

Memorandum

To: ISO Board of Governors
From: Armando Perez, Vice President of Grid Planning and Infrastructure Development
Date: May 21, 2007
Re: Overview of the California Independent System Operator (ISO) Transmission Maintenance Standards

This memorandum does not require Board action.

OVERVIEW OF ISO TRANSMISSION MAINTENANCE STANDARDS

Proper and timely transmission maintenance is critical to sustaining grid availability. The ISO Transmission Maintenance Standards (Appendix C of the Transmission Control Agreement) have helped maintain a reliable grid. Using these standards, the ISO has executed transmission maintenance oversight and review processes that have helped maintain the availability of the grid and avoid costly and/or catastrophic grid interruptions. These comprehensive standards are like no other regulatory program in the electric supply industry. This program includes managerial aspects, performance metrics and technical components.

Presently these standards apply to four Participating Transmission Owners (PTOs); Pacific Gas and Electric, San Diego Gas and Electric, Southern California Edison, and Western. These PTOs have turned over transmission facilities to the ISO for Operational Control and are also responsible for maintenance of these facilities.

The key elements of these standards include Availability Measures, PTO Maintenance Practices, a Standard Maintenance Reporting System, Annual Maintenance Reviews, Review for Cause and Investigation of Major Equipment Failure, and the Transmission Maintenance Coordination Committee (TMCC). These elements are described below:

Availability Measures

Availability measures use statistics to quantify the availability performance of ISO controlled transmission facilities and provide a gauge of PTO transmission maintenance adequacy. The availability measures allow for assessing whether maintenance might be the basis for improvements or degradation in system availability. If availability degradation were largely tied to maintenance, the PTO would be required to revise its adopted maintenance practices or its maintenance activities.

Frequency of forced outages, duration of forced outages, and proportion of lines not having forced outages are the fundamental performance measures used by the CAISO and the PTOs as the basis for the existing Availability performance monitoring system. Deviations from expected availability performance require detailed explanations and/or corrective action plans. The availability data provided by the PTO also affords the opportunity for data mining and subsequent analysis to look for outage type trends to improve maintenance practices or maintenance activities, which will improve grid availability.

There are 146 annual indicators that are monitored each year between the four PTOs. Over the last eight years, PTO availability performance has been stable and consistent and most recently showing trends toward improvement. We believe this is due to sustained and consistent focus on management of maintenance programs. In the few cases where the indicators did show degradation, most could be tied to non-maintenance causes (heavy storms or fires). The majority of the improvement indicators could be tied to increased maintenance efforts (a few examples are improvements in diagnostics, root cause analysis teams, replacing ceramic insulators with non-ceramics, being pro-active with animal/raptor control, or increasing infrared patrols).

PTO Maintenance Practices

PTO Maintenance Practices describe how each Participating Transmission Owner (PTO) maintains its transmission facilities, from which the ISO determines the adequacy of each PTO's maintenance program. Each PTO prepares and submits a description of its maintenance program, detailing the inspection, maintenance, condition assessment, repair and replacement, and associated record keeping requirements. The ISO adopts these maintenance practices after a thorough review and revision process to assure that these practices provide a comprehensive, proper, and timely, maintenance program. Several changes have been made to the maintenance practices over the years for a variety of reasons. The ISO continually monitors the effectiveness of each PTO's maintenance practices and requires revisions where appropriate. Maintenance practices amendments have also been initiated by the PTO's.

Standard Maintenance Reporting System

The Standard Maintenance Reporting System (SMRS) provides the ISO with a summary overview of each PTO's planned and actual annual maintenance activities for each major transmission element.

- Annually, each PTO provides a summary of maintenance it plans to accomplish during the year. The ISO compares this information with overall assets to be managed, past years' maintenance activities, and adopted maintenance practices to evaluate the overall direction and adequacy of the each PTO's maintenance program, and to facilitate any timely maintenance activity changes.
- The ISO may request a mid-year status summary report to confirm that the volume of maintenance being performed is on track with maintenance planned. The ISO has taken appropriate action to get maintenance activity back on track with the overall expected results.
- Annually, each PTO provides a summary of maintenance completed the prior year. This summary identifies and explains the reasons for any differences between the planned maintenance activities and actual performed maintenance. With this information, the ISO determines if each PTO did what they said they would, understand any deficiencies in work volumes, and require appropriate adjustments to the current year's planned maintenance.

Annual Maintenance Reviews

ISO personnel conduct annual maintenance reviews for each of the PTOs. These reviews are done in the field, and consist of two parts. The first is a detailed review of the PTO's maintenance records for major transmission equipment and vegetation management, including transmission lines, substations, and associated control and protection

equipment. After reviewing a sample of the maintenance records for each major type of equipment and vegetation management, the ISO review team conducts an on site field review of selected facilities. During the field review, the ISO review team evaluates the physical condition of the equipment, the overall condition of the yard or rights of way, vegetation management, and confirms maintenance records are accurate with what is observed in the field.

These annual maintenance reviews allow the ISO to determine if each PTO is managing their maintenance program and performing maintenance in conformance with its adopted maintenance practices (are they doing what they say they are doing), and to provide a forum for identifying positive feedback and corrective actions where appropriate. Problems or deviations from the adopted maintenance practices are identified, corrective action plans are developed and implemented, and corrective actions are tracked until completion.

Review for Cause and Investigation of Major Equipment Failures

Following transmission incidents that significantly impact the grid the ISO may conduct an investigation (Review for Cause) to determine the cause of the event. Corrective action plans are developed, corrective actions are tracked until completed, and sanctions may be imposed if appropriate.

Transmission Maintenance Coordination Committee

The Transmission Maintenance Coordination Committee oversees and provides direction for the development of Maintenance Standards and Procedures. This committee's high level of technical experience and knowledge results in the best possible comprehensive maintenance standards and procedures to guide transmission grid maintenance.

- The TMCC includes representatives from the PTOs, CPUC, CEC, Labor Unions, Stakeholders, and other interested participants. These members are technical experts from the utility industry.
- The TMCC assists in the resolution of ISO/PTO issues related to Maintenance and Operations.
- The TMCC develops Maintenance Procedures to clarify the existing Maintenance Standards.
- The TMCC provides a forum for sharing demonstrated best practices between the PTOs and other utilities.

Those interested further in the overview of the ISO Transmission Maintenance Standards should direct inquiries to:

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