



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION V

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WALNUT CREEK, CALIFORNIA 94596

SEP 24 1982

MEMORANDUM FOR: D. G. Eisenhut, Director, Division of Licensing
FROM: T. W. Bishop, Chief, Reactor Projects Branch No. 2
SUBJECT: SUMMARY STATUS OF REGION V DIABLO CANYON ACTION ITEMS

In accordance with discussions held with you and members of your staff on September 20, 1982, we have developed summary status statements of Region V's action items related to the Diablo Canyon Verification Program. These statements are provided as enclosures to this memorandum. The statement item numbers are in reference to the Action Item list provided as an enclosure to your memorandum to Messrs. Engelken, Vollmer, and Mattson (dated September 14, 1982) and the Region V supplement dated September 17, 1982.

Please contact me (FTS 463-3751) if you have questions about the summary statements or require further information.

T. W. Bishop

T. W. Bishop, Chief
Reactor Projects Branch No. 2

Enclosures:
As stated

cc: w/enclosures
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ENCLOSURE

SUMMARY STATUS OF REGION V DIABLO CANYON ACTION ITEMS

The item numbering below is in reference to the Action Item List provided as an enclosure to Mr. D. G. Eisenhut's memorandum to Messrs. Engelken, Vollmer, and Mattson (dated September 14, 1982) and the Region V supplement dated September 17, 1982.

5. Review Proposed Program to Evaluate Construction Quality Assurance

Region V will review the scope of the proposed IDVP review of construction quality assurance when that proposal is provided.

12. Regional Review of PG&E Internal QA Review

Region V comments were previously provided to NRR (Memorandum from R. H. Engelken to D. G. Eisenhut, dated September 15, 1982).

13. Closeout of Open Items from Previous Region V Inspections

Remaining Region V actions relate to as-built verifications and Licensee action on IE Bulletin 79-14. These reviews will be completed when licensee activity in these areas has been formally documented. See item number 10 for a related discussion, and current licensee status.

Action Items 10, 22, 26, 27, and 28 are addressed on the following pages.

22. Pre-Operational Test Programs Relationship to Non-Seismic Safety Related Design Contracts

The licensee's preoperational test program is designed to demonstrate that the plant structures, systems, and components meet the appropriate design criteria for operation and are properly installed. The program includes tests, adjustments, calibrations, and system operations necessary to ensure satisfactory operation. The tests are designed to verify the performance of the components and system under conditions expected to be experienced during plant operation. Tests for which normal plant conditions are not available and cannot be simulated are tested to the maximum extent possible. Abnormal plant conditions are simulated during testing when possible. Simulated signals are used to verify the full operating range of the systems and to calibrate or align system instruments at these conditions.

The pre-operational tests of Diablo Canyon included verification of the operation of fluid, mechanical, and electrical systems based on acceptance criteria stated in the FSAR, process requirements, and manufacturers guarantees. These tests verify certain aspects of the engineering work and identify any shortcomings in design or construction which affect the acceptance criteria. For example, the hot functional testing includes evaluation and recording of the piping thermal movements as the reactor coolant, main steam, and ECCS systems are brought to operating temperature and pressure. Significant discrepancies in the expected thermal movement of piping is readily apparent and can be corrected prior to actually operating the plant. In the case of Diablo Canyon, system testing disclosed that the original thermal analysis of movement of the pressurizer relief lines was incorrect (because the lines were originally analyzed as being hot). Since the lines could be either hot (after a relief valve opens) or cold (normally) this required a reevaluation by the licensee's engineering personnel of this thermal analysis and a plant wide evaluation of where similar situations could occur. Another example is in the heating and ventilation system where the licensee developed the system design and logic of operation, but a contractor designed the electronics hardware to provide the design damper positioning logic. The design was checked by flow rate testing, filter efficiency testing, and checking of damper position. This verified PG&E's mechanical and logic design, the filter manufacturers mechanical design, and the contractor's electronics logic design. One last example is Westinghouse, who as NSSS vendor supplied the reactor coolant system, ECCS pumps, valves, heat exchangers, and logic cabinets. The Westinghouse equipment was integrated with the PG&E design to complete a functional NSSS package. The fact that the systems (such as ECCS) operated as designed during testing and that components (such as the RPS) functioned as designed gives added assurance that these areas of design have been satisfactorily completed.

In addition to the pre-operational testing, surveillance testing has been periodically conducted for some systems during the last five years. In some cases systems (like the Comp. Cooling Water System) have operated nearly continuously for this five year period. Any major system operational problem in these components or systems would have likely been identified by now.

As described above, it appears that "active" aspects of design such as flow rate, heat exchanger capacity, instrument set points, time to open or shut valves, loading of diesel generators, and set/reset points of relief valves are adequately verified by testing and operation of the plant. Conversely, upset design conditions may not be realistically tested and are not verified by pre-operational or surveillance testing. These conditions include: seismic events, pipe breaks outside containment, tornados, tsunamis, system operation in a steam-break environment, and certain pipe stresses. Satisfactory system operation under these upset conditions is verified through design analysis (frequently supplemented with laboratory testing). Errors in the design analyses involving upset conditions are sometimes detected when there is need to re-review the design (such as the block walls at the Trojan Plant) or when a design basis event occurs (storm waves damaging the Diablo Canyon Breakwater). For these reasons these types of analyses should receive the majority of the staff's attention in the design verification process.

26. Verification of Independence for Technical Reviewers

Region V has initiated a program to verify the independence of IDVP technical reviewers. The purpose of this program is to assure that the individuals performing the IDVP will provide an objective, dispassionate technical judgment, based solely on technical merit. The following factors were considered in evaluating the question of independence:

- 1) Whether the individuals involved had been previously hired by PG&E or Bechtel Power Corporation (BPC) to do similar design work.
- 2) Whether any individual involved had been previously employed by PG&E or BPC (and the nature of the employment).
- 3) Whether the individual owns or controls significant amounts of PG&E or BPC stock.
- 4) Whether members of the present household of individuals involved are employed by PG&E or BPC.
- 5) Whether any relatives are employed by PG&E or BPC in a management capacity.

The organizations involved in the IDVP (TES, Stone and Webster, Reedy, and Cloud) developed "conflict of interest statements" for their applicable employees to sign. The statements were used to screen the proposed participants for any potential or apparent conflicts of interest with respect to the IDVP. An exhibit of the TES conflict of interest statement is attached. Originally, the conflict of interest statements referred only to PG&E; however, Bechtel Power Corporation has recently been added to the statement. In addition to signing the original statements, the participants will be required to sign the revised statements reflecting the current Bechtel involvement in Diablo Canyon.

To verify that the individual participants meet the established independence criteria the staff has reviewed conflict of interest statements, reviewed resumes, and confidentially interviewed participants. The following is a summary of that effort.

a. Conflict of Interest Statements

The staff reviewed conflict of interest statements of all of the key TES participants (44 statements). These 44 statements included statements of six individuals employed by consultants to TES. The organizations that these individuals represent are: J. W. Wheaton Technology; Hansen, Holley, Biggs, Inc.; Alexander Kusko, Inc.; and Foster-Miller Associates. The conflict of interest statements signed by these individuals indicated that none of the individuals have any significant past or present involvement

with PG&E or Diablo Canyon. The conflict of interest statements did not include Bechtel Power Corporation. Recently, Bechtel has been added to the statements. The revised statements will be signed by the individuals involved.

In addition to the conflict of interest statements of the TES individuals, the staff has reviewed the conflict of interest statements of the Stone & Webster participants in the IDVP. Sixty-six conflict of interest statements were reviewed and included all of the Stone & Webster participants with the exception of two individuals whose statements were not available at the time of the review. The conflict of interest statements signed by these individuals indicated that none of the individuals have any significant past or present involvement with PG&E or Diablo Canyon. Similar to the TES conflict of interest statements, the Stone & Webster statements did not include Bechtel; the statements will be revised to include Bechtel and will be resigned by the Stone & Webster participants.

Conflict of interest statements of Cloud and Reedy participants have not yet been reviewed.

b. Resumes

The professional resumes of key TES and Stone & Webster participants have been reviewed by the staff to give additional information regarding the question of independence. This effort included 34 resumes of TES personnel (including consultants) and 36 resumes of Stone & Webster personnel. The resumes indicated no employment history with either PG&E or Bechtel.

Additionally, the resumes were used to evaluate the professional experience and competence of the participants. The staff concluded that the TES and Stone & Webster individuals involved in the IDVP are competent and experienced in the matters under review.

c. Confidential Interviews

To further evaluate the question of independence, the staff selected key participants in the IDVP and conducted confidential interviews with them. This effort included interviews with thirteen TES personnel, nine Stone & Webster personnel, and approximately 50 percent of the Cloud participants from their West Coast office. In addition to the question of independence, the line of questioning by the Staff included the possibility of pressure being applied to suppress findings. Based on these interviews, the staff concluded that there is no conflict of interest between the participants in the IDVP and PG&E and Bechtel, and the participants feel no pressure to suppress possible findings.

Interviews with TES West Coast employees, Reedy employees, and Cloud East Coast employees have not yet been performed.

2. Financial Independence between TES and Bechtel and Stone & Webster and Bechtel

The staff discussed with the TES IDVP Project Manager and the TES Controller the extent of TES business with Bechtel. This discussion and review of the TES computer printout of current projects revealed that TES is currently involved in five projects with Bechtel (out of a total of 244 currently active projects). None of these five projects are related to Diablo Canyon. The fiscal year 1981 value of these Bechtel contracts is 1.234 million dollars. The total Teledyne corporate business for 1981 was 3237.6 million dollars, and although the company has a policy to not reveal division totals, the TES total annual business is estimated between 20 and 40 million dollars.

Staff interviews with Stone & Webster personnel indicated no contracts or financial connection between Stone & Webster and Bechtel.

Statement Regarding Potential or Apparent
Conflicts of Interest

To: Teledyne Engineering Services

Whereas, the undersigned employee ("Employee") understands that he or she is being considered as a participant to provide services to Pacific Gas & Electric Company with respect to the Design Reverification Program for the Diablo Canyon Nuclear Power Plant - Unit 1; and

Whereas, Employee understands that it is necessary that proposed participants be screened for any potential or apparent conflicts of interest with respect to this assignment;

Therefore, for the above stated purposes Employee makes the following representations to Teledyne Engineering Services:

1. Employee has not engaged in any work or business involved with or related to the engineering or design of the Diablo Canyon Nuclear Power Plant;
2. Neither Employee, nor any member of his or her immediate family, own any beneficial interest in the Pacific Gas & Electric Company and/or the Bechtel Power Corporation, including but not limited to common or preferred stocks, bonds or other securities issued on behalf of the Pacific Gas & Electric Company and/or the Bechtel Power Corporation; and
3. None of the members of Employee's immediate family are employed by Pacific Gas & Electric Company and/or Bechtel Power Corporation.

This statement is based upon the Employee's best information and belief and any exceptions to representations contained herein have been described on the reverse side of this document.

Dated: _____

Signature: _____

Print Name

27. Examination of Procedures for Controlling Work Activities and their Implementation.

In November 1981 the Region V staff initiated inspections of the licensee's and IDVP participants' work activities and the associated implementing procedures for controlling the work activities. The purpose of this inspection effort is to: (1) verify that appropriate procedures have been developed to control licensee and IDVP work activities; (2) verify that these procedures are consistent with licensee commitments and regulatory requirements, and; (3) verify that the procedures are being followed. Close coordination with NRR has been maintained by joint NRR and Region V inspections at Pacific Gas and Electric Company, R. L. Cloud and Associates, and Teledyne Engineering Services, Incorporated. The initial inspections were based on commitments such as those made during the October 9, 1981 and November 3, 1981 meetings with the licensee. Subsequent inspections were also based on program plans such as the R. L. Cloud and Associates Phase I plans dated December 3, 1981 and February 27, 1982 and later the Teledyne Engineering Services approved Phase I plan dated March 29, 1982 as well as the Phase II plan dated June 18, 1982.

The initial phase of the inspection effort consisted of examinations of procedures against the commitments and correspondence related to the subject matter (such as a Program plan or QA manual) to determine if the commitments and plans were implemented by appropriate directives. The inspectors then interview personnel (technical, clerical, and supervisory), audit records, and examine work in progress to determine if the procedures were followed. Special emphasis has been placed on the control of information between PG&E/Bechtel and the IDVP organizations, the tracking of identified issues, the completion of modifications, and individual awareness of the program requirements. These inspections have included examinations of Teledyne, R. L. Cloud, Stone & Webster, R. F. Reedy (procedures and results only), and the licensee. The inspections have been documented in memoranda, inspection reports (82-02, 82-05, 82-20 and 82-30) and trip reports (Reports/Memos dated January 15, 1982, February 3, 1982, March 2, 1982 and July 21, 1982, September 15, 1982).

Based on inspection findings to date it appears that IDVP and licensee actions are currently being adequately controlled. Appropriate procedures have been developed and are being satisfactorily implemented. Issues raised by the staff during the inspections are being properly resolved by the licensee or IDVP organization. The most significant open issue at this time relates to the exchange of information (written documents and meetings) between PG&E and the IDVP organizations. Teledyne submitted their position on this issue on August 5, 1982. The submittal is currently under NRR staff review.

28. Examination of Plant Modifications

The Independent Design Verification Program and the licensee's Internal Technical Program have resulted in a number of modifications to date. The majority of the modifications have been made to restore safety margins lost due to errors in the seismic design process. The licensee has stated that the plant, without modifications, would withstand the effects of a postulated Hosgri earthquake without loss of intended safety functions. The staff has not verified the accuracy of this statement.

The required seismic modifications identified as of September 10, 1982 include the following:

- annulus structural steel strengthening (27 of 810 connections and 11 of 405 members)
- pipe support strengthening (258 supports)
- electrical raceway support strengthening (145 supports)
- annunciator cabinet stiffening
- containment fan cooler support weld (one weld)
- valve yoke stiffening (one valve)
- instrument tubing support strengthening (four supports)

One non-seismic modification has been specified to date. This modification involves the installation of larger capacity circuit breakers in the 125V DC electrical system (6 incorrectly sized breakers were installed).

In addition to the above, the licensee anticipates further modifications will be required, as described below:

- Fuel Handling Building structural modifications
- containment polar and dome service crane guide strut and clamp modification
- strengthening of various pipe supports (estimating 20% of supports will require modification)
- strengthening of various electrical raceway supports
- strengthening of various HVAC supports
- strengthening of various equipment supports
- restoration of redundant power supplies to control room HVAC (non-seismic)

Region V has established a program for the examination of modification activity. It is the purpose of the program to verify that plant modifications are accomplished in accordance with approved design documents and in accordance with established quality requirements. The examination involves a large percentage of the field modifications and includes physical inspection of the hardware and review of quality related records.

To date, Regional inspections of modifications have centered on large and small bore pipe supports, electrical raceway supports, instrument tubing supports and the repairs made to the containment fan cooler support weld. As of September 10, 1982, the licensee has released design modifications for 179 large bore and 79 small bore pipe supports. To date, 82 (46%) large supports and 62 (78%) small bore supports have been inspected by Region V. The licensee has modified 145 raceway supports of which 97 (67%) have been inspected by Region V. Inspection results to date have shown that, in general, the modifications are being accomplished in a controlled manner to high quality standards.

10. Comparison of IE Bulletin 79-14 Actions for Diablo Canyon, Trojan and Rancho Seco

In response to IE Bulletin 79-14 "Seismic Analyses for As-Built Safety Related Piping Systems" Licensees were required to develop a verification program, examine safety related systems for nonconformances, evaluate and report all nonconformances to the NRC, modify the plant if required, and correct the documents which describe the as-built condition of the plant. Generally, the piping systems are depicted on piping isometric diagrams (isometrics) and on plant area drawings. The isometric drawings are used to formulate the input to computer calculations of the thermal and seismic stresses as well as the forces acting on pipe restraints and supports. Often two or more computer calculations are done (i.e. thermal and seismic) for each piping system. Depending upon the computer program and amount of the piping system on an isometric, a portion, one, or several, isometrics may be included in one piping computer calculation (problem). Since the licensees had different plant designs, different computer codes, different technical approaches, and chose to use different thresholds for evaluation it would be inappropriate to depend too heavily on any comparison of the relative error rate. A review of the IEB 79-14 correspondence revealed the following information.

Pacific Gas and Electric Company's (PG&E) original design utilized a total of 131 safety related piping isometrics and 222 safety related piping problems. As a result of IE Bulletin 79-14, 57 of the problems were reanalyzed and approximately 20 piping supports were modified. At the same time 14 field hardware changes were made to correct other deficiencies found when the piping system walkdowns were completed.

For the Rancho Seco plant the Sacramento Municipal Utility District's (SMUD) original design utilized 72 isometrics and 54 safety related piping problems. As a result of IE Bulletin 79-14, 9 of the problems were reanalyzed and approximately 10 modifications were made to the pipe supports.

In the case of the Trojan plant, Portland General Electric (PGE) Company's original design utilized a total of 542 safety related isometrics. As a result of IE Bulletin 79-14, 189 isometrics and an undisclosed number of piping problems were reanalyzed. As a result, 83 pipe supports were modified by minor stiffing or adding a brace. Three additional supports were also added, approximately 75 drawing changes were also required, and 9 valves required seismic reanalysis.

Based on this limited data, computation of the percent of problems or isometrics reanalyzed in response to IE Bulletin 79-14 were 17% for Rancho Seco, 26% for Diablo Canyon, and 35% for Trojan. However, as stated previously, because of the significant differences in the three plant's designs and design processes (technical approaches, computer programs, numbers of isometrics used, etc.) the use of this limited data to infer an accurate comparative error rate is inappropriate. A significant records research effort would be required by the three licensees if an accurate error rate was to be determined.

The type of errors found in the PG&E work during the last year which are related to IEB 79-14 can be divided into three broad categories.

- Information incorrectly transferred from walkdown isometrics to record copy isometrics: These errors reportedly did not affect the piping analyses, but do reflect a failure of the licensee to satisfactorily complete a commitment to the NRC.
- Pipe support, elbows, or branch connection locations outside the walkdown tolerances; these are generally Teledyne type "C" errors and have no effect on design.
- Walkdown errors; Examples are valve orientation or restraint orientation.

According to the licensee the majority of the as-built dimensional discrepancies identified by the IDVP were errors in drafting and not in the analyses. However, correct measurements of valve operator orientations apparently were not made during the IE Bulletin 79-14 walk-downs. PG&E currently plans to walk-down all piping to record correct valve orientations. PG&E stated that the original piping drawings that were marked-up during the field as-built walk-downs were used by the piping analysts. These drawings were then sent to the drafting department to develop the final isometrics. These drawings were not treated as record drawings and therefore, were not subject to stringent quality control procedures. PG&E currently plans to upgrade the drawing controls on the piping isometric drawings and they also plan to perform a sample of 17 walk-downs to the IEB 79-14 criteria. Licensee personnel have also stated that they expect to reanalyze the piping problems to verify their engineering judgment and to correct the identified deficiencies. This effort will require NRC staff review when the licensee completes the current evaluations.