



**Pacific Gas and  
Electric Company**

**David H. Oatley**  
Vice President and  
General Manager

Diablo Canyon Power Plant  
P.O. Box 56  
Avila Beach, CA 93424

805.545.4350  
Fax: 805.545.4234

November 9, 2004

PG&E Letter DCL-04-152

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  
NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency  
Sump Recirculation at Pressurized-Water Reactors"

Dear Commissioners and Staff:

The U.S. Nuclear Regulatory Commission (NRC) issued NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," dated June 9, 2003, to inform licensees of the potential for additional adverse effects due to debris blockage of flowpaths necessary for emergency core cooling system and containment spray system recirculation and containment drainage. Pacific Gas and Electric (PG&E) Letter DCL-03-097, "Response to NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," dated August 8, 2003, provided PG&E's 60-day response to Bulletin 2003-01.

On September 10, 2004, the NRC Staff requested additional information regarding PG&E's 60-day response to Bulletin 2003-01. The enclosure to this letter contains the PG&E response to the NRC request for additional information.

If you have questions regarding this response, please contact Mr. Stan Ketelsen at (805) 545-4720.

Sincerely,

David H. Oatley

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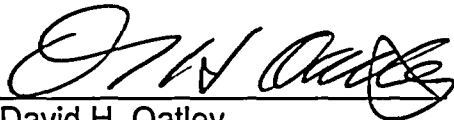
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| In the Matter of                 | ) | Docket No. 50-275          |
| PACIFIC GAS AND ELECTRIC COMPANY | ) | Facility Operating License |
|                                  | ) | No. DPR-80                 |
| Diablo Canyon Power Plant        | )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

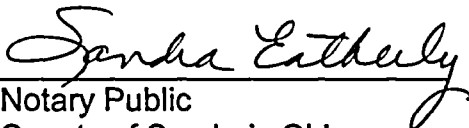
AFFIDAVIT

David H. Oatley, of lawful age, first being duly sworn upon oath states that he is Vice President and General Manager Diablo Canyon of Pacific Gas and Electric Company; that he has executed this response to the NRC request for additional information regarding NRC Bulletin 2003-01 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.

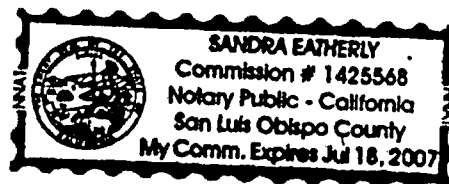


David H. Oatley  
Vice President and General Manager

Subscribed and sworn to before me this 9th day of November, 2004.



Notary Public  
County of San Luis Obispo  
State of California



**Response to NRC Request for Additional Information Regarding  
NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump  
Recirculation at Pressurized-Water Reactors"**

**NRC Request 1**

*On page 1 of Enclosure 1 of your Bulletin 2003-01 response, you stated that an "operations standing order has been issued to identify the generic concern regarding sump debris blockage and the potential impact on emergency operating procedures (EOP)." Also, on page 3 of Enclosure 1 of your Bulletin 2003-01 response, you stated that "classroom and simulator training on indications of and response to sump clogging will be included in the next operator requalification training cycle scheduled for September 2003 through October 2003." Also, on page 5 of Enclosure 1 of your Bulletin 2003-01 response, you state that "a more extensive article will be issued in the fourth quarter ESP [Engineering Support Program] newsletter, currently scheduled for issue October 31, 2003, to raise engineer awareness of the more aggressive containment cleanliness requirements, the potential for containment recirculation sump blockage, and actions being taken to address the NRC Bulletin 2003-01 concerns." Also, on page 5 of Enclosure 1 of your Bulletin 2003-01 response you state that "PG&E will conduct training for the Emergency Response Organization (ERO) decision makers and evaluators in the Technical Support Center (TSC) on indications of sump blockage and compensatory actions. The training will be incorporated into the current ERO training schedule and be completed by December 31, 2003." However, your response does not completely discuss the operator training to be implemented. Please provide a detailed discussion of the information provided to operators, the operating procedures to be implemented, the indications of sump clogging that the operators are instructed to monitor, and the response actions the operators are instructed to take in the event of sump clogging and loss of ECCS recirculation capability.*

**PG&E Response**

Diablo Canyon Power Plant (DCPP) operator training on indications of, and response to, sump clogging was provided during Operator Continuing Training Session R033. The training was conducted during September 2003 through October 2003 using simulator lesson guide R033S2, "LOCA [loss-of-coolant accident] / Cold Leg Recirculation / Clogged Recirculation Sump." This simulator training lesson was specifically designed to introduce the operators to the symptoms and actions required if the containment recirculation sump were to be clogged by debris following a high-energy line break inside containment. The training objectives were based on the operating procedures to be implemented :

- Implement Emergency Operating Procedure (EOP) E-1, "Loss of Reactor or Secondary Coolant"
- Implement EOP E-1.3, "Transfer To Cold Leg Recirculation"

- Demonstrate the ability to mitigate the consequences of a loss of emergency coolant recirculation (EOP ECA-1.1, "Loss of Emergency Coolant Recirculation").

During the scenario the operators were provided indications of sump blockage, i.e., changes to the indicated recirculation sump level were introduced, and procedure strategies were reviewed with the operators. Additionally, a PowerPoint presentation covering NRC Bulletin 2003-01 was reviewed during the post-critique of the simulator scenario.

The response actions the operators are instructed to take in the event of sump clogging and loss of emergency core cooling system (ECCS) recirculation capability are addressed in EOP E-1, EOP E-1.3, and EOP ECA-1.1. If there is a loss of ECCS recirculation capability, both EOP E-1 and EOP E-1.3 instruct the operator enter EOP ECA-1.1. EOP ECA-1.1 provides instructions for the following major actions:

- Continue attempts to restore emergency coolant recirculation,
- Increase/conservate RWST level,
- Initiate cooldown to cold shutdown,
- Depressurize the RCS to minimize subcooling,
- Attempt to add make-up to the RCS from alternate sources,
- Depressurize the steam generators to cooldown and depressurize the RCS, and
- Maintain RCS heat removal.

Operator Continuing Training also covered Operations Standing Orders associated with NRC Bulletin 2003-01 that included the following information:

- NRC Bulletin 2003-01 warns nuclear plants of the possibility of debris (especially thermal insulation) generated by a high-energy line break in containment being transported to the recirculation sump, coating the sump screen, causing a loss of suction to the RHR pumps. Until changes to the EOPs are completed, operators should be aware of the symptoms of sump blockage:
  - If a plant event occurs requiring containment recirculation alignment, sump blockage would be indicated by decreasing containment sump level (instruments LI-940, LI-941 on Vertical Board No.1) relative to the wide range containment flood level (instruments LR-942A, LR-942B on Post-Accident Monitoring Panel No. 1).
  - EOP E-1.3 requires at least 92.0 feet of water level in the containment sump to commence recirculation, and a nominal level of about 93.5 feet is expected when the contents of the RWST have been injected.

- A sump level approaching 88.6 feet means cavitation of the RHR pumps is imminent.
- Operators are expected to take actions necessary to prevent pump damage and to enter EOP ECA-1.1.

Subsequent training was given via the DCPD operator training newsletter on the changes to EOPs E-1 and E-1.3 in relation to this issue. Issues covered in this training newsletter, a self-study information package, included recognizing symptoms of containment sump blockage, the steps to minimize ECCS flow, and steps required to be taken to add makeup to the RWST.

In summary, operators have been provided information and training on (1) the potential for debris blockage of the recirculation sump following a high-energy line break inside containment, (2) symptoms and actions to be taken in the event of recirculation sump clogging, and (3) procedure strategies to be used in the event of sump clogging including the steps to minimize ECCS flow, steps to add makeup water to the RWST, and actions necessary to prevent pump damage.

The DCPD Initial Operator Training Program has also been modified to include the newest procedure changes related to the recirculation sump blockage issues and a simulator scenario has been modified to include this issue.

### **NRC Request 2**

*On page 5 of Enclosure 1 of your Bulletin 2003-01 response you state that "a schedule for DCPD implementation of changes [procedural modifications that would delay the switchover to containment sump recirculation], if required, will be established after the extent of the WOG [Westinghouse Owners Group] changes, if any, are identified." The Westinghouse Owners Group has developed operational guidance in response to Bulletin 2003-01 for Westinghouse and CE type pressurized water reactors (PWRs). Please provide a discussion of your plans to consider implementing this new WOG guidance. Include a discussion of the WOG recommended compensatory measures that have been or will be implemented at your plant, and the evaluations or analyses performed to determine which of the WOG recommended changes are acceptable at your plant. Provide technical justification for those WOG recommended compensatory measures not being implemented by your plant. Also include a detailed discussion of the procedures being modified, the operator training being implemented, and your schedule for implementing these compensatory measures.*

## PG&E Response

WCAP-16204, "Evaluation of Potential ERG and EPG Changes to Address NRC Bulletin 2003-01 Recommendations," was prepared by Westinghouse as an account of work sponsored by the Westinghouse Owners Group (WOG). It provides a generic evaluation of potential changes to the Westinghouse Emergency Response Guidelines (ERG) and Combustion Engineering (CE) Emergency Procedure Guidelines (EPG) to address NRC Bulletin 2003-01. The potential changes to the ERGs are compensatory measures that are intended to reduce the risk of concerns identified in Bulletin 2003-01 until completing actions necessary to resolve Generic Safety Issue 191, "Assessment of Debris Accumulation on Pressurized Water Reactor Sump Performance."

WCAP-16204 evaluates eleven candidate operator actions (COA) that were selected from those outlined in Bulletin 2003-01, and operations input from the Procedures Working Group of the WOG. WCAP-16204 reports the advantages and disadvantages of each COA, but makes no plant-specific recommendations. It states that incorporation of any COA into a plant's EOPs must be selected and justified by a licensee considering the trade-off among operational, design, and housekeeping aspects of Bulletin 2003-01, and impact on the plant's licensing basis. The following summarizes the results of PG&E's review of the WCAP-16204 COAs.

### COAs That Have Been or Will Be Implemented At DCP

#### COA A5 - Refill of Refueling Water Storage Tank

PG&E has implemented a new step in EOP E-1.3 to initiate RWST refill immediately after the containment recirculation alignment has been established. Additional RWST inventory provides a temporary source of borated water to the RCS should recirculation sump blockage require shutting down the recirculation trains.

Refill of the RWST has no adverse effect on recirculation because the RWST has been removed from service as an injection source once containment recirculation alignment has been established.

DCPP procedures allow refill of the RWST from either the spent fuel pool or the boric acid transfer system.

#### COA A6 - Inject More Than One RWST Volume From a Refilled RWST or by Bypassing the RWST

PG&E endorses increasing the borated water inventory in containment. Increasing the borated water inventory in containment has the effect of providing additional head to drive flow through the sump screens and to lower the debris transport velocities.

Additional inventory in containment would be a normal consequence of RWST refill and re-initiation of injection flow during a loss of recirculation event. PG&E intends to incorporate inventory addition instructions into a new EOP, ECA-1.3, "Sump Blockage Guideline," that will be based the *Sump Blockage Control Room Guideline* that has been approved by the WOG.

COA 8 - Provide Guidance on Symptoms and Identification of Containment Sump Blockage

PG&E has implemented guidance in EOP E-1.3 and EOP E-1 describing symptoms of sump blockage. These include (1) diverging level indication between inside and outside sump level monitors, (2) unstable recirculation flow, and (3) oscillating RHR pump motor amps. Guidance has been provided to reduce flow and equipment in service as needed to protect ECCS pumps from catastrophic damage.

Diverging level indication is expected to be the precursor to pump cavitation.

COA 9 - Develop Contingency Actions In Response To: Containment Sump Blockage, Loss of Suction, and Cavitation

PG&E has implemented procedural guidance to protect ECCS equipment from damage due to sump blockage. Continuous action steps have been added to EOP E-1.3 and EOP E-1 to sequentially secure ECCS components, as needed, to prevent damage.

DCPP intends to expand the guidance by implementing the WOG *Sump Blockage Control Room Guideline*. It will be implemented as new EOP ECA-1.3.

Candidate Operator Actions (COA) That Will Not Be Implemented At DCPP

COA A1a - Secure One Spray Pump

WCAP-16204 concludes that shutting down one containment spray pump prior to recirculation would have limited benefit during a small break loss-of-coolant accident and virtually no benefit during a large break loss-of-coolant accident. Even though WCAP-16204 states that the analysis required to implement this action would be minimal, PG&E believes the cost and effort involved in evaluating the acceptability of this change would be significant for such a limited benefit.

COA A1b - Secure Both Spray Pumps

As in the case above, the cost and effort involved in the required licensing and procedural guidance changes would be significant. PG&E considers current procedural guidance adequate to prevent unnecessary use of the containment spray system.



COA A2 - Establish One Train Of Containment Sump Recirculation Prior to Automatic Actuation

This COA attempts to protect an ECCS train, conserve RWST volume, and minimize recirculation flow by aligning one train for recirculation as soon as sump level requirements are met, and leaving the other train aligned for injection. However, this objective would complicate operator diagnosis and initial response, and may invalidate other Final Safety Analysis Report assumptions.

COA A3 - Terminate One Train of Safety Injection After Recirculation Alignment

WCAP-16204 states that incorporating an action to secure an operating safety injection (SI) pump into a plant's operating procedures will require a plant specific justification if it is outside the plant's licensing basis. A single failure of the operating pump after manually securing the other pump must be assumed. The probability is high that the secured pump will restart, since it was running when shut down, but there will be a time when neither pump is running. Current DCPD licensing bases assume at least one pump running continuously. Since current DCPD licensing analysis does not account for interruption in SI flow during single failure, reanalysis and a license amendment may be required. In addition, PG&E believes that creating the potential for an interruption of SI flow is not a prudent course of action.

COA A4 - Early Termination of One RHR Pump Prior to Recirculation Alignment

As indicated in WCAP-16204, this COA applies to CE plants only.

COA A7 - Provide More Aggressive Cooldown and Depressurization Following a SBLOCA

As indicated in WCAP-16204, this COA applies to CE plants only, since Westinghouse ERGs already address maximizing the cooldown rate up to the Technical Specification limit.

COA A10 - Early Termination of One Train of High-Head Injection Prior to Recirculation Alignment

As indicated in WCAP-16204, this COA applies to CE plants only.

COA A11 - Prevent or Delay Containment Spray for SBLOCA in Ice Condenser Plants

This COA does not apply to DCPD because it is not an ice condenser plant.

### Operator Training Being Implemented

COAs A5, A8, and A9 have been incorporated into EOP E-1 and EOP E-1.3, and training on these procedures has been completed as discussed in the response to Question No. 1.

### Schedule of Implementation for Operator Actions

COAs A5, A8, and A9 have been implemented as discussed above.

PG&E intends to implement new EOP ECA-1.3 based on the WOG *Sump Blockage Control Room Guideline*. It will include COA A6 and expanded guidance on COA A9. Operator training on ECA-1.3, and implementation, is scheduled for completion by April 29, 2005. This schedule will allow for development of the EOP, validation on the simulator, and review and approval. Earlier completion is precluded by the Unit 2 Twelfth Refueling Outage that commenced on October 25, 2004, and is scheduled to complete December 4, 2004.

### NRC Request 3

*On Page 6 of Enclosure 1 of your Bulletin 2003-01 response you state that "PG&E is evaluating procedural enhancements that can be made without affecting the WOG emergency response guidelines (ERG) response strategies for LOCA events. Examples are changes that would (1) reduce recirculation flows, when appropriate, to reduce the amount of debris transported to the sump and reduce head loss across the sump screen, (2) provide increased monitoring of the condition of the sump, (3) start makeup to the reactor water storage tank (RWST) earlier, and (4) provide improved strategies to mitigate sump blockage. These and other proposed changes identified through industry benchmarking will be considered. Those changes determined to be acceptable by PG&E will be incorporated into plant EOPs and implemented by December 31, 2003." Please provide a detailed discussion of any and all sump blockage related procedural enhancements, which do not affect the WOG ERG response strategies for LOCA events, implemented by PG&E.*

### PG&E Response

PG&E has implemented the following EOP changes as a result of its review discussed in the above request.

#### EOP E-1.3

Three steps were added to this procedure to address the potential for sump blockage.

- Step 11 is "Reduce RHR flow as RCS conditions permit: [followed by instructions for performing this action]." This step was added as a continuous action to reduce RHR flow and transport velocities to the

containment sump after the recirculation alignment has been established. The step ensures that spray flow from RHR is secured if no longer needed. Then RHR flow control valves are throttled to approximately 400 gpm per train while maintaining core water level and thermocouple temperatures within satisfactory limits. The recirculation alignment is not changed, i.e., high head pumps receiving suction flow from the RHR pumps remain operating at full capacity.

- Step 12 is "Implement Appendix M, RWST Makeup." This step was added to begin refilling the RWST in accordance with the instructions of new Appendix M, "RWST MAKEUP."
- Step 13 is "Monitor for Containment Recirc Sump Blockage: [followed by instructions for performing this action]." This step was added as a continuous action to monitor sump level, pump flows and motor amps for signs of loss of suction or cavitation. Action is directed to shut down pumps (high head pumps first) as necessary to prevent damage.

#### EOP E-1

EOP E-1 is reentered after completion of the transfer to cold leg recirculation. Actions pertinent to sump blockage must be continued. The following two steps were added:

- Step 15 is "Reduce RHR Flow as RCS Conditions Permit: [followed by instructions for performing this action]." This step was added to reduce RHR flow consistent with maintaining acceptable core level and temperature conditions. If RCS pressure is high enough to preclude significant RHR injection, then the step is bypassed.
- Step 16 is "Monitor for Containment Recirc Sump Blockage: [followed by instructions for performing this action]." This step was added to continue monitoring for signs of sump blockage.

In addition, as discussed in the response to Question No. 2, PG&E intends to develop and implement a new EOP (ECA-1.3) based on the *WOG Sump Blockage Control Room Guideline* by April 29, 2005.

#### NRC Request 4

*NRC Bulletin 2003-01 provides possible interim compensatory measures licensees could consider to reduce risks associated with sump clogging. In addition to those compensatory measures listed in Bulletin 2003-01, licensees may also consider implementing unique or plant-specific compensatory measures, as applicable. Please discuss any possible unique or plant-specific compensatory measures you considered for implementation at your plant. Include a basis for rejecting any of these additional considered measures.*

**PG&E Response**

The compensatory measures that PG&E considered all fell within the compensatory measures listed in NRC Bulletin 2003-01. There were no additional unique or plant specific compensatory measures considered by PG&E.