the reactor coolant pumps, safety injection (SI) pumps, ECCS centrifugal charging pumps, and ECCS injection flow path.

The reactor vessel material is less tough at low temperatures than at normal operating temperature. As the vessel neutron exposure accumulates, the material toughness decreases and becomes less resistant to pressure stress at low temperatures (Ref. 2). RCS pressure, therefore, is maintained low at low temperatures and is increased only after temperature is increased.

The potential for vessel overpressurization is most acute when the RCS is water solid, occurring only while shutdown; a pressure fluctuation can occur more quickly than an operator can react to relieve the condition. Exceeding the RCS P/T limits by a significant amount could cause brittle cracking of the reactor vessel. LCO 3.4.3, "RCS Pressure and Temperature (P/T) Limits," requires administrative control of RCS pressure and temperature during heatup and cooldown to prevent exceeding the PTLR limits. ~~Further, Centrifugal Charging Pump No. 3 (CCP-3) must be realigned for LTOP operations.~~Further, the normal charging pump (NCP) (i.e., Centrifugal Charging Pump No. 3, (CCP-3)) shall be aligned to the LTOP orifice, when it is capable of injecting into the RCS, during LTOP conditions.

This LCO provides RCS overpressure protection by ~~having~~ limiting to a minimum coolant input capability and having adequate pressure relief capacity. Limiting coolant input capability requires all SI pumps and one ECCS centrifugal charging pump (CCP) incapable of injection into the RCS and isolating the accumulators.

~~Although not directly addressed in the LCO, the plant design also includes a third charging pump (CCP-3). Operation of the third charging pump shall also comply with the LCO (Reference 13). A maximum of one centrifugal charging pump (out of three pumps: CCP-1, CCP-2, and CCP-3) shall be capable of injecting into the RCS, in MODE 4 when any RCS cold leg temperature is ≤ LTOP arming temperature. Operation of the third charging pump is controlled administratively in accordance with the PTLR and also to comply with the LCO.~~A maximum of one ECCS CCP shall be capable of injecting

into the RCS, and the NCP shall be aligned to LTOP orifice when it is capable of injecting into the RCS, when any RCS cold leg temperature is less than or equal to the LTOP arming temperature.

(continued)

BASES

BACKGROUND (continued)

The pressure relief capacity requires either two redundant RCS relief valves or a depressurized RCS and an RCS vent of sufficient size. One RCS relief valve or the open RCS vent is the overpressure protection device that acts to terminate an increasing pressure event.

The pressurizer has three Power Operated Relief Valves. Two of the three are classified as safety related and are designated for LTOP pressure protection. All the PORVs are air operated. These two safety related PORVs have a nitrogen gas backup to the non-safety related air supply.

The three PORVs are the same design. The PORV that is designated as non-Class I may be used, when instrument air is available, to control RCS pressure similarly to the Class I PORVs although the non-Class I PORV does not receive an automatic open signal like the LTOP designated valves. Therefore, because no credit is taken for its operation for LTOP, continued operation with the non-Class I PORV unavailable for RCS pressure control is allowed as long as the associated block valve or non-Class I PORV can be closed to maintain the RCS pressure boundary.

In MODE 4 with the RHR loops in operation and in MODES 5 and 6, the operating RHR loop, connected to the RCS, can provide pressure relief capability through the RHR suction line relief valve. This capacity for RCS pressure relief is not assumed in the PTLR LTOP considerations and analyses and is not included in the LCO, ACTIONS, or Surveillances.

With minimum coolant input capability, the ability to provide core coolant addition is restricted. The LCO does not require the makeup control system deactivated or the SI actuation circuits blocked. Due to the lower pressures in the LTOP MODES and the expected core decay heat levels, the makeup system can provide adequate flow via the makeup control valve. If conditions require the use of more than one ECCS CCP for makeup in the event of loss of inventory, then RHR pumps can be made available through manual actions.

Additionally, ECCS CCPs in excess of the above limitations can be momentarily capable of injection into the RCS for swapping of inservice ECCS CCPsS. This condition is acceptable based on the operator's attentiveness to RCS pressure during the pump switch over and the capability of the operator to limit a pressure increase.

The LTOP System for pressure relief consists of two Class I PORVs with reduced lift settings or a depressurized RCS and an RCS vent of sufficient size. Two RCS Class I PORVs are required for redundancy. One RCS Class I PORV has adequate relieving capability to prevent overpressurization from the allowable coolant input capability.

(continued)

BASES

BACKGROUND (continued)

PORV Requirements

As designed for the LTOP System, each Class I PORV is signaled to open if the RCS pressure approaches a limit determined by the LTOP actuation setpoint. The evolution of RHR cooldown with no RCP

forced circulation represents a condition where variation in RCS cold leg temperatures may occur. The RCS loop 2 and 3 wide range cold leg temperature indications provide the temperature input signal. Temperature indications from these two loops were selected to constitute a good representation of the overall four loop temperatures. However, in the event that only one RHR loop is in operation, temperature indications from RCS cold legs 2 and 3 will provide indication from a RCS loop into which the cooler water from the RHR discharge is entering. All four cold leg temperature indications are in the control room and provide a loop by loop comparison for the operator.

The LTOP system is placed into service and the block valves verified to be open by procedure at a RCS pressure of about 350 psig. This is an administrative action, not required by TS. However, if LTOP has not been placed into service prior to when the RCS temperature decreases to LTOP arming temperature specified in the PTLR (Reference 12) , the LTOP enable alarm annunciates to alert the operator to place the LTOP system into service. Placing LTOP into service at this point is required to satisfy the LTOP Applicability requirements. Following being placed into service, LTOP will receive RCS temperature and pressure input. The PTLR LTOP pressure setpoint is then compared with the indicated RCS pressure from a wide range pressure channel. If the indicated pressure meets or exceeds the LTOP value, and the temperature is lower than the enable temperature, a PORV is signaled to open. The two Class I PORVs operate individually with their own setpoints.

The PTLR specifies the setpoints for LTOP. Having the setpoints of both valves within the limits in the PTLR ensures that the Reference 1 limits, with a 10% relaxation provided by Reference 9, will not be exceeded in any analyzed event.

When a PORV opens in an increasing pressure transient, the release of coolant will cause the pressure increase to slow and reverse. As the PORV releases coolant, the RCS pressure decreases until a reset pressure is reached and the valve is signaled to close. The pressure continues to decrease below the reset pressure as the valve closes.

(continued)

BASES

BACKGROUND (continued)

RCS Vent Requirements

Once the RCS is depressurized, a vent exposed to the containment atmosphere will maintain the RCS at containment ambient pressure during a RCS overpressure transient, if the relieving requirements of the transient do not exceed the capabilities of the vent. Thus, the vent path must be capable of relieving the flow resulting from the limiting LTOP mass or heat input transient, and maintaining pressure below the P/T limits. The required vent capacity may be provided by one or more vent paths.

(continued)

BASES (continued)

APPLICABLE SAFETY ANALYSES

Safety analyses (Ref. 4) demonstrate that the reactor vessel is adequately protected against exceeding the Reference 1 P/T limits. In MODES 1, 2, and 3, and in MODE 4 with RCS cold leg temperatures exceeding LTOP arming temperature specified in the PTLR, the pressurizer safety valves will prevent RCS pressure from exceeding the Reference 1 limits. At or below the arming temperature specified in the PTLR, overpressure prevention falls to two OPERABLE RCS Class I PORVs or to a depressurized RCS and a sufficiently sized RCS vent. Each of these means has a limited overpressure relief capability.

The actual temperature at which the pressure in the P/T limit curve falls below the pressurizer safety valve setpoint increases as the reactor vessel material toughness decreases due to neutron embrittlement. Each time the PTLR curves are revised, the LTOP System must be re-evaluated to ensure its functional requirements can still be met using the RCS relief valve method or the depressurized and vented RCS condition.

The PTLR contains the acceptance limits that define the LTOP requirements. Any change to the RCS must be evaluated against the Reference 4 analyses to determine the impact of the change on the LTOP acceptance limits.

Transients that are capable of overpressurizing the RCS are categorized as either mass or heat input transients, examples of which follow:

Mass Input Type Transients

a. Inadvertent safety injection;

b. Charging/letdown flow mismatch;

c. Accumulator discharge.

Heat Input Type Transients

a. Inadvertent actuation of pressurizer heaters;

b. Loss of RHR cooling; or

c. Reactor coolant pump (RCP) startup with temperature asymmetry within the RCS or between the RCS and steam generators.

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BASES

APPLICABLE SAFETY ANALYSES (continued)

The following are required during the LTOP MODES to ensure that mass and heat input transients do not occur, which either of the LTOP overpressure protection means cannot handle:

a. Rendering all SI pumps and one ECCS CCP incapable of injection; and aligning NCP to the LTOP orifice when it is capable of injecting into the RCS;

b. Deactivating the accumulator discharge isolation valves in their closed positions; and

c. Precluding start of an RCP if secondary temperature is more than 50°F above primary temperature in any one loop and pressurizer water level is not less than 50%. LCO 3.4.6, "RCS Loops-MODE 4," and LCO 3.4.7, "RCS Loops-MODE 5, Loops Filled," provide this protection.

The Reference 413 analyses demonstrate that either one RCS relief valve or the depressurized RCS and RCS vent can maintain RCS pressure below limits when ~~only~~maximum mass injection capability of one ECCS CCP ~~is actuated~~in conjunction with the NCP aligned to the LTOP orifice is considered. ~~Thus, the LCO allows only one CCP OPERABLE during the LTOP MODES.~~Thus, the LCO allows a maximum of one ECCS CCP OPERABLE, and the NCP aligned to the LTOP orifice when it is capable of injecting into the RCS during the LTOP MODES. Since neither one RCS relief valve nor the RCS vent can handle the pressure transient resulting from accumulator injection, when RCS temperature is low the LCO also requires accumulator isolation when accumulator pressure is greater than or equal to the maximum RCS pressure for the existing RCS cold leg temperature allowed in the PTLR.

The isolated accumulators must have their discharge valves closed and the valve power supply breakers fixed in their open positions.

The current DCPP temperature of LTOP Applicability specified in PTLR (Reference 12) was determined in agreement with WCAP 14040 and ASME Code Case N-514. This criteria was approved for use by LA 133/131.

The consequences of a small break loss of coolant accident (LOCA) in LTOP MODE 4 conform to 10 CFR 50.46 and 10 CFR 50, Appendix K (Refs. 5 and 6), requirements by having a maximum of one ECCS CCP OPERABLE and SI actuation enabled.

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BASES

APPLICABLE SAFETY ANALYSES (continued)

PORV Performance

The fracture mechanics analyses show that the vessel is protected when the PORVs are set to open at or below the P/T limit, based on References 1 and 9, as shown in the PTLR. The setpoints are derived by analyses that model the performance of the LTOP System, assuming the limiting LTOP transient of one ECCS CCP injecting into the RCS with the ~~third charging pump (CCP-3 aligned for LTOP) operating~~NCP aligned to the LTOP orifice when it is capable of injecting into the RCS and with RCS letdown isolated. These analyses consider pressure overshoot and undershoot beyond the PORV opening and closing, resulting from signal processing and valve stroke times. The PORV setpoints at or below the derived limit ensures the Reference 1 P/T limits, with a 10% relaxation provided by Reference 9, will be met at low temperature operation.

~~NOTE: As discussed above, safety analyses assume operation of one ECCS CCP and operation of the third charging pump (CCP-3 aligned for LTOP) during LTOP transient. However, a maximum of one centrifugal charging pump (out of three pumps: CCP-1, CCP-2, and CCP-3) shall be capable of injecting into the RCS, in MODE 4 when any RCS cold leg temperature is ≤ LTOP arming temperature in order to comply with the LCO (Reference 13).~~

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