

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Investigation on the Commission's Own Motion Into the Operations and Practices of Pacific Gas and Electric Company; Notice of Opportunity for Hearing; and Order to Show Cause Why the Commission Should Not Impose Fines and Sanctions For the December 20, 2003 PG&E Mission Substation Fire and Electric Outage Pursuant to Public Utilities Code Section 451.

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PUBLIC UTILITIES COMMISSION
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SAN FRANCISCO
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ORDER INSTITUTING INVESTIGATION,
NOTICE OF OPPORTUNITY FOR HEARING,
AND ORDER TO SHOW CAUSE WHY THE COMMISSION
SHOULD NOT IMPOSE APPROPRIATE FINES AND SANCTIONS

I. INTRODUCTION

On December 20, 2003, a fire in Pacific Gas and Electric Company's (PG&E's) Mission Substation caused an outage to more than 100,000 customers throughout San Francisco, including downtown retail stores filled with shoppers on a peak holiday shopping weekend. PG&E and the Commission's Consumer Protection and Safety Division (CPSD) have completed independent investigations into the causes of the fire¹.

¹ PG&E's Mission Substation December 20, 2003 Event Report (August 20, 2004); CPSD's Investigation Report on PG&E Mission Substation Fire and Outage, December 20, 2003 (October 20, 2004).

The immediate cause of the fire was an electric cable failure. However, a single electric cable failure, by itself, should not cause an outage to over 100,000 customers. The investigations determined that other factors contributed to the catastrophic nature of the outage – for example, PG&E had not installed smoke detectors despite its own root cause analysis in the aftermath of a previous fire at the same Mission Substation that recommended that smoke detectors should be installed; PG&E’s operators did not have appropriate information to evaluate the alarm, which caused them to take no action for two hours; PG&E did not have written procedures for coordinating emergency fire response with the fire department; the surrounding insulation materials were flammable; and auxiliary equipment that did not have to be energized was in fact energized and short-circuited, causing the fire. Had PG&E followed the recommendations made in the fire report from the 1996 Mission Substation fire, the outage would not have occurred.

The Commission finds that PG&E’s failure to implement the recommendations from the previous fire investigation at the Mission Substation jeopardized system reliability and safety. Public Utilities Code section 451 requires that public utilities maintain their equipment and facilities in a safe and reliable manner. The Commission initiates this proceeding in order to consider whether to adopt the evidence set forth in the outage and fire reports, and issues an order to PG&E to appear and show cause why the Commission should not make a finding that PG&E violated Public Utilities Code section 451 by allowing an unsafe condition to exist at the Mission Substation, and impose appropriate fines and sanctions.

The Commission is deeply concerned by PG&E’s failure to implement changes in response to known safety hazards at the Mission Substation, and finds that good cause exists to consider safety and reliability at PG&E’s other indoor substations. We will require PG&E to provide a status report on the safety enhancements made at PG&E’s indoor substations. If the Commission finds that PG&E’s maintenance and/or operations practices at other indoor substations are unsafe, unreasonable, improper, or

insufficient, we may order PG&E to change or improve its maintenance, operations, or construction standards for substations, to ensure system-wide safety and reliability.

II. BACKGROUND

A. The Mission Substation Fire And Outage

On December 20, 2003, a fire in PG&E's Mission Substation caused an outage to more than 100,000 customers throughout San Francisco, including downtown retail stores filled with shoppers on a peak holiday shopping weekend. There was substantial smoke, but the fire that was the source of the smoke was not located for almost five hours.

PG&E did not call the San Francisco Fire Department (SFFD) until two hours after the first signs of trouble at the Mission Substation. SFFD firefighters arrived within minutes of being called, cleared the smoke, were unable to locate the fire that was the source of the smoke, and PG&E restored service to about one-half of its affected customers. Approximately one hour after service was restored to these customers, PG&E located the fire, and again interrupted service to the customers it had just recently restored. The SFFD fought and extinguished the fire and PG&E again began the task of restoring service to all of its affected customers. PG&E completed that task late in the evening of the next day.

B. The Investigation

The Commission's Enforcement Branch initiated an independent investigation immediately following the incident. The team that was selected was tasked with determining what happened, why it happened, and what could be done to prevent or minimize a recurrence of this type of incident, at the Mission Substation and any other indoor substations.

The Enforcement Branch investigation team worked independently but collaboratively with PG&E personnel, and monitored the content and status of PG&E's investigation and related findings. CPSD has also issued numerous requests for information (data requests) to PG&E, conducted in-depth joint interviews of PG&E and

SFFD personnel, and conducted site inspections of the Mission Substation and the Golden Gate Control Center (GGCC).

C. 1996 Mission Substation Fire

On November 26, 1996, the same Mission Substation had a similar fire that resulted in equipment damage and required the assistance of the SFFD to extinguish. As described in PG&E's report on the 1996 fire², at 10:34 p.m. on November 26, a 12 kV cable splice (in the Mission Substation) short circuited and caused an X-1117 circuit breaker to open. The breaker operation was reported by PG&E's Supervisory Control and Data Acquisition system (SCADA) to the GGCC. The splice was located approximately six feet from the first floor ceiling, just below the opening in the floor at the bottom of the X-1117 switch cabinet.

The short circuit in the splice burned the cable insulation and produced much smoke, which rose through the floor opening into the switch cabinet. Once the cabinet filled with smoke, smoke contaminated the air and reduced the electrical resistance between phases of switch components. The reduced resistance resulted in a flashover between phases of the bus bars connecting the overhead N bus to the switch, causing insulation on the N bus to ignite. The short circuit on the N bus caused the bus breaker to open at 12:55 a.m. (also reported by SCADA).

Around 1:00 a.m. on November 27, 1996, a PG&E employee on night shift stopped at the Mission Substation to use the restroom. Before entering, he noticed smoke coming from the building. After leaving the restroom he saw smoke, heard alarms and saw cables on fire after investigating further. He went back to his truck and called the Golden Gate District Operator. He then returned to the building and went up to the second floor switch room because he knew that was the path of the burning cable. The fire department and his supervisor soon joined him. The supervisor directed efforts to protect the equipment and provided fire fighters access to the switch cabinets. Sometime

² Mission Substation Circuit X-1117 Root Cause Analysis, 12/5/1996

after 2:00 a.m., the fire department finished putting out the fire, which destroyed the X-1117 cabinet and a significant portion of the N bus as well as lightly damaging adjacent switch cabinets. Since the fire caused a short time service interruption only to customers supplied through the X-1117 switch, the outage did not meet the reporting requirements of the CPUC so PG&E did not report the incident.

1. 1996 Fire Root Cause Analysis

PG&E's 1996 event report listed three action items to minimize future fire damage. These items were not implemented:

- a) Initiate a fire barrier penetration sealing program to seal openings,
- b) Review procedures for quickly responding to abnormal conditions such as breakers operations to promptly identify potential problems,
- c) Evaluate a cost effective method of smoke detection throughout the substation. A method of remotely monitoring alarms should also be reviewed.

The event report also cited previous PG&E Insurance Department, Property Loss Control Group, Property Loss Prevention Reports that make the same recommendations. The second and third action items, quick response and smoke detection, directly apply to the 2003 fire. In 1996, PG&E's Insurance Department realized that GGCC operators had no way of knowing through SCADA that a fire was burning in the substation. If the employee had not stopped at the substation on the night of the fire to use the restroom, the fire would have continued until more circuits were lost, as occurred in the 2003 fire. The Insurance Department stated that since the substation was unattended, at least one of the two recommendations would need to be implemented to prevent an undetectable fire from progressing.

2. Similarities to the December 20, 2003 Event

Similar to the December 2003 fire, the overhead N bus burned and remote monitoring did not detect the fire. X-1117 is a network feeder so no customers lost power and no one was dispatched to the substation to investigate, although SCADA reported both the X-1117 circuit breaker and an EN circuit breaker had opened. Even though the initial fault differed from the 2003 fire, the immediate resulting events and response were virtually identical:

- a) The incident occurred on an auxiliary bus that did not have to be energized.
- b) The incident occurred during reduced staffing hours.
- c) SCADA reported a breaker opening on a network circuit and later on an auxiliary bus.
- d) The failed cable splice produced smoke contamination that resulted in arcing in the N bus that ignited the bus insulation.
- e) SCADA did not detect or report a fire burning in the unmanned substation.
- f) PG&E did not immediately investigate the fault because it was only one circuit in a network (N-1).
- g) The fire did not self extinguish.

PG&E did not investigate the importance of the 1996 fire not self-extinguishing in the Root Cause Analysis. Similarly, PG&E's event report did not acknowledge the flammability of the insulation on auxiliary buses. Nor did it realize that the fault on the N bus that ignited the insulation occurred because the bus was energized when it did not have to be.

The similarities between the 1996 and 2003 fire are important because they demonstrate that PG&E should have anticipated and been prepared for the 2003 fire. The

1996 fire showed PG&E that a single network circuit fault could result in a fire. It demonstrated the auxiliary bus insulation was made of flammable material that could be ignited by a short circuit and sustain a fire. It also showed that SCADA monitoring would not detect an active fire in the switch cabinets and N bus. It further showed that auxiliary buses should be de-energized when not in use.

D. CPSD's Findings

In its report, CPSD made findings and recommendations relating to PG&E equipment, systems, work processes and procedures. (CPSD Outage Report, pp. 12-24.) The following are the findings and recommendation contained in CPSD's report:

- The root cause of the incident was a cable failure in a switch cabinet. The cable failed explosively, which caused a bus located above it to catch on fire. Over time, vertically installed cable with oil impregnated paper insulation loses its insulating capability because the insulation dries out, resulting in a short circuit.
- There were no smoke detectors at Mission substation at the time of the December 20, 2003 incident despite earlier recommendations by PG&E to install them in certain areas.
- The insulation of the 12 kV distribution auxiliary buses is composed of flammable material. Once ignited, the fire in the bus insulation continued to spread and burn. The flammable insulation caused both the 1996 and 2003 fires to spread along the bus duct and damage more switch cabinets. Switch cubicle openings did not have barriers to contain smoke. In both the 1996 and 2003 incidents, smoke flowing through cubicle openings caused arcing between exposed, live electrical parts that ignited a fire. Both the 1996 and 2003 fires spread beyond the fault because a short circuit arc on the N bus ignited the bus insulation. The arc occurred because the bus was energized.

The bus was normally energized as a standby power source for the distribution switches.

- PG&E operators do not have user-friendly SCADA screens and interactive capabilities that enable them to effectively monitor and respond to SCADA alarms and conditions.
- The GGCC district operators cannot recognize, prioritize, and respond effectively when a large number of SCADA alarms arrive in a short period of time. This is why operators did not respond to the initial X-1153 and fire subsystem audible alarms.
- SCADA has a single nonspecific alarm for the many auxiliary bus breakers, preventing an operator from determining which breaker generated the alarm.
- The 1162 circuit breaker tripped on reverse current when the voltage on the Section H bus fell to close to zero as the result of the fault in the X-1109 cubicle. The instantaneous units in the circuit breaker's overcurrent relays initiated the trip. Opening of the circuit breaker under these conditions is undesirable because it could unnecessarily cause customers to lose power.
- Fire suppression equipment is adequate at Mission Substation, but it can be improved in key areas consistent with recommendations in PG&E's 1996 CES Substations Fire Project Report.
- Roof fans can only be turned on manually at the fan location. The SFFD needed the fans to ventilate the building and were forced to use a ladder truck to access the building roof to operate the fans.
- The SFFD Rescue Squad Chief stated that there was no lighting in the substation when he was there. However, there is a minimum of emergency lighting powered by the station battery that automatically turns on when power is lost in the substation. When the rescue squad was in the building, the dense smoke likely diminished the intensity of the emergency lighting.

E. PG&E's Investigation and Findings

PG&E's own investigation, completed in August of 2004, made the following findings:

- Over time, the particular application of paper and lead cable (40 years in a vertical position) caused the cable to lose its insulating capability. This caused the cable to fail and was the initiating event of the fire.
- PG&E's practice of energizing auxiliary equipment in the substation contributed to the start of the fire.
- PG&E did not adequately evaluate two measures identified to minimize the effect of a fire at the Mission Substation. These measures were contained in a 1996 report on a similar fire at the Mission Substation. If PG&E had implemented these measures (smoke detection and immediate response when a circuit trips) its response to this fire would have been faster.
- PG&E operators did not have the tools or procedures to evaluate appropriately the SCADA information coming from the Mission Substation. This delayed the response to the fire.
- PG&E had no specific, written procedures for coordinating with SFFD for fire response at indoor substations. This delayed the fire suppression activities. (PG&E Event Report, pp.5-7.)

After the 1996 fire, PG&E essentially took no steps to implement the recommendations stemming from the event report of that fire. As of today, PG&E has de-energized the auxiliary buses, installed smoke detectors, installed fire barriers, and has developed written operating procedures for better event responses. (PG&E Event Report, p.8.) However, those steps should have been taken several years ago; failure to do so meant that the conditions at the Mission Substation were dangerous and jeopardized system safety.

Based on PG&E's and CPSD's findings, the Commission has good cause to find that an unsafe condition existed at the Mission Substation that jeopardized system reliability and safety, in violation of PU Code section 451. The fire and resulting outage

would not have occurred had PG&E implemented the recommendations made several years earlier. Given the expense, inconvenience and potential harm to the public from electrical outages, PG&E's failure to implement its own recommendations to prevent a recurrence of this type of fire falls below the standard of performance the Commission expects of utilities under its jurisdiction.

III. ORDER TO SHOW CAUSE; PENALTIES

Based on the public reports issued by both PG&E and CPSD, there is good cause to find that PG&E violated Public Utilities Code section 451 by failing to maintain its system in a safe and reliable manner. A dangerous condition existed at PG&E's Mission substation because of the lack of adequate fire prevention, lack of fire coordination with the SFFD, lack of appropriate fire alarm response, flammable insulation, and an auxiliary bus that did not have to be energized – of which PG&E was fully aware since 1996. This Order to Show Cause orders PG&E to appear and show cause why the Commission should not make a finding that PG&E violated Public Utilities Code section 451 by allowing an unsafe condition to exist at the Mission Substation, which led to an electrical fire and catastrophic power outage. Section 451 requires a public utility to maintain its equipment and facilities in a safe and reliable manner. We hereby place PG&E on notice and provide an opportunity for PG&E to be heard on the issue of whether it violated section 451, and whether penalties should be imposed.

This order also includes an Order Instituting Investigation, so that a forum exists in which to enter the two above-mentioned reports and exhibits as evidence, and to consider any further information or documents that may come to light.

Pursuant to Public Utilities Code sections 2107 and 2108, the Commission may impose penalties in the amount of \$500 to \$20,000 per day per offense for violations of the Public Utilities Code. We place PG&E on notice that it must demonstrate why it should not be held liable for allowing an unsafe condition to exist during the time period after the 1996 fire when PG&E was warned of the danger at the Mission substation by its own engineers. PG&E is also placed on notice that the Commission may consider a

penalty for each customer that lost power, or for each day that the outage was ongoing. Pursuant to the guidelines we set forth in D.98-12-075, we may consider fines and penalties in order to deter future misconduct and to serve as a punitive measure against PG&E for failing to maintain a safe and reliable system for a period of several years, resulting in a catastrophic outage that endangered the public and caused substantial economic harm.

Pursuant to Public Utilities Code section 761, if the Commission finds that PG&E's maintenance and/or operations practices are unsafe, unreasonable, improper, or insufficient, we may consider ordering PG&E to change or improve its maintenance, operations, or construction standards for substations, to ensure system-wide safety and reliability. We place PG&E on notice that the Commission may consider ordering PG&E to implement the recommendations made in PG&E's own event report, or to implement CPSD's recommendations contained in its investigative report, and whether those recommendations should be implemented in PG&E's other indoor substations as well in order to improve and ensure system-wide safety and reliability. In order to evaluate safety and reliability in PG&E's substations system-wide, we will require PG&E to provide a status report on the safety enhancements made at PG&E's other indoor substations since 1996.

Therefore, **IT IS ORDERED** that:

1. An investigation on the Commission's own motion is instituted into the operations and practices of Respondent Pacific Gas & Electric Company, regarding the December 20, 2003 Mission Substation Fire and Outage. A redacted copy of PG&E's Mission Substation December 20, 2003 Event Report (August 20, 2004), and CPSD's Investigation Report on PG&E Mission Substation Fire and Outage, December 20, 2003 (October 20, 2004) will be placed in the docket designated for this proceeding.
2. Respondent PG&E is directed to appear at a time and place to be determined by an Administrative Law Judge (ALJ) and show cause why the Commission should not make a finding that PG&E violated Public Utilities Code section 451 by allowing an

unsafe condition to exist at the Mission Substation, which led to an electrical fire and catastrophic power outage on December 20, 2003. Section 451 requires a public utility to maintain its equipment and facilities in a safe and reliable manner. Pursuant to sections 2107 and 2108, the Commission may impose penalties in the amount of \$500 to \$20,000 per day per offense for violations of the Public Utilities Code. PG&E is put on notice that it must demonstrate why it should not be held liable for knowingly allowing an unsafe condition to exist. PG&E is also placed on notice that the Commission may consider a penalty for each customer that lost power during the outage, or for each day that the outage was ongoing.

3. Respondent PG&E is placed on notice that, pursuant to Public Utilities Code section 761, the Commission may consider ordering PG&E to implement the recommendations made by PG&E's own event report or by CPSD's investigative report or any other changes called for by the investigations stemming from the December 20, 2003 fire and outage, and whether those changes to PG&E's maintenance, operations, or construction standards should be implemented in other indoor substations, in order to improve and ensure system-wide safety and reliability. In order to evaluate the safety and reliability of PG&E's indoor substations, PG&E is ordered to provide Commission Staff with a status report on the condition of its other indoor substations, including whether the changes and enhancements made at the Mission Substation have been made at other indoor substations, and further providing the following data for each indoor substation: a) the number, date, time and duration of fires that occurred in each indoor substation since 1996; b) the number, date, time and duration of any unplanned outages caused by equipment and cable failures in each indoor substation since 1996; c) a list of indoor substation equipment and cables that have been identified by PG&E since 1996 for replacement based on age and wear criteria established by PG&E; d) what improvements have been made in SCADA monitoring at all indoor substations and control centers since the December 20, 2003, Mission Substation fire, including an explanation of how the improvements will prevent similar outages; e) what

improvements in written procedures have been made for each indoor substation for coordinating with local fire departments for fire response at indoor substations since the December 20, 2003, Mission Substation fire; f) any other important measures taken or data collected regarding indoor substation safety and reliability. PG&E shall provide CPSD staff with its status report within 60 days of the effective date of this order.

4. After an Administrative Law Judge (ALJ) is assigned, a Prehearing Conference pursuant to Rule 49 will be convened, and the ALJ will calendar a date, time, and location for a hearing on the Order to Show Cause in a subsequent ruling or order. The subsequent ruling will set a schedule for the issuance of prepared testimony and any additional discovery matters. Respondent shall serve prepared testimony responding to the issues stated above and any other allegations presented in this OII/OSC.

5. This ordering paragraph suffices for the "preliminary scoping memo" required by Commission Rule 6(c) of the Commission's Rules of Practice and Procedure (Rule). This proceeding is categorized as an adjudicatory proceeding and will be set for evidentiary hearing. The issues of this proceeding are framed in the above order. A prehearing conference shall be scheduled for the purpose of setting a schedule for this proceeding, including dates for the exchange of written testimony, determining which witnesses will need to testify, and addressing discovery issues. As to categorization of this proceeding, this order is appealable pursuant to Rule 6.4. Any person filing a response to this Order Instituting Investigation, Notice with Opportunity to be Heard, and Order to Show Cause must state in any response any objections to such orders and notice regarding the need for hearings, issues to be considered, or proposed schedule. However, objections may not address factual allegations that an evidentiary hearing will decide.

6. The Executive Director of the Commission is directed to cause a certified copy of this ORDER INSTITUTING INVESTIGATION, NOTICE OF OPPORTUNITY FOR HEARING, AND ORDER TO SHOW CAUSE to the Respondent's offices at 77 Beale Street, San Francisco CA 94105.

This order is effective as of the date shown below.

Dated March 17, 2005, at San Francisco, California.

MICHAEL R. PEEVEY
President
GEOFFREY F. BROWN
SUSAN P. KENNEDY
DIAN M. GRUENEICH
Commissioners