

April 12, 2007

Mr. John S. Keenan  
Senior Vice President and Chief Nuclear Officer  
Pacific Gas and Electric Company  
Diablo Canyon Power Plant  
P.O. Box 770000  
San Francisco, CA 94177-0001

SUBJECT: DIABLO CANYON POWER PLANT, UNIT NO. 1 - GENERIC LETTER 2004-02, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY RECIRCULATION DURING DESIGN BASIS ACCIDENTS AT PRESSURIZED-WATER REACTORS," EXTENSION REQUEST APPROVAL (TAC NO. MD4584)

Dear Mr. Keenan:

Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors," requested that all licensees complete actions related to the GL by December 31, 2007. By letter dated February 22, 2007, Pacific Gas and Electric Company (PG&E, the licensee) requested an extension to the completion date for its corrective actions to be taken at the Diablo Canyon Power Plant (DCPP), Unit No. 1. PG&E requested an extension to the DCPP, Unit No. 1 Refueling Outage 15 (designated 1R15), scheduled to start on January 26, 2009. In a phone conversation on March 23, 2007, Nuclear Regulatory Commission (NRC) staff asked the licensee to verify its compliance with the DCPP, Unit 1 licensing basis regarding debris blockage of the sump screen following a loss-of-coolant accident (LOCA). By letter dated March 27, 2007, the licensee informed the NRC that DCPP, Unit 1 currently meets, and will continue to meet during the period of the requested extension, its current licensing basis.

In its February 22, 2007 letter, PG&E stated that the original sump screens were replaced with significantly larger screens in 2000. These new screens have about 700 square-feet (sq. ft.) of area. In response to GL 2004-02, PG&E performed tests on the current screen design. These tests appeared to yield satisfactory results for the "Alternate Break Case or Option B" as defined in Chapter 6 of the NRC Safety Evaluation for the Nuclear Energy Institute's Guidance Report 04-07 until the effects of chemical effects and screen bypassing (downstream effects) were identified. Because of issues in these two technical areas, PG&E stated that it would replace the existing screens with screens of about 3,500 sq. ft. during the DCPP, Unit 1 spring 2007 refueling outage (RFO) (1R14, beginning on April 30, 2007). PG&E has also implemented or planning to implement additional mitigative measures that support its extension request. These additional mitigative measures are discussed below.

PG&E stated in its February 22, 2007, letter that recent analysis of various breaks resulted in projected unacceptable performance of the proposed replacement screen due to debris loading from mineral wool insulation located on the steam generators (SGs). This insulation is a custom fit to the SGs. PG&E stated that it plans to replace the SGs at DCPP, Unit 1 during the 2009 RFO. During the 2009 RFO, the insulation for the SGs will be replaced with a type that

will not adversely load the sump screen with debris. PG&E stated that following the replacement of the SG insulation DCP, Unit 1 will be in full compliance with GL 2004-02 including chemical and downstream effects. PG&E believes that it is not prudent to replace or mitigate the SG insulation during the 2007 RFO due to radiological dose and industrial safety concerns associated with the work, only to replace it again during the 2009 RFO.

In addition to the above, PG&E stated that it is currently evaluating a potential break on the 6-inch pressurizer relief valve inlet piping that could impact acceptable sump performance. If the analysis shows that sump performance would be unacceptable in this scenario, PG&E will take action to prevent unacceptable response to this postulated event during the spring 2007 RFO.

In its February 22, 2007 letter, PG&E described the following mitigative measures that will be accomplished at DCP, Unit 1 prior to the GL 2004-02 date of December 31, 2007:

- modify the reactor cavity door to allow debris to transport into an inactive area;
- add debris interceptors at doors in three locations (the doors are designed to allow flow through them into the reactor cavity and have already been modified to reduce the probability of becoming blocked with debris);
- remove cable tray fire stops that could become dislodged and create debris during a LOCA;
- install protective coverings over calcium silicate insulation in break zones of influence to reduce insulation debris generation;
- install tray covers and jet deflectors to protect pressurizer heater cable insulation to reduce debris generation;
- install an approximately 3,500 sq. ft. screen in place of the existing 700 sq. ft. screen; and
- install a raised drain screen in place of the flat grating over the reactor cavity drain line reducing the risk of water hold-up in the refueling cavity (complete).

PG&E also cited the following conditions and characteristics applicable to DCP, Unit 1 (as discussed in GL 2004-02):

- The DCP, Unit 1 containment is compartmentalized, tending to reduce debris transport;
- DCP, Unit 1 does not require switchover to recirculation mode until 20 to 30 minutes after initiation of a LOCA, allowing time for debris to settle in other areas of containment; and
- The probabilities of LOCA initiating events (large and medium break LOCAs) are extremely low. DCP, Unit 1 analyses show that LOCAs from pipe breaks less than

10 inches in diameter do not generate sufficient debris to cause the sump screens to plug. Small break LOCAs are within this category.

In addition to the above, PG&E noted that the issue regarding pressurized water stress-corrosion cracking with pressurizer Alloy 600/82/182 dissimilar metal welds is not applicable to DCCP, Unit 1.

PG&E performed a probabilistic risk assessment (PRA) of the effects of delaying mitigation of the mineral wool insulation on the SGs at DCCP, Unit 1 until its 2009 outage. PG&E stated that the GL 2004-02 assumptions regarding break probabilities, debris transport, and debris settling during an accident remain valid through the period of the extension. However, the PRA does not take credit for the GL 2004-02 assumptions for debris transport and settling. In addition, the PRA does not take credit for compensatory measures taken in response to Bulletin 2003-01. The PRA found that the additional core damage frequency risk associated with the extension request is estimated to be  $2.9E-7$  per year. The increase in large early release frequency risk is estimated to be  $6.0E-9$  per year. Both of these risk increments are "very small" as defined by Regulatory Guide 1.174.

PG&E stated that it had already implemented the following compensatory measures:

- Several actions have been implemented to ensure containment cleanliness. These actions include provisions for cleanliness during containment close-out following RFOs and for at-power entries into containment. A containment cleanliness program owner has been assigned overall responsibility for ensuring containment cleanliness. The program requires that the containment be cleaned prior to Mode 4 near the end of each RFO. The maintenance orders for cleaning the containment provide detailed instructions for cleaning and inspections. Cleaning activities include dirt and dust removal and vacuuming of cable trays and other accessible surfaces. Cleaning is scheduled late in the RFO to increase its effectiveness. In support of the cleanliness program, walkdowns covering all areas of the containment are required prior to RFO restart. The walkdowns include management, operations, radiation protection, and other personnel with technical knowledge of the containment. General Employee Training has been revised to include information on the importance of containment cleanliness;
- Sump inspections are performed near the end of each RFO to ensure that no adverse gaps or breaches are present in the sump screens;
- To help maintain pump functionality, operators are trained and provided guidance for continuous post-LOCA monitoring of containment spray (CS) and residual heat removal (RHR) pump parameters including loss of net positive suction head (NPSH). Note that at DCCP, Unit 1 only the RHR pumps take suction from the containment sump. Other emergency core cooling system pump suction is supplied by the RHR pumps. Training briefs on the issue are provided during operator requalification sessions to increase awareness of this potential for loss of pump NPSH. Guidance has been provided to monitor conditions, decrease flow as necessary to maintain NPSH, and shut down pumps as necessary to prevent damage. Per the DCCP, Unit 1 response to NRC Bulletin 2003-01, refueling water storage tank (RWST) refill is directed by procedure

immediately after containment recirculation is initiated. Alternate flowpaths for injection to the reactor coolant system and CS system are also specified by emergency operating procedures. Injection to the containment via alternate flowpaths could be used to increase the containment sump level via the CS system if sump level has not been adequately established using normal methods;

- RWST level is maintained higher than required by Technical Specifications (TS). The TS minimum requires 400,000 gallons to be available at all times. The additional volume in the RWST is estimated at 27,500 gallons; and
- Emergency response organization personnel have been provided training on indications of sump blockage and appropriate compensatory measures.

As previously noted, in a phone conversation on March 23, 2007, the NRC staff asked the licensee to verify its compliance with the DCP, Unit 1 licensing basis. The licensee informed the NRC staff by letter dated March 27, 2007, that DCP, Unit 1 currently meets, and will continue to meet during the period of the requested extension, its current licensing basis regarding debris blockage of the sump screen following a LOCA. The current licensing basis is described in the DCP Final Safety Analysis Report, Section 6.2.3.3.8, "Evaluation of Insulation and Other Debris Affecting Recirculation Sump Availability Following a LOCA."

The NRC has confidence that PG&E has a plan that will result in the installation of modifications that provide acceptable screen function with an adequate margin for uncertainties. Further, the NRC has concluded that PG&E has put mitigation measures in place to adequately reduce the risk for the requested extension period, and that it is therefore acceptable to extend the completion date for the corrective actions for the issues discussed in GL 2004-02 until the completion of the DCP, Unit 1 2009 refueling outage, currently scheduled to begin on January 26, 2009. Consistent with GL 2004-02, the DCP, Unit 1 licensing basis should be updated to comply with the analysis called for in the GL before resuming plant operation after that date. Should PG&E elect to begin the DCP, Unit 1 outage more than 30 days after January 26, 2009, PG&E will need to provide the NRC additional justification for further delay in completing corrective actions for GL 2004-02. A pressurized-water reactor licensee with an approved GSI-191 extension into 2008 or beyond should send in an "as complete as possible" GL 2004-02 supplemental and/or request for additional information response by December 31, 2007. If any substantive GL 2004-02 corrective action analytical results or technical details change in 2008 or 2009 (e.g., during an outage in which GL 2004-02 corrective action modifications are completed) a GL 2004-02 supplemental response should be submitted within 90 days of the change or outage completion.

J. Keenan

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If you have any questions or comments regarding this approval, please contact Alan Wang at 301-415-1445.

Sincerely,

*/RA/*

Thomas Hiltz, Branch Chief  
Plant Licensing Branch IV  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-275

cc: See next page

J. Keenan

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If you have any questions or comments regarding this approval, please contact Alan Wang at 301-415-1445.

Sincerely,

*/RA/*

Thomas Hiltz, Branch Chief  
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Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-275

cc: See next page

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**ADAMS Accession No.: ML071010537**

**\* memo dated 4/2/07**

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