

## PUBLIC UTILITIES COMMISSION

505 VAN NESS AVENUE  
SAN FRANCISCO, CA 94102-3298



June 3, 2013

SA2013-002

John Hagen, P.E.  
Pacific Gas and Electric  
Manager, Transmission Compliance  
77 Beale Street, #2383  
San Francisco, CA 94105

**SUBJECT:** Audit of PG&E's Daly City Area Substation Facilities

Dear Mr. Hagen:

On behalf of the Electric Safety and Reliability Branch of the California Public Utilities Commission, Ben Brinkman, Raymond Cho, Yusef Collins, Ivan Garcia, and Alok Kumar conducted an audit of Pacific Gas and Electric's (PG&E's) electric substation facilities in the Daly City Area from April 15 - 18, 2013. The audit included a review of PG&E's maintenance records and inspections of PG&E's facilities.

During the audit, we identified violations of General Order 174. A copy of the audit summary itemizing the violations is enclosed. As part of a new risk-based audit protocol for substations, the summary also includes recommendations and observations.

Please advise me no later than July 12, 2013, by electronic or hard copy, of all corrective measures taken by PG&E to remedy and prevent the violations. Responding to the observations and recommendations is optional.

If you have any questions concerning this audit you can contact Ben Brinkman of my staff at (213) 576-7093 or [Benjamin.Brinkman@cpuc.ca.gov](mailto:Benjamin.Brinkman@cpuc.ca.gov).

Sincerely,

A handwritten signature in purple ink, appearing to read "Raymond G. Fugere".

Raymond G. Fugere, P.E.  
Program and Project Supervisor  
Electric Safety and Reliability Branch  
Consumer Protection and Safety Division

Enclosure: Audit Summary

CC: Ben Brinkman, Senior Utilities Engineer, CPUC

## Audit Summary

**Company:** PG&E  
**Location:** Electric Substation System, Daly City Area  
**Audit:** Substation  
**Date:** April 15-18, 2013

## Violations

GO 174, Rule 30.1, states in part:

“Each Operator shall establish, update as needed, and follow an Inspection Program.”

GO 174, Rule 33.1 states, in part,

“Electronic or hard copy records of completed Inspections shall include, at a minimum: ...  
Scheduled date of corrective action (where applicable)”

PG&E DRAFT Document “PG&E Substation Inspection Program Summary” (TD3322S) states, in part,

“Section 2, General, a. iii. The Substation Inspection Program Activities Include:

Document and Report any abnormal condition found in the substation and any repairs or services or work performed.”

Substation L, March 7, 2013 Inspection, “Lighting” inspection sheet states, in part:

“building interior is dark, need repair or add more lighting”

PG&E stated that it may have added transformers or equipment in areas of the substation, necessitating a lighting evaluation and possibly a capital budget request. PG&E has not yet fully evaluated the lighting in this building.

**Field Portion**

<b>1.</b>	<b>Structure ID / Location:</b>	Taravel Substation, Breaker Bank 1, 3 Phase Transformer
	<b>Previous PG&amp;E Inspection:</b>	March 13, 2013
	<b>Date of CPUC Inspection:</b>	April 17, 2013
<b>Explanation of Violation(s):</b>		
<p><b><u>Oil Leak</u></b>  GO 174, Rule 30.1, states in part:</p> <p><i>“Each Operator shall establish, update as needed, and follow an Inspection Program.”</i></p> <p>PG&amp;E DRAFT Document “PG&amp;E Substation Inspection Program Summary” (TD3322S) states, in part,</p> <p style="padding-left: 40px;"><i>“Section 2, General, a. iii. The Substation Inspection Program Activities Include:</i></p> <p style="padding-left: 80px;"><i>Document and Report any abnormal condition found in the substation and any repairs or services or work performed.”</i></p> <p>The inspection form does not list a weeping leak on the transformer bank. PG&amp;E inspectors reported similar leaks on other transformers as priority 2 or 3. This leak appears to be at the oil sampling port. PG&amp;E should attempt to standardize these readings, including whether residue or weeping from oil sampling should be included in inspections.</p>		

2.	<b>Structure ID / Location:</b>	Noriega Substation
	<b>Previous PG&amp;E Inspection:</b>	December 10, 2012
	<b>Date of CPUC Inspection:</b>	April 17, 2013
<b>Explanation of Violation(s):</b>		
<p><b><u>Substation Housekeeping</u></b></p> <p>GO 174, Rule 30.1, states in part:</p> <p><i>“Each Operator shall establish, update as needed, and follow an Inspection Program.”</i></p> <p>PG&amp;E DRAFT Document “PG&amp;E Substation Inspection Program Summary” (TD3322S) states, in part,</p> <p><i>“Section 2, General, a. iii. The Substation Inspection Program Activities Include:</i></p> <p><i>Document and Report any abnormal condition found in the substation and any repairs or services or work performed.”</i></p> <p>ESRB found broken bottles and wooden pallets at the site. This was not noted on the inspection sheet. This substation is located in an urban area, and ESRB is aware this garbage might not have been present at the time of the last inspection.</p>		

3.	<b>Structure ID / Location:</b>	East Grand Substation, General
	<b>Previous PG&amp;E Inspection:</b>	March 7, 2013
	<b>Date of CPUC Inspection:</b>	April 18, 2013
<b>Explanation of Violation(s):</b>		
<p><b><u>Broken Barbed Wire</u></b></p> <p>GO 174, Rule 30.1, states in part:</p> <p><i>“Each Operator shall establish, update as needed, and follow an Inspection Program.”</i></p> <p>PG&amp;E DRAFT Document “PG&amp;E Substation Inspection Program Summary” (TD3322S) states, in part,</p> <p><i>“Section 2, General, a. iii. The Substation Inspection Program Activities Include:</i></p> <p><i>Document and Report any abnormal condition found in the substation and any repairs or services or work performed.”</i></p> <p>On the latest inspection sheet, PG&amp;E failed to record cut barbed wire on fence top near substation entrance.</p>		

4.	<b>Structure ID / Location:</b>	East Grand Substation, Bank 5 3-phase transformer
	<b>Previous PG&amp;E Inspection:</b>	March 7, 2013
	<b>Date of CPUC Inspection:</b>	April 18, 2013
<b>Explanation of Violation(s):</b>		
<p><b><u>Broken Cabinet Sliding Door Linkage</u></b>  GO 174, Rule 30.1, states in part:  GO 174, Rule 30.1, states in part:</p> <p><i>“Each Operator shall establish, update as needed, and follow an Inspection Program.”</i></p> <p>PG&amp;E DRAFT Document “PG&amp;E Substation Inspection Program Summary” (TD3322S) states, in part,</p> <p><i>“Section 2, General, a. iii. The Substation Inspection Program Activities Include:</i></p> <p><i>Document and Report any abnormal condition found in the substation and any repairs or services or work performed.”</i></p> <p>Cabinet sliding door linkage is broken. PG&amp;E did not record this on the inspection sheet.</p>		

5.	<b>Structure ID / Location:</b>	Noriega Substation, Battery Structure
	<b>Previous PG&amp;E Inspection:</b>	December 10, 2012
	<b>Date of CPUC Inspection:</b>	April 17, 2013
<b>Explanation of Violation(s):</b>		
<p><b><u>Damaged Battery Housing</u></b></p> <p>GO 174, Rule 30.1, states in part:</p> <p><i>“Each Operator shall establish, update as needed, and follow an Inspection Program.”</i></p> <p>PG&amp;E DRAFT Document “PG&amp;E Substation Inspection Program Summary” (TD3322S) states, in part,</p> <p><i>“Section 2, General, a. iii. The Substation Inspection Program Activities Include:</i></p> <p><i>Document and Report any abnormal condition found in the substation and any repairs or services or work performed.”</i></p> <p>The battery cabinet structure is damaged, apparently due to vehicle impact. One door appears to be unable to open. PG&amp;E failed to record on the inspection sheet. ESRB also believes a temporary or permanent barricade might be advisable in front of the structure.</p>		

6.	<b>Structure ID / Location:</b>	East Grand Substation, Oil Circuit Breakers 401 and 402
	<b>Previous PG&amp;E Inspection:</b>	March 7, 2013
	<b>Date of CPUC Inspection:</b>	April 18, 2013
<b>Explanation of Violation(s):</b>		
<p><b><u>Oil Leaks</u></b></p> <p>GO 174, Rule 30.1, states in part:</p> <p><i>“Each Operator shall establish, update as needed, and follow an Inspection Program.”</i></p> <p>PG&amp;E DRAFT Document “PG&amp;E Substation Inspection Program Summary” (TD3322S) states, in part,</p> <p><i>“Section 2, General, a. iii. The Substation Inspection Program Activities Include:</i></p> <p><i>Document and Report any abnormal condition found in the substation and any repairs or services or work performed.”</i></p> <p>PG&amp;E failed to report all Oil Leaks on inspection sheet. PG&amp;E should develop consensus policy for evaluating oil leaks (see recommendations).</p>		



7.	<b>Structure ID / Location:</b>	East Grand Substation, 1111 Distribution Oil Breaker
	<b>Previous PG&amp;E Inspection:</b>	March 7, 2013
	<b>Date of CPUC Inspection:</b>	April 18, 2013
<b>Explanation of Violation(s):</b>		
<p><b><u>Oil Level Missing – Possible Wrong Equipment on Checklist</u></b>  GO 174, Rule 30.1, states in part:</p> <p><i>“Each Operator shall establish, update as needed, and follow an Inspection Program.”</i></p> <p>PG&amp;E DRAFT Document “PG&amp;E Substation Inspection Program Summary” (TD3322S) states, in part,</p> <p style="padding-left: 40px;"><i>“Section 2, General, a. iii. The Substation Inspection Program Activities Include:</i></p> <p style="padding-left: 80px;"><i>Document and Report any abnormal condition found in the substation and any repairs or services or work performed.”</i></p> <p>The inspection sheet does not contain an entry for the oil level for the March 2013 inspection. It is possible that this breaker has been replaced with a vacuum breaker and the inspection sheet requires updating.</p>		

## **Observations and Recommendations**

ESRB notes that PG&E is in the process of implementing a new computer-based Condition Based Maintenance management system for its substation inspection program. Therefore, many of the comments below refer to issues related to the transition period from paper-based to electronic inspection records.

ESRB provides these recommendations only for consideration by PG&E, not as directives. PG&E can determine whether the proposed recommendations would enhance its substation inspection program. However, after PG&E determines the appropriate inspection processes, its written procedures should match those actual processes.

- The substations inspections procedure section of PG&E's Substation Maintenance and Construction Manual (SMCM) still refers to paper records, including the "Substation Readings Report." The manual should be updated to reflect the new computer based record system associated with the Condition Based Maintenance (CBM) program.
- PG&E's new CBM process needs more transparency and traceability with regard to alarm levels designated by the Qualified Electrical Worker (QEW) during the inspection procedure, and the subsequent supervisor review. To make the process more auditable PG&E should consider a traceable process with respect to the transition from an alarm level to a priority code where supervisors explain the reasoning process behind the priority codes they assign, and list any communications with the QEW.
- The current process for creating reports from the CBM system is cumbersome. ESRB will work with PG&E to develop standard reports for future General Order 174 audits.
- Under PG&E's current process, after the QEW enters an alarm (a condition requiring attention) on an inspection report, the supervisor must acknowledge and evaluate the alarm within thirty days. For a high critical alarm the supervisor must acknowledge and evaluate the alarm within 14 days. However, if the same or a different QEW re-inspects the same facility before the thirty day period expires, and for some reason removes the alarm, it is possible that the supervisor might never see the alarm. This might occur when one inspector considers something to be a discrepancy, and another inspector does not. Supervisors should review all alarms. PG&E does print a report of all pending alarms at the beginning of each month. PG&E should consider whether under this system a supervisor might miss an actual alarm, and whether the process should be changed in some way, including possibly requiring a third party to assist the supervisor by reviewing the monthly printout, or by requiring the supervisor to review all inspection forms and evaluate all alarm before the next inspection date.
- ESRB notes that PG&E's inspection checklists may contain duplicate alarms for the same condition, and in some cases PG&E is not removing all alarms after the condition is repaired. For example, if an oil leak is found on a transformer bank,

it may also be noted in the general "Oil Leaks" section of the inspection checklist. When the leak is corrected PG&E may not remember to remove both notices, potentially leading to confusion.

- PG&E DRAFT Document "PG&E Substation Inspection Program Summary" (TD3322S) may require updating. ESRB understands this is a draft document. However, ESRB notes at least two unclear sections. First, the note following Section 2A is unclear. Second, Section 2D restates the language of the General Order, but is unclear when it states that the Estimated Date of Correction is recorded at the time of inspection. Under PG&E's process a supervisor enters this date after review of the inspection report.
- As noted above in the field violations portion, because of changes to the new electronic CBM methodology, the inspection sheets may contain equipment which does not exist in the substation, and therefore some unneeded fields on the inspection sheets. Generally, this problem manifests itself in extra line items, rather than incorrect or missing inspection line items. PG&E is in the process of changing these, and has automated some of the process (eg, inspectors entering -999 to demarcate a field which should be deleted), but the extra line items may prove confusing. Not all inspectors appear to use the same notation for marking lines for deletion.
- PG&E should develop a consensus policy for reporting oil leaks. For example, some inspectors appear to report residue at the sampling ports while others report only more obvious, recent weeping or leaks.
- The March 3, 2013 inspection for the Taravel Substation Bank 1 Load Tap Changer (LTC) states that the LTC has been placed in Manual Mode. Discussion with substation staff indicates that this is a problem with the distribution circuit, not the LTC.
- Some inspection checklists contain negative values for MegaWatts (MW). ESRB checked the actual meters in selected substations and verified that these were the correct readings. In this case PG&E staff explained that "negative" power actually referred to power flow direction. For example, power (or current) flowing "in" to a component would appear as "positive", whereas power flowing "out" of a component would appear as "negative." A reference sheet with explanations of various values might be a helpful tool for PG&E's inspectors.
- PG&E should consider a standard notation on inspection sheets for substations undergoing construction. Ongoing construction at substations may modify station characteristics in a manner that affects the inspection protocol or records. For example
  - Work at East Grand Substation modified the secondary containment reservoirs.
  - Because of work at the Mission, San Bruno and East Grand Substations, some construction debris and spare parts are present in the substations. This would possibly not be acceptable in a substation under normal circumstances. PG&E must ensure that only necessary parts are stored in substations, and that substation housekeeping does not present a safety or reliability problem.