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PG&E Letter DCL-05-077

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 ASME Section XI Inservice Inspection Program Relief Requests

Dear Commissioners and Staff:

Pacific Gas and Electric Company (PG&E) Letter DCL-05-033, "ASME Section XI Inservice Inspection Program Relief Requests," dated April 1, 2005, submitted Inservice Inspection relief requests for inspections to be completed during Diablo Canyon Power Plant (DCPP) Unit 1 refueling outage thirteen, currently scheduled for Fall 2005, and DCPP Unit 2 refueling outage thirteen, currently scheduled for Spring 2006.

On May 26, 2005, the NRC identified additional information required to complete the evaluation associated with the relief requests. PG&E's response to the May 26, 2005, requests for additional information is included in Enclosure 1.

Sincerely,

James R. Becker

mjrm/4557/A0632940
Enclosures
cc: Diablo Distribution
cc/enc: Edgar Bailey, DHS
Terry W. Jackson, Senior Resident Inspector
Bruce S. Mallett, Region IV
Girija S. Shukla, NRR
State of California, Pressure Vessel Unit

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Response to NRC Request for Additional Information Regarding ASME Section XI Inservice Inspection Program Relief Requests

Questions received on May 26, 2005:

NRC Question 1

Provide the root mean square (RMS) values for Supplement 10 qualification, as well as Supplement 2 and Supplement 3 qualifications.

PG&E Response

A request for this information was sent to the Electric Power Research Institute (EPRI) performance demonstration initiative (PDI) administrator. The response provided is as follows:

Supplement 2	0.367" RMSE
Supplement 10	0.189" RMSE
Supplement 2 & 10 combined (Supplement 14)	0.245" RMSE
Supplement 3	</= 0.125" RMSE

NRC Question 2

Confirm that, currently, no vendor has been able to comply with the code-required RMS error (RMSE) of 0.125 inches, and that the performance with an RMSE of 0.245 inches is the best a vendor can do.

PG&E Response

Per communication with the EPRI PDI administrator, no vendor has successfully complied with the code-required RMS values of 0.125 inches for qualification tests from the reactor vessel inner diameter. The vendor that has been contracted for this task at Diablo Canyon Power Plant (DCPP) has substantial worldwide reactor vessel inspection experience and no limitations on the detection aspects of these examinations, other than on axial flaws in closure (field weld) configurations. Should indications be detected that require depth sizing, the approach of adding the RMS sizing error to the as-measured extent of an indication results in a conservative calculation of size for code acceptance comparisons. Discussions with the EPRI PDI staff indicate that a significant contributor to the sizing errors likely originates in the difficult geometry on the austenitic test set. Hence, the RMSE on the austenitic qualification test (Supplement 2) is greater than the RMSE on the dissimilar metal test set (Supplement 10).

NRC Question 3

Please indicate whether the alternative provided in the licensee's request is the most current Supplement 14 version of the proposed PDI alternative.

PG&E Response

The alternative Supplement 14 qualification was performed to Revision 2, the latest Supplement 14 as published in the 2004 Edition of ASME Section XI.

NRC Question 4

Specify the time period these relief requests are applicable to.

PG&E Response

The reactor vessel inspection relief requests apply to the DCPP Unit 1 and Unit 2 second inservice inspection intervals, 01/01/96 - 12/31/05, and 6/1/96 - 5/31/06, respectively. All examinations will be performed prior to the end of the respective second interval. Relief Request REP-2 stated that it applies to the second and third inspection intervals. However, as stated in the PG&E response to NRC question 8, Relief Request REP-2 is hereby withdrawn.

NRC Question 5

The questions below, 5(a) through 5(d), concern request for relief NDE-DMW.

NRC Question 5 (a)

Request for Relief NDE-DMW states that this request for relief applies to all 8 reactor pressure vessel (RPV) nozzle-to-shell welds for each unit at Diablo Canyon. Identify the materials and specific geometries for each of the subject welds. Discuss the surface conditions, if known, and whether it is reasonable to expect that 0.125-inch root mean square flaw depth sizing error is possible to attain under the as-built conditions at DCPP.

PG&E Response

The request applies to the nozzle-to-safe end welds of all eight nozzles. The materials used in the fabrication are as follows:

RPV Nozzle	SA 508 Carbon Steel
Safe Ends	SA-182 316 Stainless Steel
Cold Legs	A-351 CF8M Stainless Steel Elbows
Hot Legs	A-376 316 Seamless Stainless Steel piping
Cladding	Stainless Steel
Welds	Dissimilar Metal - Alloy 600 Buttering with Alloy 600 welds Non-Dissimilar Metal – TP 308

Per the reactor vessel manufacturer's drawings, the nozzle-to-safe end dissimilar metal welds received a final machining to a specific bore size leaving the inner diameter (ID) with a smooth surface. This drawing indicates that there could be as much as a 1/8 inch diameter (1/16 inch radial) difference 1 inch away from the dissimilar weld centerline, faired in with a 30 degree slope (stacking tolerances unfavorably could add 1/16 inch to this diameter difference). This anticipated smooth surface would be conducive to accurate sizing capabilities.

The safe end-to-pipe welds on the hot legs and the elbow-to-safe end welds on the cold legs were made on site to PG&E specifications. Previous examination data acquired in accordance with Section XI, not PDI, requirements did not note extreme geometry interferences. However, the exact condition of the ID of these welds is unknown.

To supplement the ultrasonic data, an eddy current inspection technique and surface profilometry will be employed. The eddy current technique will provide enhanced surface flaw detection capabilities, while the surface profilometry will accurately map the inner surface and note any areas where volumetric coverage could be compromised due to surface irregularities.

In summary, the exact surface condition of these welds is not known, and the surface interaction with the latest ultrasonic probe designs cannot be known. However, it is DCPP's intent to use the differential from the demonstrated vs. test criteria values as an additive sizing factor for all through-wall dimensions regardless of the presumed condition of the scanning surface. This will result in a conservative measurement calculation, especially where a smooth ID surface would otherwise not warrant this consideration.

NRC Question 5 (b)

Confirm that volumetric examinations will be performed from the inside surface for all of the subject welds listed in this relief request. Because of inside surface geometries and as-welded conditions typical of these welds, limitations have been identified for many of the EPRI PDI ultrasonic (UT) qualifications. Other than the RMSE depth sizing alternative cited in this request, discuss any other limitations to the UT qualifications that could affect detection and sizing of axial and circumferential cracks in these dissimilar metal welds. Include DCPP's proposed solutions to these limitations.

PG&E Response

The volumetric examinations will be performed from the inside diameter for all the subject welds listed in this relief request.

Limitations that have been identified to affect detection and sizing capabilities include the inside surface conditions, and factors such as tool scanning speeds, tool end effecter surface compliance and probe seating pressures, transducer selections, transducer array configurations, and data acquisition system performance could all affect detection and sizing capabilities. Most of these variables will be controlled by duplicating the parameters used during the PDI qualification tests. Where latitude is available in the selection of settings, the pre-examination calibrations will optimize the selections used.

At all times, the acquisition process will be monitored by UT-qualified personnel, whose extensive experience in these examinations will provide real-time confirmation that the integrated system is functioning properly by viewing UT signal characteristics, expected geometric reflectors, tool positioning information, etc. The analysts responsible for reviewing the acquired data are also required to be cognizant of the data attributes that would indicate degraded system performance or data quality and stipulate rescans where necessary. This monitoring and second check system has proven to be effective in detecting data discrepancies in reactor vessel examinations for many years.

Supplementing the volumetric examinations will be eddy current examination and UT profilometry of the nozzle-to-safe end and safe end-to-pipe or elbow welds. The eddy current surface examination will provide additional ability to detect surface breaking flaws, regardless of orientation or location and with less dependency on surface condition, and the surface profilometry will provide an accurate indication of the true inside surface condition of these welds.

The comprehensive package of ultrasonic examination, eddy current examination, surface profilometry and real-time monitoring with secondary data validation provides assurance that data quality will meet all requirements.

NRC Question 5 (c)

Confirm whether UT weld profiling will be used on all welds specified in this relief request as a technique to assist in the evaluation of poor transducer contact and to provide a permanent record of the inside surface condition of the subject welds. Describe any other techniques that may be used to provide a description of the inspection surface conditions.

PG&E Response

Ultrasonic weld profiling will be used on all eight of the inlet and outlet nozzle-to-safe end and safe end-to-pipe welds as an evaluation aid for transducer contact and to provide a permanent record of the configuration inside surface configuration.

A video camera system on the inspection device will be used where possible, which may provide some indication of surface conditions. The real-time and secondary review of the primary transducer data stream would immediately indicate coupling problems.

NRC Question 5 (d)

Confirm that the UT procedures have been qualified to detect axially-oriented cracks. If the procedures to be used are not qualified to detect axial cracks in the subject dissimilar metal welds, discuss whether the use of supplemental surface eddy current testing (ET) could be deployed at Diablo Canyon to address the UT procedure limitation, as these ET techniques are currently being used at other licensee's facilities. Include in the discussion the value of ET to detect surface-breaking flaws in the presence of irregular surface geometries, and whether ET techniques may be useful to cover areas of the weld not accessible to UT transducers.

PG&E Response

The WesDyne UT procedure to be used, PDI-ISI-254-SE, has been qualified to detect axial cracks in dissimilar metal welds, with the limitation for axial flaws in either Supplement 2 or 10 closure (field weld) configurations. The limitation is due to severe irregularities in the ID contact surfaces of the PDI test set. To address this potential concern, the use of surface ET is planned for all reactor vessel nozzle–to-safe end, safe end-to-pipe and safe end-to-elbow welds at DCPP. Per discussions with the vendor, demonstrations undertaken at another facility (VC Summer) confirmed that this technique is sensitive to surface breaking flaws. The surface eddy current probes' small contact footprint, which allows excellent compliance with irregular surface profiles, greatly increases probability of detection on non-uniform surfaces. The surface ET examination can be considered complementary to the UT examination, providing an

enhanced sensitivity to surface breaking flaws while the UT provides coverage of the rest of the inspection volume.

NRC Question 6

Request for Relief NDE-ASC proposes using the RMSE acceptance criteria for flaw depth and length sizing, as listed in 10 CFR 50.55a(b)(2)(xv)(C)(1), in lieu of the statistical parameters required by ASME Code, Section XI, Appendix VIII, Supplement 4. Since this has been approved by the staff in the regulation, it is appropriate for use at Diablo Canyon. However, the regulation at 10 CFR 50.55a(b)(2)(xv) also states that if licensees elect to use the provisions listed therein, they must apply all of the provisions in this section (except for 10 CFR 50.55(a)(b)(2)(xv)(F), which is optional). Confirm that all provisions in 10 CFR 50.55a(b)(2)(xv), with the possible exception of paragraph (F), will be applied at Diablo Canyon.

PG&E Response

The provisions of 10 CFR 50.55a(b)(2)(xv)(C), which apply to Supplement 4 and Relief Request NDE-ASC, were used in the qualification process for Supplement 4 as confirmed in EPRI Report #1009658, "Guideline for Implementation of Appendix VIII and 10 CFR 50.55a, Update," dated December 2004.

The PDI administrator brought to PG&E's attention that the concern addressed by Relief Request NDE-ASC was remedied by 10 CFR 50.55a(b)(2)(xv)(C)(1) as noted in Federal Register Volume 69 number 190 dated Friday, October 1, 2004, page 58808.

Therefore, Relief Request NDE-ASC is not required, and is hereby withdrawn.

NRC Question 7

Request for Relief NDE-SFW proposes using an UT inspection procedure that has been qualified to the requirements of ASME Code, Section XI, Appendix VIII, Supplements 4 and 6, as modified by 10 CFR 50.55a(b)(2)(xv), in lieu of the ASME Code Section XI required procedure. For the licensee's ASME Code of Record (1989 Edition, no addenda), volumetric examinations of the RPV flange-to-shell weld must be performed in accordance with ASME Code, Section V, Article 4.

The proposed alternative, to use procedures qualified through performance demonstration, is a progressive step that may ultimately enhance the reliability of this examination. However, it is unclear whether the range of essential variables listed in the procedures qualified under ASME Code, Section XI, Appendix VIII are also appropriate for the RPV shell-to-flange weld. Please discuss the

essential variables of the procedures, qualified under the industry's PDI, and why the use of these procedures is appropriate for the RPV shell-to-flange weld.

PG&E Response

The DCPP reactor vessel upper shell course immediately adjoining the flange to vessel weld is approximately 10.75 inches thick. The essential variables of the vendor procedure used to meet ASME Code, Section XI, Appendix VIII requirements for Supplements 4 and 6, PDI-ISI-254, Revision 4, Addenda 0, qualifies it for detection and length/depth sizing of ferritic materials with a nominal thickness of 0.0 to 12.30 inches. This procedure is qualified for single-sided examination, which indicates that it has been demonstrated to be capable of detecting and length sizing flaws on either side of the weld when examining from one side of the weld. This capability alone warrants the selection of this procedure over the prescriptive methods of non-Appendix VIII procedures. When combined with the examination that this weld will receive from the flange side of the weld, this method is superior to the method prescribed by Section V, Article 4. Note also that this procedure is qualified without reservation to examine the intersecting longitudinal welds on the same (upper) shell course.

NRC Question 8

The basis for relief provided in REP-2 simply states that bolts for the reactor coolant pump flange are being replaced. Please provide a technical explanation as to why these bolts are being replaced, including whether the original bolting is degraded and the cause of the degradation. Also discuss why the new bolt design (and material) will preclude this degradation in the future.

The licensee appears to be requesting relief from the requirements of ASME Code Case N-579. ASME Code Cases approved by the NRC provide an acceptable voluntary alternative to the mandatory ASME Code provisions. These voluntary alternatives must be followed in their entirety, with any conditions the NRC may have imposed on their use. The NRC cannot grant relief from a voluntary alternative to ASME Code requirements. For Relief Request REP-2, state the specific ASME Code, Section XI requirement for which relief is being requested. Also, confirm that all other replacement requirements of ASME Code, Section XI, IWA-7000 will be met.

PG&E Response

The original bolting has not degraded; rather the replacement is being made during routine disassembly of the pumps for scheduled maintenance. The hydraulically tensioned bolting will improve equipment service by permitting more uniform flange tension and by reducing radiation exposure to maintenance personnel on reassembly by optimizing the reassembly sequence.

Recent discussions with the vendor for the replacement (the original equipment manufacturer for the pump) have revealed that the bolting may not require relief from the applicable Code for the subject reactor coolant pump flange bolting. The bolting properties will be appropriately evaluated in the design stress analysis, and will either meet the Code requirements, or a separate relief request will be submitted requesting relief from specific ASME Section XI Code requirements. Relief Request REP-2 is hereby withdrawn.