



California Public Utilities Commission

# **SAFETY AND ENFORCEMENT DIVISION REPORT ON COMPLIANCE WITH GENERAL ORDER 174 AS REQUIRED BY D.12-10-029**

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*The views presented in this paper are those of staff and do not necessarily represent the views of the five member California Public Utilities Commission. Staff may revise this paper based on further discussion and comments received.*

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## **Executive Summary**

The Safety and Enforcement Division (SED) of the California Public Utilities Commission (“the Commission” or “CPUC”) prepared this report to fulfill the requirements ordered by Ordering Paragraphs 1 and 2 of Decision (D.) 12-10-029, which approved General Order (GO) 174 in Rulemaking 10-09-001. Ordering Paragraph 1 of D.12-10-029 adopted GO 174 (“Rules for Electric Utility Substations.”), and required the utilities to develop and implement substation safety and inspection programs. Ordering Paragraph 2 required the utilities to hold conferences to develop a set of “best practices” for substation safety and inspection programs. Ordering Paragraph 2 further required the Safety and Enforcement Division (SED) of the Commission to report on the best practice conferences and the utilities’ compliance with GO 174. SED issues this report in compliance with this requirement.

On October 25, 2012, the California Public Utilities Commission (“the Commission” or “CPUC”) adopted D.12-10-029, which approved General Order 174 “Rules for Electric Utility Substations.” The decision found that the Commission has safety jurisdiction over both investor owned and publicly owned utilities and ordered these utilities to adopt and implement safety rules and inspection programs for electric substations. The decision, in Ordering Paragraph 2, also required the utilities to meet annually, to compare their practices and develop a “best practice” for safety rules and inspections of substation facilities. The Commission further ordered SED to attend these conferences and report on the results of the conferences as well as utility compliance with GO 174. To fulfill the requirements of Ordering Paragraph 2, this report will present the results of the best practice conferences and a description of the currently implemented substation inspection program.

The major Investor Owned Utilities (IOUs) and Publicly Owned Utilities (POUs) in the state, as well as many smaller jurisdictional IOUs and POU have developed and enacted substation safety and inspection programs in compliance with GO 174. Both IOUs and POU have been cooperative with SED efforts to verify compliance with GO 174 through substation audits. However, while IOUs in the state comply with GO 174 annual reporting requirements, most POU do not.

As required by Ordering Paragraph 2, the major IOUs held annual best practice conferences and developed a consensus best practice on substation safety and inspection programs. SED attended these conferences and found that the utilities took this requirement seriously, and dedicated significant effort to producing a consensus document.

## Introduction and Background

On October 25, 2012, the California Public Utilities Commission adopted D.12-10-029, which approved General Order 174 “Rules for Electric Utility Substations.”<sup>1</sup> The decision found that the Commission has safety jurisdiction over both investor owned and publicly owned utilities and ordered these utilities to adopt and implement safety rules and inspection programs for electric substations. The decision, in Ordering Paragraph 2, also required the utilities to meet annually, to compare their practices and develop a “best practice” for safety rules and inspections of substation facilities. The Commission further ordered SED to attend these conferences and report on the results of the conferences as well as utility compliance with GO 174. To fulfill the requirements of Ordering Paragraph 2, this report will present the results of the best practice conferences and a description of the currently implemented substation inspection program.

On December 25, 2003, a power outage in Pacific Gas and Electric’s (PG&E’s) Mission Substation caused an extended outage to 100,000 customers in downtown San Francisco during the peak holiday shopping season. As a result of this event, on March 17, 2005 the Commission opened Investigation (I.) 05-03-001, *Investigation on the Commission’s Own Motion Into the Operations and Practices of Pacific Gas and Electric Company; 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.*

D.06-02-003 closed I.05-03-001 and approved a settlement agreement between SED, PG&E, and the City and County of San Francisco, which directed PG&E to pay \$500,000 to the state general fund, and directed SED to develop a program for inspection practices for electric substations, not limited to PG&E but applicable to all Commission regulated utilities. The decision also directed PG&E to pay \$500,000 to SED for development, training, and implementation of an audit program for utility substation inspections.

To fulfill part of the settlement agreement, on September 8, 2010, the Commission issued Order Instituting Rulemaking (R.) 10-09-001, *Order Instituting Rulemaking to Implement Commission Regulations Relating to Safety of Electric Substations.* For a year prior to the official proceeding, SED worked with a collection of stakeholders, including major utilities and the International Brotherhood of Electrical Workers Union (IBEW), to develop consensus on a draft General Order for substation safety and inspection practices. The stakeholders reached consensus, and the draft General Order was circulated for comments during the formal rulemaking.

General Order 174 is a performance based GO<sup>2</sup>, which requires the utilities to develop and implement an inspection program in line with industry norms. The primary comments in opposition to the draft GO came from the City and County of San Francisco, which felt the GO was not sufficiently detailed and prescriptive, and that over time the utilities would develop vastly different programs, some of which would be ineffective. Partly in response to this commentary, the decision directed the utilities to meet and develop a standard set of accepted best practices for substation safety and inspections.

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<sup>1</sup> D.12-10-029 and GO 174 are Attachment A to this report.

<sup>2</sup> As opposed to a “prescriptive” GO, which dictates specific methods and actions a utility must undertake, a “performance” based GO establishes performance goals, methods and guidelines for a program, but leaves the specifics of implementation up to the utility.

## **Decision 12-10-029 Ordering Paragraphs**

### ***Ordering Paragraph 1 -Adopted General Order 174***

Ordering Paragraph 1 of D.12-10-029 adopted GO 174, which requires all California jurisdictional utilities (including publicly owned utilities) to “adopt, implement, and use detailed written safety rules and inspection practices for electrical substations.” This report will discuss the utilities’ compliance with this Ordering Paragraph as determined through audits, inspections, and reporting, as well as correspondence, data and plan review, and discussions with all jurisdictional utilities.

### ***Ordering Paragraph 2 -Ordered Best Practice Conferences and SED Report***

Ordering Paragraph 2 required all jurisdictional utilities to hold annual best practice conferences in the first quarters of 2014, 2015, and 2016 to discuss and develop a set of best practices for substation safety and inspection. It further required a representative of SED (then USB) to attend these conferences and submit a report to the Commission on the results of these conferences and the utilities’ compliance with GO 174. The decision ordered SED to complete this report by the second quarter of 2016.

## **Utility Compliance with GO 174**

### ***GO 174 Description***

GO 174 is a performance based rule, and therefore not composed of a “laundry list” of prescriptive maintenance and inspection requirements for all substation facilities. Developing such a list would be extremely inefficient and difficult to enforce given the vast array of different equipment and technologies used in substations. Rather, the GO presents basic requirements for a robust enforcement program based on accepted good practices throughout the utility industry. Under GO 174, the utilities must develop and implement inspection practices which specify inspection activities, inspection frequencies, and record keeping and data retention policies.

In “general duty” Rule 12 of GO 174, the utilities are required to design, construct and maintain substations per accepted good practice, for their intended use, and in a manner that promotes safety and adequacy of service. GO 174 further requires that utilities inspect their substation facilities as frequently as necessary, that the utilities specify inspection frequencies in their practice documents, and that the utilities utilize qualified inspectors. Rule 32.1 of GO 174 lists facilities which the utilities must inspect, at a minimum. These facilities are included in the best practice inspection lists in Attachment B. Rule 33 of GO 174 lists requirements on record retention, including the requirement that the utilities maintain inspection records for at least 5 years.

Rule 11 of GO 174 exempts substations under operational control of the California Independent System Operator (CAISO), or subject to Federal Energy Regulatory Commission (FERC) reliability standards. Typically, this exempts bulk-power transmission level substations operating at over 100 kilovolts from the rules of GO 174. These substations are subject to extensive FERC maintenance and operations standards, as well as CAISO business requirements, and are regularly audited by these agencies.

Because of the Rule 11 exemption, GO 174 primarily applies to distribution level substations which are not audited by FERC or CAISO. Therefore, although SED investigates major incidents at all substations, it only conducts regular audits of substations subject to GO 174. Some substations contain both exempt transmission level and lower voltage distribution facilities. When auditing these substations, SED inspectors will ensure that no significant safety hazards exist on the transmission facilities.

### ***SED Enforcement Activities and Utility Compliance***

While it may appear counterintuitive, a performance based rule for substations with limited prescriptive requirements actually gives Commission engineers, auditors and inspectors greater latitude in evaluating the effectiveness and compliance of utility programs. As evaluation tools, Commission staff can use industry practice codes and standards, comparisons between utility inspection programs, and a utility's own inspection procedures in evaluating compliance with GO 174. The inspection best practices developed by the jurisdictional utilities through conferences in 2014, 2015, and 2016 now present another valuable tool.

SED believes GO 174 has been effective in requiring the utilities to examine, formalize and document existing inspection programs, and in some cases requiring the utilities to develop such programs where none existed before. In general, SED believes the utilities have taken this effort seriously, are generally compliant, have been cooperative, and that SED has implemented an effective enforcement program for GO 174.

Beginning in 2012, SED began gathering information pertinent to utilities' substation inspection practices in order to develop an audit program. After review of this information, and several meetings with the utilities, SED developed internal procedures for conducting these audits, including a standard pre-audit data request.

In addition, SED established an accounting process for the funds that Decision D.0602003 directed PG&E to pay directly to SED for use in developing an audit program for substation inspections. SED uses the funds for substation training and initial travel expenses required to establish the program, and other resources necessary to conduct substation audits and inspections.

In 2013 SED implemented substation inspection and audit programs, and started to include violations of GO 174 rules in its incident investigations when deemed appropriate. Based on enforcement activities to this point, along with discussions in conferences, and data requests, the IOUs generally make a strong effort to comply with GO 174.

SED has also audited the two largest POUs in the state: the Los Angeles Department of Water and Power (LADWP) and the Sacramento Municipal Utility District (SMUD). These POUs have complied with the requirements to establish inspection programs, and have allowed SED staff to audit their substations for compliance with GO 174. However, these POUs have not complied with annual filing requirements, although they have allowed auditors to review the information required in these filings during audits.

As of now, SED has not been able to audit all smaller POUs in the state because of the large number of such agencies. However, based on conversations and document requests with many of these POUs, it appears they have implemented inspection programs. SED has audited a handful of

these utilities, and will continue to audit more in the future. As with the larger POUs, many of these smaller POUs have not complied with annual filing requirements, although some have.

## **Audits**

Since February 2013 SED staff has completed 15 substation audits. An additional 10 audits either are awaiting final closure, or have been scheduled for 2016. These audits represent comprehensive evaluations of utility substation inspection programs, on-site inspections of over 150 substations, and record reviews of utility inspections of hundreds more. SED has audited substation facilities throughout the state, in most geographical areas of the major utilities.

Utilities audited or scheduled to be audited include (number of audits in parenthesis):

### Investor Owned Utilities

Pacific Gas and Electric – PG&E (4)  
Southern California Edison - SCE (4)  
San Diego Gas & Electric – SDG&E (3)  
Bear Valley Electric (1)  
NV Energy (1)  
Liberty Utilities (1)  
Pacific Power (2)

### Local Publicly Owned Utilities<sup>3</sup>

Los Angeles Department of Water and Power - LADWP (2)  
Sacramento Municipal Utility District – SMUD (2)  
Imperial Irrigation District - IID (1)  
Trinity Public Utilities (1)  
City of Anaheim (1)  
Lassen Municipal (1)  
Pasadena Water and Power (1)

During one or more of these audits, SED staff has found violations of GO 174 which include (but are not limited to) leaking transformers, broken or rusted fencing, missing barbed wire, deteriorated cabling, multiple tripping hazards, missing grounds, malfunctioning lighting systems, inadequate labeling or signage, animal guarding in need of repair, malfunctioning or unreadable gauges, dirty insulators, and broken flags and other equipment. Utility inspectors failed to document these violations during their inspections. The utilities corrected these violations following the audits, and in cases where SED identified violations which were not already on utility checklists, the utilities added those violations to their checklists.<sup>4</sup>

In addition to identifying violations, SED was able to verify and confirm that, in general, the utilities properly operated multiple substation systems and equipment, including fire suppression, battery systems, and security equipment, when necessary or required.

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<sup>3</sup> “Local Publicly Owned Utility” is defined in Public Utilities Code Section 224.3.

<sup>4</sup> Note that the utilities would not refer to these deficiencies as violations, but prefer to call them “non-conformances”.

During the utilities' best practice conferences, participants drafted consensus documents indicating conditions which should be checked during each inspection, as part of an effective inspection program. SED already checks these items, along with other equipment at the substation and on the utilities' own checklists.

A typical SED audit includes a comprehensive pre-audit data request, focused on the visual and auditory inspection practices of the utilities. SED requests inspection procedures, inspection records, substation one-line diagrams, training documents, and pending and completed work. Although not directly related to specific General Order 174 requirements, SED may further request other documents, including infrared inspection reports, electrical and mechanical testing records, transformer oil test records, counter reads, insurance reports, and other pertinent information. SED reviews the above information as part of its "record review" portion of the audit. SED will then spend several days physically inspecting the substations. SED ensures that the physical conditions in the substations match the records, and checks that items reported repaired have actually been repaired and that inspectors consistently identify violations or issues in the substations.

SED may request interviews with inspectors or to accompany inspectors during the inspections. SED has also witnessed infrared inspection, circuit breaker maintenance, and other substation work as part of audits. During audits SED examines safety and security processes as well, including pre-entrance "tailboards" or safety meetings prior to entering the substation, and access control at the substation.

While performing audits, SED has discovered some variation in how utilities perform maintenance. As an example, with respect to circuit breaker maintenance, some utilities completely dismantle, inspect and refurbish circuit breakers annually, while others run a "profile" test to determine whether the breakers are in good operating condition.

## **Incidents**

Since the approval of GO 174, SED has issued notices of violation to utilities three times for violations of GO 174 that SED discovered during incident investigations. In each case, SED found that the utility violated General Order 174, Rule 12 which requires, in part, that "substations shall be designed, constructed, and maintained for their intended use ...to promote the safety of workers and the public and enable adequacy of service". Rule 12 further requires (in part) that substation facilities be designed, constructed and maintained according to accepted good practice. The utilities ultimately corrected these violations.

The three incidents were caused by:

- Animal contact across a transformer in a Santa Barbara substation,
- An internal transformer failure in a San Diego substation, and
- A battery design problem during a substation upgrade in a Stockton substation.

Under the CPUC's broad safety oversight jurisdiction, SED investigates all significant substation related incidents regardless of whether or not the substation involved is subject to GO 174 rules. In April 2013, a gunshot attack damaged PG&E's Metcalf Substation, and in August 2014 burglars cut through a fence at the Metcalf Substation, removing tools and equipment valued at nearly \$40,000. SED investigated both incidents.

Although the Metcalf Substation (which operates at voltage levels over 100 kilovolts) is subject to FERC jurisdiction and CAISO control, and therefore exempt from GO 174 rules, SED ultimately issued a citation to PG&E for violation of Public Utilities Code Section 451. In the citation, SED found that PG&E failed to adequately respond to alarms during the August 2014 burglary.<sup>5</sup>

## **Reporting**

GO 174, Rules 40.1 and 40.2 require the utilities to file reports with the Electric Safety and Reliability Branch (ESRB- formerly USB) no later than July 1<sup>st</sup> of each year. Each utility must report any changes to its inspection program practices, as well as summarize its completed and past due inspections for the prior year. ESRB requires a simple report, listing the number of inspections completed and the number past due. All IOUs complied with the reporting requirements, with most reporting no passed due inspections.

As with reporting under General Order 165 for distribution inspections, most POUs failed to report, but indicated they would allow review of these records during audits. As of the date of this report, SED has not encountered any difficulty obtaining necessary substation inspection information from the POUs, or conducting audits of POU substations.

## **Utility “Best Practice Conferences”**

### ***Best Practice Conferences and Document***

Ordering Paragraph 2 of D.12-10-029 ordered PG&E, SCE, and SDG&E to convene annual conferences to develop a best practice for substation safety and inspection. The decision further ordered that these conferences be held in the first quarter of 2014, 2015 and 2016, and that SED attend and participate in the conferences and report to the Commission on the status of all jurisdictional utilities’ compliance with GO 174 and the progress achieved in developing a best practice. The decision ordered SED to produce this report on the conferences and on utility compliance with GO 174 by the second quarter of 2016.

SED believes the utilities have taken this effort seriously and have complied with the requirements of Ordering Paragraph 2. Each of the three major IOUs hosted and facilitated an annual best practice conference. All jurisdictional utilities were invited to participate, and many did including several POUs and smaller IOUs. In between conferences, the utilities worked collaboratively to arrive at proposed best practices for final discussion at the annual conference. As in almost all of such processes, this required significant discussion and compromise. SED participated in each of the three annual conferences where SED comments were taken into consideration and final issues were resolved. As part of their efforts, conference participants and organizers developed a consensus best practices spreadsheet for inspection of various facilities (Attachment B).

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<sup>5</sup> <http://www.cpuc.ca.gov/General.aspx?id=1965>

## ***Conference Attendance***

Representatives of SCE, PG&E, and SDG&E attended the first conference, along with Pacific Power, Liberty Utilities, NV Energy, Bear Valley Utilities, SMUD, IID, LADWP, and several smaller POUs. In general, these utilities attended and participated in all conferences, with the exception that some smaller POUs did not participate in every conference.

The Conference attendees included utility subject matter experts (SMEs), attorneys, company and regulatory representatives and management up to the Director level. Many utilities sent multiple representatives to all conferences.

### **January 23, 2014 Conference**

SCE hosted the first best practice conference at its Pomona Facility. The focus during this conference was for the three major IOUs to present their basic inspection practices, including:

- Substation inspection frequency,
- Inspector qualifications and training,
- Basics of inspection,
- Documentation of substation issues,
- Prioritization of work and assurance of work completion, and
- Record keeping

Following the presentations, other municipal utilities and smaller IOUs discussed their inspection practices, which in general comported with the practices of the major IOUs. Many of these smaller utilities operate less than 15 substations, or are principally located in rural areas with few customers.

For the most part, utility procedures were similar. Utilities typically inspect substations once a month<sup>6</sup>, using Qualified Electrical Workers, or Grid Operators. The utilities provide the inspectors with written and on-the-job training. Inspections are visual and auditory, with most utilities using detailed checklists identifying “discrepancies,”<sup>7</sup> “issues,” or “non-conformances.” Some inspectors enter inspection findings electronically using a computer known as a “field tool,” while others use handwritten checklists.

All utilities had a method of entering the inspections into maintenance management systems with prioritizations for repair and tracking repairs through these same management systems. All utilities had a priority system whereas SDG&E is notable in that it performs all repairs within one year. Participants discussed differences between utility inspection programs. Of the utilities, only SDG&E included infrared inspections in its GO 174 program, although all utilities perform these inspections in substations, typically annually. Some utilities only list “discrepancies” found (inspection records by exception), while others list all facilities examined during an inspection whether the inspector discovers an issue or not.

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<sup>6</sup> Since 2013, some utilities have changed inspection frequencies. PG&E has reduced inspections to once every two months for less critical substations, while SCE has reduced inspections to once every two months for all substations.

<sup>7</sup> Utilities typically refer to problems found during inspections as “non-conformances” while SED refers to them as violations.

SED audit practices were discussed, including how SED would deal with portions of substations that are not subject to GO 174.<sup>8</sup> This issue arises in so-called “receiving stations” where some facilities’ voltages may be at a level rendering them not subject to GO 174, while other facilities in the same substation would be subject to GO 174.

SED presented its required format for annual reporting (see below under “Reporting”). SED later sent a letter to the utilities confirming the format.

Finally, the participants requested direction from SED on how to proceed with the next meetings. SED indicated it would like the utilities to prepare a “best practice” list of required inspection items for the facilities listed in GO 174, Rule 32.1.

## **February 5, 2015 Conference**

PG&E hosted the second best practice conference at its San Ramon Facility. Conference participants discussed “best practice” inspection items for four types of equipment listed in GO 174, Rule 32.1: perimeter fences and gates, transformers, batteries and circuit breakers. The consensus results of those discussions are tabulated in Attachment B. These are not specific “procedures” but general guidelines for accepted good practice applying to most substations.

Participants also discussed:

- Animal abatement (problems with abatement obscuring oil level meters)
- Descriptions for oil leaks, oil level, oil coloration,
- Secondary Containment,
- Oil leaks,
- Nitrogen issues,
- Pad condition,
- Signage,
- Battery Condition,
- Housekeeping, and Tripping hazards.

The SED representative discussed the typical items SED inspectors look for during an audit. The SED representative also discussed catastrophic conditions that might be identified in a substation inspection and how counter readings are used by the utilities. The utilities stressed that in their experience inspections typically identified critical deficiencies before they posed a significant risk to substation safety or reliability.

## **January 29, 2016 Conference**

SDG&E hosted the third best practice conference at its Kearny Mesa Service Center. Participants discussed best practices for inspections of the final eight facilities listed in GO 174, Rule 32.1. These are fire detection and suppression, voltage regulators, buses, capacitor banks, insulators, bushings and arrestors, grounding systems, reactors, and support structures (Attachment B).

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<sup>8</sup> Per GO 174, Rule 11, facilities subject to California Independent System Operator control or Federal Energy Regulatory Commission reliability standards are exempt from GO 174. This is typically bulk power level substations operating over 100 KV.

Following the discussion of these facilities, participants and SED discussed:

Issues with audit data requests,  
The electric citation program and GO 174,  
Methods for changing GO 174 in the future.

The utilities expressed frustration with large data requests. The SED representative explained the need for these requests and the jurisdictional authority for these requests but relayed the utility concerns to SED management.

## **Additional Issues and Possible Next Steps**

### ***Utility Actions Going Forward***

SED found the “Best Practices Conferences” process valuable and encourages the utilities to continue to collaborate. For transmission level facilities the CAISO “Transmission Maintenance Coordinating Committee” (TMCC) provides a valuable place for utilities to share information on maintenance of their high voltage substations.

SED also encourages the utilities to share their concerns over the substation inspection program with SED staff.

### ***General Order 174 Issues and Possible Next Steps***

Changes to GO 174 would require Commission approval through some formal process. Some possible issues include:

- Consideration of removal of the exemption for CAISO controlled facilities or facilities subject to FERC reliability standards,
- Possible modification of GO 174 as a result of the Physical Security Rulemaking (R.15-06-009)
- Methodology or framework for recommending some changes to GO 174 in a collaborative process (similar to the General Order 95 rules committee).

### ***Substation Audit Program Issues and Possible Next Steps***

Designing the audit program is an SED internal process and does not involve formal rulemakings or other proceedings. Some potential issues and next steps to consider include:

- Use of utility developed best practices in audits
  - Determining how the best practice documents and ideas developed during the utilities’ best practice conferences will be included in audit procedures going forward,
- Standardizing audit activities and criteria
  - Standardizing and improving audit procedures

- Standardizing and improving data requests to obtain the important, relevant information
- Standardizing inspection criteria. For example, SED staff has already standardized how it will evaluate oil leaks and bushing contamination. Further standardization could prove useful, provided SED auditors maintain necessary autonomy,
- Ensure that SED protects any critical energy infrastructure related information.
- Expansion of audit activities
  - GO 174 is comprised primarily of visual and auditory inspection rules. Many problems in substations cannot be identified through visual and auditory means. SED staff should discuss how, under other authority as well as general duty rules (GO 174, Rules 12) it might more effectively promote substation safety and reliability through its audit program.

## Conclusions and Recommendations

SED found that the utilities met the requirements of Ordering Paragraphs 1 and 2 of D.12-10-029. The utilities have made a strong effort to comply with the requirements of GO 174. Although SED has noted some violations during its audits and investigations, the major IOUs and POU's and the smaller POU's audited by SED adopted and implemented rules for substation inspections. The utilities require and use qualified inspectors, have developed and generally followed inspection protocol for important substation facilities, and have developed regular intervals for inspection, and programs to document and repair non-conformances. The utilities have also developed record retention policies meeting GO 174 requirements.

The IOUs have submitted annual inspection records under GO 174 reporting requirements. While the majority of POU's have not submitted these records, they have allowed SED inspectors to review the records during audits.

The three major IOUs (SCE, PG&E, and SDG&E) held annual "best practice" workshops and developed a set of consensus best practices for substation inspection programs.

SED has developed a GO 174 inspection and audit program, and has conducted or scheduled 25 GO 174 audits, including physical inspections of over 100 substations and record reviews of hundreds more. SED consistently seeks to improve its GO 174 compliance monitoring and auditing practices.

SED recommends that utilities:

- Continue to meet and collaborate in the development of substation inspection and maintenance best practices,
- Utilize regular electrical, infrared, and mechanical testing of substation facilities where appropriate, with industry standards as guidelines,
- Consider appropriate substation grounding evaluation, such as ground resistance measurement, ground potential rise (GPR) calculations, or other measurements to mitigate problems of step and touch potential, and stray voltage in and around substation facilities,
- Develop standard evaluation tools to ensure consistency between inspectors for subjective evaluations such as bushing or oil condition, or transformer leaks,
- Regularly check and evaluate substation lighting, in particular for indoor substations,
- Carefully inspect and maintain security related equipment such as lighting, barriers, intrusion detection and cameras (if any), and
- Monitor substation housekeeping.

# Attachment A

## Decision 12-10-029 (with General Order 174)

COM/TAS/rs6

Date of Issuance 10/29/2012

Decision 12-10-029 October 25, 2012

### BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Implement  
Commission Regulations Relating to the  
Safety of Electric Utility Substations.

Rulemaking 10-09-001  
(Filed September 2, 2010)

### DECISION ADOPTING A NEW GENERAL ORDER RELATING TO THE INSPECTION AND SAFETY OF ELECTRIC UTILITY SUBSTATIONS

#### 1. Summary

This decision adopts a new general order, General Order 174 (Attachment I) which will require all jurisdictional utilities, both publicly and investor-owned, to adopt and implement new safety rules and inspection practices for electric substations. The decision finds that the Commission has safety jurisdiction over publicly owned utilities and therefore may require them to comply with this general order. Finally, this decision imposes a requirement that both publicly owned and investor-owned utilities meet on an annual basis with the Commission's Consumer Protection and Safety Division to review and compare their safety rules and inspection practices for electric substations in order to develop a "best practice" for safety rules and inspection practices for electric substations in California.

No utility rates are changed as a result of this decision. This proceeding is closed.

**2. Background**

Rulemaking 10-09-001 (Rulemaking) considered the adoption of a new general order<sup>1</sup> setting minimum inspection and maintenance standards for electric substations. The Commission's current General Orders 95, 128, and 165 are already designed to promote safe operation of electric utility and communications infrastructure facilities, and provide minimum safety requirements which the utilities are to supplement with additional safety precautions when local conditions warrant. However, these General Orders do not give guidance as to how utilities operate and maintain their substations, and there are no specific regulations governing substation operation. The proposed new general order was the product of a settlement by various interested parties.<sup>2</sup> The Rulemaking also addressed the threshold question of the Commission's authority and jurisdiction over public health and safety arising from utility operations, including its jurisdiction over the electric facilities of publicly owned utilities.

**3. Commission Safety Jurisdiction Includes Publicly Owned Utilities**

It is well-established law the Commission has jurisdiction over the publicly owned utilities for safety matters. The record shows, as discussed below, that

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<sup>1</sup> Attachment I to today's decision. The general order is unchanged from the draft attached to the original rulemaking.

<sup>2</sup> Southern California Edison Company, Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company, International Brotherhood of Workers Local 47 and 1245, NV Energy North, PacifiCorp, and Los Angeles Department of Water and Power. (Rulemaking at 3.)

the opposition by the publicly owned utilities is not based on the law. The California Municipal Utilities Association (Muni Association) and the Northern California Power Association argued that the Commission lacks the jurisdiction to impose this general order on publicly owned utilities. We disagree.

The publicly owned utilities argue that their opposition to this general order is not in opposition to the concept of safety, but only to the Commission's jurisdiction. (Muni Association Opening Brief at 2.) The Muni Association "...acknowledges that previous Commission Decisions have determined that it has broad authority over the electric facilities of [publicly owned utilities]. However, [Muni Association] and its members believe that these Decisions were wrongly decided and should be overturned." (*Id.* at 4.) PG&E aptly responded to this argument noting that the wishes of the publicly owned utilities have nothing to do with the law which clearly supports the Commission's jurisdiction. PG&E cites to the 1945 *Polk v. City of Los Angeles*,<sup>3</sup> noting that the Commission's electric safety rules (originally General Order 64, now General Order 95) were developed pursuant to this specific legislative direction, and the Court further stated: "There can be no doubt that the Legislature was empowered to pass such a statute and make it applicable to municipally operated electric systems even though the municipality is chartered and has control over municipal affairs. ... [and the Commission's safety rules challenged in *Polk*] are nothing more than safety requirements in which the entire state has an interest." (*Id.* at 540-41.)

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<sup>3</sup> 26 Cal.2d 519 (1945).

PG&E also cites to the much more recent electrical restructuring legislation (Stats. 1996, ch. 854) which did not repeal Public Utilities Code Sections 8001-8057, which continue to give the Commission jurisdiction over the safety of overhead and underground electric facilities (including those owned by publicly owned utilities). PG&E further noted: "Sections 8037 and 8056 state in pertinent part: '...[T]he commission may **inspect** all work which is included in the provisions of this article, and may make such further additions or changes as the commission deems necessary for the purpose of safety to employees and the general public. (Emphasis added.)'<sup>4</sup> In fact, as noted above, it was in 1998 (after AB 1890 was enacted) that the Commission expressly applied the maintenance standards adopted in Decision (D.) 97-03-070 (General Order 165) to municipal and publicly owned utilities."<sup>5</sup>

The Commission's Consumer Protection and Safety Division (Safety Division) makes essentially the same arguments as PG&E that the safety matters concerning the publicly owned utilities are subject to Commission's jurisdiction. The Safety Division points out, like PG&E, that the existing legislation and the courts consistently support the Commission's safety authority. (Safety Division Opening Brief at 2.) We need not recite the entire brief of the Safety Division or PG&E where they meticulously cite example after

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<sup>4</sup> (PG&E footnote 10) "D.98-03-036; [Muni Association] *Application for rehearing denied* D.98-10-059; [Muni Association] *petition to modify decision denied* D.99-12-052. This progression of Decisions addressed all the jurisdictional arguments posed again by [Muni Association] and [Northern California Power Authority] in this proceeding."

<sup>5</sup> PG&E Opening Brief at 6.

example of legislation and court decisions upholding the Commission's jurisdiction.

The Los Angeles Department of Water and Power argues that is already subject to oversight by other entities. In fact, it is certain that the North American Electric Reliability Corporation and the Western Electricity Coordinating Council already oversee substation maintenance and inspection programs for both investor-owned utilities and publicly owned utilities. (Opening brief at 4.) It argues that the Commission should consider the degree of regulation or oversight by other entities. (*Id.* at 5.) Los Angeles Department of Water and Power makes the argument that it is not subject to the Commission's jurisdiction; however, it fails to cite to any court decision supporting this position. (*Id.* at 5 - 6.)

Los Angeles Department of Water and Power also tends to argue that there is some equipment that is not subject to the Commission's jurisdiction. (*Id.* at 9 -11.) We disagree with this distinction: it is not rational that the Legislature would ever intend to have distinguished within the physically interconnected components of an electric system, with certain pieces exempt from regulation when pieces on either side of the devices are subject to regulation. There can be no good rationalization inferred for such a gap, especially when no such rationalization is specifically stated by the Legislature.

Recently, the Commission revised General Order 95 and addressed the issue of jurisdiction over publicly owned utilities:

As required by the Public Utilities Code, "[e]very public utility shall furnish and maintain such adequate, efficient, just, and reasonable service, instrumentalities, equipment, and facilities ... as are necessary to promote the safety, health, comfort, and convenience of its patrons, employees, and the public." (Pub. Util. Code § 451.) In our broad grant of jurisdiction over public

utilities in California, we are authorized to “do all things, whether specifically designated in ... [the Public Utilities Act] or in addition thereto, which are necessary and convenient” to our regulation of public utilities, including, though not limited to, adopting necessary rules and requirements in furtherance of our constitutional and statutory duties to regulate and oversee public utilities operating in California. (Pub. Util. Code § 701.)

This Commission has comprehensive jurisdiction over questions of public health and safety arising from utility operations. (San Diego Gas & Electric v. Superior Court, (1996) 13 Cal.4th 893, 923-924.) Our jurisdiction to regulate these entities is set forth in the California Constitution and in the Public Utilities Code. (Cal. Const., Art. 12, §§ 3, 6; Pub. Util. Code §§ 216, 701, 768, 1001.) While such utilities are required to “obey and comply with every order, decision, direction, or rule made or prescribed by the [C]ommission ....” (Pub. Util. Code § 702; see §§ 761, 762, 767.5, 768, 770), the Commission is also obligated to see that the provisions of the Constitution and state statutes affecting public utilities are enforced and obeyed. (Pub. Util. Code § 2101.)

Under Pub. Util. Code §§ 8002, 8037, and 8056, the Commission’s jurisdiction extends to publicly-owned utilities for the limited purpose of adopting and enforcing rules governing electric transmission and distribution facilities to protect the safety of employees and the general public. (D.09-08-029 at 8.)

The Los Angeles Department of Water and Power’s timely filing for rehearing of D.09-08-029 was denied in D.10-02-034 where the Commission found no legal error.

We therefore find that the California publicly owned utilities are subject to the general order adopted herein, and are fully subject to the Commission’s jurisdiction for safety oversight.

**4. Best Practices**

Today's decision requires each electric utility subject to the Commission's jurisdiction to develop new safety rules and inspection practices for electric substations that are appropriate for each utility. We are concerned that over time we will end up with vastly different safety rules and inspection practices for each utility. Therefore, we also require today that the major investor-owned utilities as well as the publicly owned utilities subject to the Commission's jurisdiction meet on an annual basis and have a frank and open comparison and discussion of their newly developed practices. We expect each utility to critically review its own practices in light of this observation of other utilities' practices for similar equipment and facilities. We further expect this will result in an expansion and improvement of these practices across the state. In other words, a "best practice" will evolve that shows how to most effectively operate and safely control the electric systems in California based on the shared experience and expertise of all of the utilities even as these practices continue to reflect the unique elements of each system. We do not expect a single uniform state-wide practice: we expect each utility to develop a best practice of inspection for its own unique circumstances but to build them utilizing the breadth of experiences of all jurisdictional utilities.

We therefore order that in the first quarter of 2014, 2015, and 2016, the three major investor-owned utilities shall in turn host an annual review for all utilities to meet and discuss the details of their safety rules and inspection

practices for electric substations.<sup>6</sup> We direct our Safety Division to send appropriate expert staff to these meetings. By the end of the second quarter of 2016, we direct our Safety Division to report to the Commission on the status of the utilities' compliance with this general order and the degree to which the Safety Division believes the utilities have made a good faith effort to share information, modify and improve their own programs, and generally to have developed a best practice for safety rules and inspection practices for electric substations in California. The Safety Division should make any other recommendations it deems apposite at the time.

**5. Procedural History**

The Commission issued the Rulemaking on September 2, 2010, as a quasi-legislative proceeding, and PG&E, PacifiCorp, Los Angeles Department of Water and Power, San Diego Gas & Electric Company, and Southern California Edison Company were made respondents to this Rulemaking. Timely comments were filed by the City and County of San Francisco (San Francisco), San Diego Gas & Electric Company, Southern California Edison Company, PG&E, Pacific Corp., Sierra Pacific Power Company, Safety Division, California Municipal Utilities Association, Northern California Power Association, Mountain Utilities,

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<sup>6</sup> We believe the utilities are capable of managing this process without detailed intervention by the Commission. We therefore leave to them specific timing, location, and structure of the sessions, so long as they are broad in scope and inclusive with the experts from the public and investor-owned utilities in attendance who are empowered to make meaningful changes to their own utilities' practices with an eye to the development of a best practice in California based upon their collective experiences.

Northern California Power Agency, and Engineers and Sciences of California, Local 20, IFPTE.

On February 18, 2011, California Pacific Electric Company (CalPeco) filed a motion for party status to replace Sierra Pacific Power Company as a respondent to the Rulemaking because it now operates the territory (*see* D.10-10-017). We deem the motion granted, and therefore CalPeco is subject to this decision.

By ruling on March 30, 2011 respondents were directed to brief the issue of jurisdiction over the publicly owned utilities. Timely briefs were filed by the Muni Association, Los Angeles Department of Water and Power, PG&E, and the Safety Division. Timely replies were filed by the Muni Association, Los Angeles Department of Water and Power, and the Safety Division.

**6. Comments on Proposed Decision**

The proposed decision of the assigned Commissioner in this matter was mailed to the parties in accordance with Section 311 of the Public Utilities Code and comments were allowed under Rule 14.3 of the Commission's Rules of Practice and Procedure. Timely comments and reply comments were filed. Southern California Edison Company, PG&E, PacifiCorp, San Diego Gas & Electric Company, Bear Valley Electric Service (a division of Golden State Water Company), and California Pacific Electric Company filed joint comments in support of the proposed decision. Additionally, they indicated their willingness to accept and participate in the best practices workshops and reports as described in this decision.

San Francisco comment that the decision fails to address San Francisco's concerns from the workshop that the Commission should develop detailed robust inspection requirements and not defer to the utilities. This decision does address the concern over the quality and thoroughness of the inspection

practices by establishing the best practices workshops and reports, and by giving an oversight role to the Commission's Safety Division in that process in addition to the Safety Division's existing duty to inspect and enforce safety.

The Commission's Safety Division filed timely reply comments supporting the decision as written and expressing support for the best practices workshops and reports. The Safety Division also opposed the opening comments of San Francisco pointing out that the Division's ongoing inspection program is superior to a restrictive detailed plan proposed by San Francisco and has begun a robust audit and inspection process which will improve safety.

The California Municipal Utilities Association filed comments which reargues its view on the Commission's jurisdiction and we accord the comments no weight.

#### **7. Assignment of Proceeding**

This proceeding is categorized as quasi-legislative. The assigned Commissioner is Timothy Alan Simon and the assigned ALJ is Douglas M. Long.

#### **Findings of Fact**

1. The attached general order would require jurisdictional investor-owned and publicly owned electric utilities to create safety rules and inspection practices for electric substations that will enhance public safety and provide uniformity in California.
2. Electric substations and all their component parts are connected to other components of electric system.
3. Annual meetings where the electric utilities share and discuss their practice for safety rules and inspection practices for electric substations can lead to the development of best practices for California utilities.

4. CalPeco now operates the service territory previously operated by Sierra Pacific Power Company.

**Conclusions of Law**

1. The Commission has the authority to adopt a general order requiring electric utilities in California to adopt detailed practice for safety rules and inspection practices for electric substations.

2. Electric substations and all their connected component parts fall within the Commission jurisdiction.

3. The publicly owned electric utilities in California are subject to the Commission's jurisdiction for safety matters.

4. The Commission has the authority to impose this general order on both investor and publicly owned electric utilities in California.

5. The Commission has the authority to direct both the investor-owned and publicly owned electric utilities to annually review and compare their detailed safety rules and inspection practices.

6. CalPeco is subject to this decision superseding Sierra Pacific Power Company.

7. This decision should be effective immediately.

8. Rulemaking 10-09-001 should be closed.

**O R D E R**

**IT IS ORDERED** that:

1. General Order 174 (Attachment I) is adopted. It requires all California jurisdictional utilities to adopt, implement, and use, detailed written safety rules and inspection practices for electric substations.

2. Pacific Gas and Electric Company, San Diego Gas & Electric Company, and Southern California Edison Company, must in turn schedule and convene three annual conferences for all California jurisdictional electrical utilities to meet and confer to collectively develop a best practice for safety rules inspection practices for electric substations based upon the shared experiences of all California jurisdictional electric utility. We direct the Consumer Protection and Safety Division (Safety Division) to participate in the three annual conferences. These conferences must be held in the first quarter of 2014, 2015, and 2016. Further, we direct the Safety Division report to the Commission no later than the end of the second quarter of 2016 on the status of all jurisdictional utilities' compliance with the general order, and the progress achieved in developing a best practice.

3. Rulemaking 10-09-001 is closed.

This order is effective today.

Dated October 25, 2012, at Irvine, California.

MICHAEL R. PEEVEY  
President  
TIMOTHY ALAN SIMON  
MICHEL PETER FLORIO  
CATHERINE J.K. SANDOVAL  
MARK J. FERRON  
Commissioners

R.10-09-001 COM/TAS/rs6

**General Order 174**

**Rules for Electric Utility Substations**

**(Adopted October 25, 2012 by Decision 12-10-029)**

- 1 -

**Section I  
General Provisions**

**10 Purpose**

The purpose of these rules is to formulate, for the State of California, uniform requirements for substation inspection programs, the application of which will promote the safety of workers and the public and enable adequacy of service.

**11 Applicability**

This General Order applies to electric utilities subject to the jurisdiction of the California Public Utilities Commission (Commission).

Facilities subject to the California Independent System Operator's operational control and/or subject to FERC reliability standards and Customer Substations are exempt from this General Order.

**12 General**

These rules are not intended as complete specifications, but embody only minimum requirements that will promote safety and enable adequacy of service.

Substations shall be designed, constructed and maintained for their intended use, regard being given to the conditions under which they are to be operated, to promote the safety of workers and the public and enable adequacy of service.

Design, construction and maintenance should be performed in accordance with accepted good practices for the given local conditions known at the time by those responsible.

**13 Saving Clause**

The Commission reserves the right to change any of the provisions of these rules in specific cases when, in the Commission's opinion, public interest would be served by so doing.

Compliance with these rules is not intended to relieve an electric utility from other statutory requirements not specifically covered by these rules.

## **Section II Definitions/Acronyms**

- 20 Discrepancy:** a noteworthy anomaly, material or structural deficiency.
- 21 Inspection:** a basic evaluation, generally performed using visual and auditory senses, but which could be conducted by other means.
- 22 Inspection Plan Summary:** a paper or electronic document that summarizes an Operator's Inspection Program.
- 23 Operator:** an electric utility subject to this General Order.
- 24 Substation:** An assemblage of equipment, (e.g., switches, circuit breakers, buses, and transformers), under the control of qualified persons, through which electric energy is passed for the purpose of switching or modifying its characteristics.

**24.1 Customer Substation:** a Substation that functions as the main source of electric power supply for a single customer, including those that provide feed through for additional customers.

## **Section III Inspection Programs**

### **30 General**

- 30.1 Each Operator shall establish, update as needed, and follow an Inspection Program. At a minimum, this Program shall specify for each piece of equipment and system listed in Rule 32.1:
- Inspection activities
  - Frequency of Inspections
  - Record keeping and retention
- 30.2 Inspections shall be performed by persons who, by reason of training, experience and instruction, are qualified to perform the task.

**31 Frequency**

31.1 Substations shall be inspected as frequently as necessary.

- Time intervals or other bases shall be specified in the Inspection Program.

**32 Facilities**

32.1 Facilities subject to Inspection shall include, but are not limited to:

- Batteries
- Buses
- Support Structures
- Capacitor Banks
- Circuit Breakers
- Fire Detection and Suppression System (Where applicable)
- Grounding System
- Insulators/Bushing/Arrestors
- Perimeter Fences and Gates
- Transformers
- Reactors
- Voltage Regulators

**33 Records**

33.1 Electronic or hard copy records of completed Inspections shall include, at a minimum:

- Inspector name or identification
- Inspection date
- Brief description of identified discrepancies
- Condition rating (where applicable)
- Scheduled date of corrective action (where applicable)

33.2 Electronic or hard copy records of completed Inspections shall be retained for not less than five (5) years.

**Section IV  
Reporting**

**40 Annual Filings**

- 40.1 No later than July 1<sup>st</sup> of each year, each Operator shall transmit to the Utilities Safety and Reliability Branch (USRB) an Inspection Program Summary.

Changes to the Inspection Program shall be reflected in the Inspection Program Summary, including the effective date of the change. Should no changes occur since the previous filing, the Operator shall transmit written correspondence confirming that no changes were made to the Program.

- 40.2 No later than July 1<sup>st</sup> of each year, each Operator shall transmit to the CPSD a report summarizing completed and past due Inspections for the prior calendar year.

**(END OF ATTACHMENT I)**

## Attachment B

### Equipment and Facility Inspections Best Practices

**TABLE OF CONSENSUS BEST PRACTICE INSPECTION ITEMS FOR SELECTED SUBSTATION FACILITIES**

GO 174 (Rule 32.1) Facilities Name	Inspection Task
Insulator/Bushings/Arrestors	Condition of Installed Animal Guarding
Insulator/Bushings/Arrestors	Connections and Terminations
Insulator/Bushings/Arrestors	Contamination, Oil Level, Leaks, and Damage
Perimeter Fences and Gates (internal/external)	Barbed/razor wire
Perimeter Fences and Gates (internal/external)	Encroachments near perimeter
Perimeter Fences and Gates (internal/external)	Perimeter/entry way
Perimeter Fences and Gates (internal/external)	Signs/labels
Reactors	Condition (degradation or corrosion)
Reactors	Condition of installed animal guarding
Reactors	Ground vegetation overgrowth
Reactors	Grounds intact
Reactors	Insulator
Reactors	Perimeters, enclosures, and signs
Transformer	Bushing/Insulator
Transformer	Condition of Installed Animal Guarding
Transformer	Control cabinet condition
Transformer	Counter Operations
Transformer	Degradation/corrosion
Transformer	Moisture Intrusion System
Transformer	Nitrogen System
Transformer	Oil and Winding Temperature
Transformer	Oil Filtration System
Transformer	Oil Leaks
Transformer	Oil Level
Transformer	Pressure Relief Indicating Flags
Transformer	Radiators and Auxiliary Cooling Equipment
Transformer	Signs/Labels
Batteries	Cell corrosion, leaks, damage and cleanliness
Batteries	Check ventilation
Batteries	Electrolyte levels
Batteries	Float voltage / charging current / ground indication
Batteries	Rack condition
Batteries	Signs / labels
Buses	Condition of installed animal guarding
Buses	Degradation or corrosion
Buses	Instrument transformer (including bushing) and disconnect condition

Buses	Insulators condition
Capacitor banks	Bushing / insulator
Capacitor banks	Condition of installed animal guarding
Capacitor banks	Fuse condition / blown
Capacitor banks	Ground vegetation overgrowth
Capacitor banks	Grounds intact
Capacitor banks	Leaking and/or bulging units
Capacitor banks	Perimeter enclosures, signs, interlocks
Support structures	All connections are intact
Support structures	Degradation / deformation / corrosion
Support structures	Grounds intact
Support structures	Loose/missing bolts and/or anchoring
Circuit breakers	Condition of installed animal guarding
Circuit breakers	Control cabinet condition
Circuit breakers	Degradation / corrosion
Circuit breakers	Indicator lights
Circuit breakers	Oil/fluid leaks
Circuit breakers	Oil/fluid levels
Circuit breakers	Operating mechanism
Circuit breakers	Operations counter
Circuit breakers	Position indicator
Circuit breakers	Pressure indicator
Circuit breakers	Signs/labels
Fire Detection and Suppression systems (where applicable)	Fire Control panels
Fire Detection and Suppression systems (where applicable)	Fire extinguishers
Grounding Systems	Grounds intact: Equipment types as applicable
Voltage Regulators	Abnormal noise
Voltage Regulators	Bushing/ Insulator check
Voltage Regulators	Condition of installed animal guarding
Voltage Regulators	Control cabinet condition
Voltage Regulators	Counter operations
Voltage Regulators	Degradation/ corrosion
Voltage Regulators	Grounds intact
Voltage Regulators	Oil leaks
Voltage Regulators	Oil levels
Voltage Regulators	Position indicator, drag hands
Voltage Regulators	Radiators and auxiliary cooling equipment
Voltage Regulators	Signs / labels
Voltage Regulators	Surge arrestor