

Distribution
Docket File



JAN 10 1977

Docket Nos.: 50-275, 50-323

Pacific Gas and Electric Company
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Gentlemen:

REACTOR VESSEL OVERPRESSURIZATIONS - DIABLO CANYON UNITS 1 AND 2

Several instances of reactor vessel overpressurizations have occurred in pressurized water reactors in which the Technical Specifications implementing Appendix G to 10 CFR Part 50 have been exceeded. The majority of cases have occurred during cold shutdown, during which time the primary system was in a water solid condition. These overpressurization events have been initiated by a variety of causes, including:

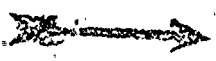
- (1) Isolation of the residual heat removal system/letdown system while charging to a water solid primary system,
- (2) Thermal expansion following the starting of a primary coolant pump due to stored thermal energy in steam generators,
- (3) Inadvertent actuation of safety injection accumulators, and
- (4) Initiation of operation of a reactor coolant pump or a high pressure safety injection pump.

In essentially all of the events reported, a single personnel error, equipment malfunction or procedural deficiency has been sufficient to cause the event.

In view of the potential seriousness of exceeding the limits of Appendix G to 10 CFR Part 50, we believe that appropriate steps should be taken promptly by all pressurized water reactor licensees to minimize the likelihood of additional occurrences of reactor vessel overpressurization. To that end we recently completed a series of

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The first part of the document discusses the importance of maintaining accurate records. It emphasizes that proper record-keeping is essential for the efficient operation of any organization. The text highlights the need for clear communication and the role of documentation in ensuring that all activities are properly tracked and reported.

In the second section, the author outlines the various methods used to collect and analyze data. This includes a detailed description of the experimental procedures and the statistical techniques employed to interpret the results. The text provides a thorough explanation of how the data was gathered and how it was used to draw meaningful conclusions from the study.

The third part of the document focuses on the results of the study. It presents a clear and concise summary of the findings, supported by relevant data points and statistical analysis. The author discusses the implications of these results and how they relate to the overall objectives of the research project.

Finally, the document concludes with a discussion of the limitations of the study and suggestions for future research. The author acknowledges the constraints of the current work and offers valuable insights into how the research could be expanded or refined in the future. This section provides a forward-looking perspective on the field of study.

In summary, this document provides a comprehensive overview of the research project, from the initial objectives to the final conclusions. It serves as a valuable resource for anyone interested in the subject matter and offers a detailed look at the methods and findings of the study.

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meetings with several pressurized water reactor licensees and nuclear steam supply system suppliers in which we discussed the overpressurization events and assessed the measures that are currently being employed to either avoid or reduce the probability of similar occurrences. Examples of measures identified by the various licensees include:

- (1) Complete avoidance of water solid conditions by either maintaining a pressurizer steam bubble, or by providing a low pressure nitrogen blanket in the pressurizer when a steam bubble cannot be maintained,
- (2) Disabling high pressure injection and safety injection pumps by disconnecting electrical power supplies when at low primary system temperatures,
- (3) Installation of dual setpoint pressurizer power relief valve(s) to provide protection against exceeding Appendix G limits while at low primary system temperatures,
- (4) Minimization of time at water solid conditions and upgrading plant procedures to include appropriate warnings and cautions when such operations are necessary, and
- (5) Installation of relief valves in charging pump discharge lines with a setpoint to provide protection against exceeding Appendix G limits

It was noted in our discussions with the pressurized water reactor licensees that, for the majority of those plants involved, not all potential overpressurization events would be prevented by the measures they had identified, and that some of the measures may have undesirable effects on reactor safety.

Based on the information gathered to date, we have concluded that all pressurized water reactor licensees should evaluate their system designs to determine the vulnerability to overpressurization events. Accordingly, you are requested to provide:

- (1) An analysis of the reactor coolant system response to pressure transients that can occur during startup and shutdown. Any design modifications determined to be necessary in order to preclude exceeding Appendix G limits are to be incorporated in this analysis. The analysis should include a plot of pressure as a function of time until termination of the event. The analysis should assume the most limiting initial conditions (e.g., one residual heat removal train operating or available

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1. The first part of the document discusses the general principles of the law of contract. It states that a contract is a legally binding agreement between two or more parties. The law of contract is concerned with the formation, performance, and breach of contracts.

2. The second part of the document discusses the requirements for a valid contract. It states that a contract must be formed by the free consent of the parties, and it must be for a lawful purpose. The law of contract also requires that the parties to a contract must be competent to contract.

3. The third part of the document discusses the performance of a contract. It states that the parties to a contract must perform their obligations under the contract. The law of contract also provides remedies for breach of contract, such as damages and specific performance.

4. The fourth part of the document discusses the discharge of a contract. It states that a contract may be discharged by agreement, frustration, or breach. The law of contract also provides remedies for discharge of a contract, such as damages and specific performance.

5. The fifth part of the document discusses the assignment of a contract. It states that a party to a contract may assign its rights under the contract to another party. The law of contract also provides remedies for assignment of a contract, such as damages and specific performance.

6. The sixth part of the document discusses the novation of a contract. It states that a contract may be novated, which means that the original contract is replaced by a new contract. The law of contract also provides remedies for novation of a contract, such as damages and specific performance.

7. The seventh part of the document discusses the rescission of a contract. It states that a contract may be rescinded, which means that the contract is treated as if it never existed. The law of contract also provides remedies for rescission of a contract, such as damages and specific performance.

8. The eighth part of the document discusses the rectification of a contract. It states that a contract may be rectified, which means that the contract is corrected to reflect the true intention of the parties. The law of contract also provides remedies for rectification of a contract, such as damages and specific performance.

9. The ninth part of the document discusses the discharge of a contract by agreement. It states that the parties to a contract may agree to discharge the contract. The law of contract also provides remedies for discharge of a contract by agreement, such as damages and specific performance.

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for letdown while other components such as pressurizer heaters and charging pumps and one or more reactor coolant pumps are in normal operation when the system is water solid) with the worst single failure or operator error as the initiating event. Justification should be provided for the choice of limiting conditions and worst single failure or operator error assumed in the analysis,

- (2) A description of those design modifications determined to be necessary, including equipment performance specifications and system operational sequences. The design basis used in the choice of equipment should be included, and
- (3) A schedule for the prompt implementation of the proposed design modifications.

The basic criteria to be applied in determining the adequacy of over-pressurization protection are that no single equipment failure or single operator error will result in Appendix G limitations being exceeded.

For those situations in which the necessary design changes identified cannot be implemented within the next few months, you should identify short-term measures to reduce the likelihood that overpressurization events will occur in the interim period until the permanent design changes can be made. Short term measures should be identified separately for immediate implementation subject to the terms and conditions of your license. Short term measures might consider some combination of, but would not be limited to, the following suggestions:

- (1) Procedural changes to minimize the time in which the primary system is in a water solid condition,
- (2) Upgrading existing plant procedures and administrative controls to assure that appropriate warnings and cautions are included to alert the operator whenever the potential for primary system overpressurization exists,
- (3) Providing alarms or indications to alert the operator whenever primary system pressure increases approach the Appendix G limits,
- (4) Introducing temporary plant modifications for pressure relief, and
- (5) Assigning additional personnel to monitor plant operations when the reactor coolant system is water solid.

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You should be aware that the design modifications required to preclude or minimize the probability of reactor vessel overpressurization events are plant dependent, and that the examples given may or may not be adaptable to your specific system design. In addition, proper consideration must be given to the potential effects of both the short term and long term measures you consider to insure that other aspects of nuclear safety are not compromised.

To verify compliance with Appendix G pressure-temperature limits during startup and shutdown, you should assure that the appropriate instrumentation is installed to provide a continuous permanent record over the full range of both pressure and temperature. This instrumentation should be in service during long periods of cold shutdown as well as during startup and shutdown operations. Reliance upon the plant computer to reconstruct a pressure transient is not considered sufficient because of the likelihood of computer down time especially during plant shutdown conditions.

We request that within 20 days after receipt of this letter you notify us that you will provide all the information requested within 60 days or explain why you cannot meet this schedule and provide the schedule that you will meet.

This request for generic information was approved by GAO under a blanket clearance number B-180225 (R0072); this clearance expires on July 31, 1977.

Sincerely,

Original Signed by
John F. Stolz

John F. Stolz, Chief
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cc: See Page 5

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