Final Report
Southern California Edison’s Response to the
November 30, 2011 Windstorm

March 28, 2012

Prepared For:
EDISON INTERNATIONAL

Prepared By:
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Executive Summary

1. Executive Summary

On November 30, 2011, a severe windstorm struck the Southern California Edison (SCE) service territory. By 4:00 a.m. on December 1, when peak outages occurred, more than 220,000 customers were without power. During the entire restoration, about 408,000 customers lost power across the service area. The damage, however, was extremely concentrated within the Mesa area, which accounted for more than 76% of outages at peak. SCE conducted storm related work in 26 districts and deployed more than 1,500 field resources to restore power. Although SCE restored power to a large number of customers within the first 24 hours (more than 118,000), the restoration process lasted seven and a half days.

1.1. Approach Overview

As a result of the extended restoration caused by the November 30 event, Edison International (EIX) and SCE engaged Davies Consulting to conduct an independent assessment of the company’s preparedness for and effectiveness in responding to the event, and provide recommendations on how to improve future performance – from both an emergency response and utility operations perspective. In addition, Davies Consulting was asked to review and provide input into the Root Cause Evaluation (RCE), which was conducted internally by SCE, to assess the “restoration activities and communications associated with the November 30 storm.” After mobilizing the project, the approach undertaken by Davies Consulting, which was based on both qualitative (interviews) and quantitative (data) analyses, included the following steps:

- **Assess the Impact of the Storm on the SCE System** - The purpose of this step was to understand the effect of the event on SCE’s system and compare damage to similar events through the use of a confidential database that Davies Consulting created in 2003 and has updated continuously. During this step, Davies Consulting also developed a simulation that illustrates the relationship between weather and customer outages and visually depicts how SCE managed and deployed line and vegetation resources.

- **Conduct Preparedness and Response Analysis** - During this task, Davies Consulting used data gathered in the previous step to identify focus areas and develop interview questionnaires for key SCE staff involved in the restoration and external stakeholders affected by the event. Approximately 90 interviews were conducted.

- **Conduct an Independent Review of the RCE Initial Draft Report** - As described earlier, SCE conducted a comprehensive internal RCE assessment of the windstorm. Once the draft report from the RCE team was available, Davies Consulting conducted an independent review of the report and provided feedback to the team and SCE sponsors on the key findings.

- **Assess SCE Construction Standards and Maintenance Programs** - In this step, Davies Consulting conducted a high-level review of SCE’s construction and engineering
standards relative to extreme weather guidelines for the region and assessed pole replacement and vegetation management programs to determine whether SCE adequately funded these programs over the past several years.

- **Develop Summary Findings Report** - Throughout the course of the engagement, Davies Consulting documented findings and potential areas for further exploration and then consolidated them into a summary report highlighting findings and, most importantly, recommended improvement opportunities.

The purpose of this evaluation and report is to identify the processes, technologies, and metrics recommended for SCE to improve on future restoration efforts.

It is important to note that SCE leadership and staff were transparent during this assessment. Davies Consulting had complete access to SCE staff – from senior leadership to craftsmen to support staff. Throughout the evaluation, SCE staff were open and honest about their own experiences during the storm and did not hesitate to highlight mistakes that they personally made or that they saw happen. All pertinent data that Davies requested was provided in a timely manner. Davies Consulting’s overall impression of SCE was that the company and its staff truly want to use the lessons learned from this windstorm to improve emergency preparedness and response. The findings and recommendations contained herein will be a step in the process of moving toward best practice in a number of key emergency management areas.

### 1.2. Evaluation Areas

Davies Consulting identified the following key areas to support the team in evaluating SCE’s emergency planning, preparedness, and response practices:

- **Emergency Planning and Preparedness** – Is there a vision of what leadership wants to accomplish before, during, and after major emergencies and a set of guiding principles that define the response strategy? Is there a comprehensive Incident Command System-based plan in place that has been tested at least annually in both table top and functional exercises? Are the senior management team roles well defined? Is there a commitment to storm roles?

- **Resource Acquisition and Mutual Aid** – How quickly is the company able to determine needs, secure off-system support if needed, and pre-position necessary resources? Is there an effective on-boarding process?

- **Crisis Communication and Estimated Restoration Times (ERTs)** – Have processes been put in place to ensure “one voice” communication during major events and are these processes followed? Is there a process for creating and managing ERTs that is sufficiently granular to meet the needs of stakeholders?

- **Damage Assessment, Analysis, and Planning** – How well is the damage assessment process defined and executed? How is the damage information captured and used? Is planning done to optimize crew productivity?

- **Restoration Execution** – How effectively did the company allocate, manage, and track resources? Was the restoration coordinated with local and state governments efficiently? Were there any delays in restoration? Does the company have a strong...
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safety plan that drives performance during major events? What processes and procedures does the company have to ensure public and workforce safety throughout restoration? What was the company’s Occupational Safety and Health Administration (OSHA)-recordable rate during the event?

- **Information Systems and Technology** – Is technology seen as an integral part of the restoration effort and is it tested at least annually to ensure it meets requirements and supports both customers’ and internal/foreign crew needs?

- **Logistics** – Was logistics support adequate to ensure effective restoration? Were lodging and food secured in a timely manner? Were materials available to make necessary repairs without delay?

- **Call Center Performance** – Is there a proactive plan for addressing the increased volume of calls from customers? Are Interactive Voice Response (IVR) messages scripted, were outbound calls performed, and were plans implemented?

- **Maintenance and Vegetation Management** – Did the company suffer an undue amount of damage because of inadequate vegetation management or equipment maintenance execution or funding?

- **Transmission** – How did the company restore its transmission system? Did transmission outages cause delays in the customer restorations? How is transmission response integrated into the company’s overall restoration effort?

1.3. **Summary of Findings and Recommendations**

The findings and recommendations listed in this section were developed through interviews conducted by Davies Consulting in January and February 2012; a review of SCE data provided in response to Davies Consulting requests; and a review of SCE’s internal Root Cause Evaluation (RCE), which assessed the “restoration activities and communications associated with the November 30 storm.” While it is important to understand that each storm is different (e.g., different path, wind speeds, precipitation levels, etc.) and that each utility system is inherently different from the perspective of customer density, geography, and operating philosophy, the general practices in emergency preparedness and response should not vary greatly across the industry.

Based on a benchmark data analysis that compares SCE’s November 30 windstorm restoration to 29 similar event restorations performed by other utilities, it appears that while the SCE system suffered a similar amount of damage to other major storms in the benchmark cohort, the company deployed a sufficient number of line resources to restore power to customers. Given the size of SCE’s service territory and the concentrated area that was affected by the November 30 windstorm, the percent of total customers without power at peak was lower in this event than for other events in the benchmark comparison.

Figure 1, below demonstrates Davies Consulting’s assessment of SCE’s overall performance as compared to industry peers.
SCE restored its customers within seven and a half days and did so without any serious injuries to SCE staff or the public. In addition, SCE’s logistics practices (from a food and stores perspective) and the transmission group performed well during the response to the event.

Based on the qualitative and quantitative analyses, Davies Consulting’s estimate is that this restoration could have been shortened by at least one day, possibly two days, if the following aspects of restoration had been more effective:

- Better situational awareness;
- A fully functional Incident Command System response structure;
- A damage assessment process;
- A planning process; and
- A better wire down process.

Although this report details more than 80 findings and 70 recommendations, many of which touch on the five areas above, key recommendations across all of the evaluation areas noted previously include:

- Develop an emergency response vision and guiding principles;
- Significantly expand the role and authority of the SCE emergency management group and elevate the group to an executive level in order to drive change across SCE;
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- Define restoration strategies;
- Fully implement an ICS response structure;
- Define expectations with external Emergency Management Agencies;
- Standardize shifts during events;
- Coordinate all externally facing staff under a single communications team to better execute a “one voice” approach;
- Enhance the process for developing and releasing ERTs;
- Enhance the Local Public Affairs (LPA) program;
- Implement a comprehensive damage assessment, analysis, and planning process;
- Improve weather and forecast monitoring;
- Develop and implement a restoration strategy for different size events;
- Develop and implement, in collaboration with communities, a prioritized weighting mechanism;
- Strengthen Outage Management System (OMS) training;
- Ensure that software and hardware to operate OMS during peak usage are sufficient;
- Fully deploy Mobile Data Terminals (MDTs) and provide appropriate training;
- Formalize agreements with key staging and satellite sites;
- Ensure adequate health and sanitation facilities at staging sites;
- Develop a protocol for changing the default page of sce.com to the storm page; and
- Develop and implement a detailed transmission prioritization tool.

SCE’s leadership has already demonstrated its commitment to learn from the November 30 windstorm restoration effort and improve the company’s ability to respond to major weather events in the future. Recently, SCE created and filled a position with responsibility for fully implementing the necessary changes identified through these two assessments. It is important to note that while certain improvements can be made over the next few months, other improvements will take several years to fully implement.

As a matter of course, it is important to note that SCE’s approach to this assessment was in line with best industry practices for reviewing large outage events. While some industries tend to minimize opportunities for improvement or avoid identifying lessons learned, SCE asked Davies Consulting to provide an independent and publicly available assessment of the windstorm and, accordingly, Davies Consulting took a critical look at SCE’s practices. Engaging a third party to independently review the event, providing external stakeholders with the final assessment, and ensuring that the third party has unfettered access to critically evaluate the response aligns SCE with best practice companies in the utility industry and in other sectors focused on improving after significant events (i.e., aviation, maritime, shipping, fire and law enforcement agencies, and healthcare). Absent an open and honest examination, an organization will not learn from the event.
Executive Summary

Based on the objective of the engagement, the findings and recommendations included in this report are focused on providing SCE with a critical assessment of the restoration. The findings, however, do not sufficiently highlight the level of effort that SCE employees undertook over the course of seven and a half days. It was not for a lack of effort or determination that SCE did not restore customers in a shorter timeframe. Instead, the opportunities for improvement resulted from: infrequent severe storms; an abnormal storm (catastrophic damage in a focused area); response plans that were not designed to accommodate an incident as complex and intense as the November 30 event; and several improvement programs that SCE was undertaking at the time of the event but had not yet fully implemented. In the end, Davies Consulting believes that SCE has the requisite skills, tools, and commitment to improve its response capabilities in the near future.
2. Introduction

On November 30, 2011, a severe windstorm struck the Southern California Edison (SCE) service territory, resulting in more than 224,246 SCE customers losing power at peak and ultimately affecting approximately 408,154 customers. The storm damaged and required replacement of approximately 200 distribution poles, 600 spans of wire, and 100 transformers. With outages concentrated in the El Nido, Lighthipe, Mira Loma, Ridgecrest, Vista, and Mesa areas (and Mesa accounting for more than 76% of peak customers), SCE conducted storm work in 26 areas and deployed more than 1,500 field (line and tree) resources to fix damage to the distribution and transmission systems. Within 24 hours of peak outages (4:00 a.m. on December 1), SCE had restored more than 47% of customers without power at the peak. Restoration efforts were completed on December 8.

2.1. Purpose and Scope

As a result of the extended restoration caused by the November 30 event, Edison International (EIX) and SCE engaged Davies Consulting to conduct an independent assessment of the company’s preparedness for and effectiveness in responding to the event and to provide recommendations on how to improve future performance – from both an emergency response and utility operations perspective. In addition, Davies Consulting was asked to review and provide input into the Root Cause Evaluation (RCE) conducted internally by SCE to assess:

“…the events, restoration activities and communications associated with the November 30 storm, as well as the primary challenges, root causes and corrective actions identified through SCE’s internal review. The RCE addresses only SCE’s response to the storm and does not examine the condition, prior to the event, of SCE’s power distribution system or equipment…”

The RCE effort started in December 2011 and differed from the Davies Consulting assessment in methodology and scope. The RCE, which was guided by an expert root cause evaluator, is used to determine the “root cause” of failure in complex engineering systems. In contrast, the Davies Consulting assessment methodology was intended to provide a broad view of the company’s preparedness for and response to the event and therefore included interviews with community members and a sampling of SCE staff from across the organization. These differing approaches enabled both a wide and deep assessment of the response and recovery to the windstorm.

Davies Consulting’s assessment of the RCE and SCE’s response focused on the five key aspects of the emergency management cycle depicted in Figure 2, below, and specifically included a review of the key aspects of a restoration effort outlined in Section 2.3.
2.2. **Approach and Methodology**

After mobilizing the project, the approach undertaken by Davies Consulting, which was based on both qualitative (interviews) and quantitative (data) analyses, included the following steps:

- **Assess the Impact of the Storm on the SCE System** - The purpose of this step was to understand the effect of the event on SCE’s system and compare damage to similar events through the use of a confidential database that Davies Consulting created in 2003 and has updated continuously. During this step, Davies Consulting also developed a simulation that illustrates the relationship between weather and customer outages and visually depicts how SCE managed and deployed line and vegetation resources.

- **Conduct Preparedness and Response Analysis** - During this task, Davies Consulting used data gathered in the previous step to identify focus areas and develop interview questionnaires for key SCE staff involved in the restoration and external stakeholders affected by the event. Approximately 90 interviews were conducted. It should be noted that throughout this evaluation, SCE strived to provide the Davies Consulting team with a balanced perspective on the company’s response – indeed, the company erred on the side of providing access to interviewees who were more likely to be critical than not. In light of this, we would like to acknowledge both the company’s efforts to ensure Davies Consulting was able to provide an unbiased critique of SCE’s response and also SCE staff candor and openness in this interview process. Each member of the SCE team and interviewees (from the executives to Customer Service Representatives to field resources) strove to:
  - Identify individuals who would provide critical feedback;
  - Be open to personal and professional critiques; and
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— Stated, and supported with actions, the entire company’s interest in improving from this experience.

- **Conduct an Independent Review of the RCE Initial Draft Report** - As described earlier, SCE conducted a comprehensive internal RCE assessment of the windstorm. Once the draft report from the RCE team was available, Davies Consulting conducted an independent review of the report and provided feedback to the team and SCE sponsors on the key findings.

- **Assess SCE Construction Standards and Maintenance Programs** - In this step, Davies Consulting conducted a high-level review of SCE’s construction and engineering standards relative to extreme weather guidelines for the region and assessed pole replacement and vegetation management programs to determine whether SCE adequately funded these programs over the past several years.

- **Develop Summary Findings Report** - Throughout the course of the engagement, Davies Consulting documented findings and potential areas for further exploration and then consolidated them into a summary report highlighting findings and, most importantly, recommended improvement opportunities.

The purpose of this evaluation and report is to identify the processes, technologies, and metrics that will improve future SCE restoration efforts.

2.3. **Key Evaluation Areas**

Davies Consulting focused on eleven key areas in its evaluation of SCE’s emergency planning, preparedness, and response practices:

- **Emergency Planning and Preparedness** – Is there a vision of what leadership wants to accomplish before, during, and after major emergencies and a set of guiding principles that define the response strategy? Is there a comprehensive Incident Command System (ICS)-based plan in place that has been tested at least annually in both table top and functional exercises? Are the senior management team roles well defined? Is there a commitment to storm roles?

- **Resource Acquisition and Mutual Aid** – How quickly is the company able to determine needs, secure adequate off-system support and pre-position necessary resources? Is there an effective on-boarding process?

- **Crisis Communication and Estimated Restoration Times (ERTs)** – Have processes been put in place to ensure “one voice” communication during major events and are these processes followed? Is there a process for creating and managing ERTs that is sufficiently granular to meet the needs of stakeholders?

- **Damage Assessment, Analysis, and Planning** – How well is the damage assessment process defined and executed? How is the damage information captured and used? Is planning done to optimize crew productivity?

- **Restoration Execution** – How effectively did the company allocate, manage, and track resources? Was the restoration coordinated with local and state governments efficiently? Were there any delays in restoration? Does the company have a strong safety plan that drives performance during major events? What processes and
Introduction

procedures does the company have to ensure public and workforce safety throughout restoration? What was the company’s Occupational Safety and Health Administration (OSHA)-recordable rate during the event?

- **Information Systems and Technology** – Is technology seen as an integral part of the restoration effort and is it tested at least annually to ensure it meets requirements and supports both customers’ and internal/foreign crew needs?
- **Logistics** – Was logistics support adequate to ensure effective restoration? Were lodging and food secured in a timely manner? Were materials available to make necessary repairs without delay?
- **Call Center Performance** – Is there a proactive plan for addressing the increased volume of calls from customers? Are Interactive Voice Response (IVR) messages scripted, were outbound calls performed, and were plans implemented?
- **Maintenance and Vegetation Management** – Did the company suffer an undue amount of damage because of inadequate vegetation management or equipment maintenance execution or funding?
- **Transmission** – How did the company restore its transmission system? Did transmission outages cause delays in the customer restorations? How is transmission response integrated into the overall company’s restoration effort?

Since the November 30 windstorm mainly affected the distribution part of SCE’s power delivery system, most of the findings within the first ten areas are related to the distribution system. Davies Consulting separately evaluated the response to the limited number of transmission outages.

2.4. **The Benchmark Database**

Davies Consulting began to develop its confidential and proprietary Storm Benchmark Database in 2003 after it sent a survey to 14 utilities that had experienced major weather events during the previous ten years. The data included in the benchmark database is derived from a standard survey that includes approximately 100 questions. The questions provide information related to the utility, its service territory, and the restoration of service following the weather event(s) in question. The database currently contains key statistics from more than 70 major event responses by over 32 major electric utilities across North America, allows different comparisons of response effectiveness, and includes information on all different facets of restoration and preparedness. While each event is unique and the comparisons among utilities have to be carefully evaluated, benchmarking can be valuable in identifying areas where potential improvement opportunities exist. For example, certain metrics (e.g., poles replaced per 1,000 customers out of power at peak) can be used to understand the magnitude of damage a utility has experienced, while other metrics, such as the number of personnel utilized per pole replaced, can be used to evaluate the level of resource deployment.
2.5. The Response Simulation

Davies Consulting developed a visual representation of SCE’s response to the November 30 winds using Microsoft PowerPoint. The simulation captured the following information on a day-to-day basis for the periods November 30, 2011 until December 8, 2011:

- Storm path;
- Wind speed and direction;
- Percentage of customers out of power by area and duration of those outages; and
- Number of resources deployed to specific areas to assist with restoration.

The resources represented in the presentation include SCE’s own line personnel and contractor vegetation and line resources. Logistics support personnel and construction support personnel are not represented in the simulation.

Inputs to these simulations include data provided by SCE concerning (1) the extent of customer interruptions by day by area, (2) line resources utilized by area, and (3) vegetation resources.\(^1\) Data on wind speeds and wind directions recorded by the National Oceanic and Atmospheric Administration (NOAA) and other research institution monitoring stations in the area are represented in the simulation.

The presentation visually depicts the temporal development of the storm’s impact from the perspective of the customers out of service, together with the deployment of resources in response. The presentation is a useful tool for evaluating how SCE responded to the event and managed its resources throughout the restoration effort and allows SCE leadership to review critical decision points (such as resource acquisition, allocation, and release decisions) and understand where mistakes may have been made or where processes and procedures may require closer evaluation for improvement.

\(^1\) The term “resources” refers to workers or individual persons and is interchangeable with terms such as “workers” or “personnel.”
3. Edison International and Southern California Edison Background

The earliest predecessors of SCE formed in the late 19th century when the Hold and Knupp partnership of Visalia, California, finished installing direct-current (DC) arc lighting in time for the city's annual Independence Day celebration. The partnership later evolved to become Visalia Electric Light and Gas Company, one of Edison International's earliest forebears. San Francisco speculators first licensed the name "Edison" in Southern California in 1894 and created the Los Angeles Edison Electric Company. This company, however, never actually generated or distributed electricity. In 1896, the West Side Lighting Company began lighting the growing city of Los Angeles. To comply with a conduit ordinance, it wished to license the patented technology of Thomas Edison and created a new company called the Edison Electric Company of Los Angeles. In 1902, that company merged with another electric supplier and became the Edison Electric Company and in 1909, it incorporated as Southern California Edison.

Since 1988, Edison International has operated as a holding company that generates and distributes electric power and invests in infrastructure and other energy assets. Today, SCE provides more renewable energy (15.4 billion kWh, representing 21%), than nearly any other utility in the world. With approximately 18,200 employees, SCE provides power to nearly 14 million people (4.9 million customers) over a 50,000 square mile service territory that includes 180 cities and 11 counties in central and coastal southern California. SCE’s commercial industrial and non-profit customers include 5,000 large businesses and 280,000 small businesses.

Table 1: SCE System Statistics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transmission</strong></td>
<td></td>
</tr>
<tr>
<td>Transmission circuits</td>
<td>916</td>
</tr>
<tr>
<td>Substations</td>
<td>133</td>
</tr>
<tr>
<td><strong>Distribution</strong></td>
<td></td>
</tr>
<tr>
<td>Distribution circuits</td>
<td>4,435</td>
</tr>
<tr>
<td>Overhead (miles)</td>
<td>53,054</td>
</tr>
<tr>
<td>Underground (miles)</td>
<td>36,884</td>
</tr>
<tr>
<td>Substations</td>
<td>7,795</td>
</tr>
<tr>
<td>Overhead transformers</td>
<td>452,244</td>
</tr>
<tr>
<td>Poles</td>
<td>1,444,720</td>
</tr>
<tr>
<td>Meters (12/31/11)</td>
<td>4.929 million</td>
</tr>
<tr>
<td>Generation Capacity (12/31/09)</td>
<td>5,502 MW</td>
</tr>
<tr>
<td>Peak Demand</td>
<td>22,771 MW</td>
</tr>
</tbody>
</table>

SCE’s distribution system consists of approximately 88,207 circuit miles of distribution construction and 12,278 circuit miles of transmission construction. Primary distribution voltages range from 2.4kV to 34.5kV.
As noted previously, on November 30, 2011, SCE’s service territory was subject to a significant windstorm, similar to a Santa Ana windstorm, which can easily reach 40 mph and is typical of California’s fall and winter weather pattern. The table depicted below provides an overview of the level of damage that SCE experienced in November/December in comparison to other major events (i.e., events that caused more than 100,000 total customer interruptions) over the last 18 years.

Table 2: Event Comparison

<table>
<thead>
<tr>
<th>Major Storm Event</th>
<th>Date</th>
<th>Total Customers Affected</th>
<th>Total Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthquake</td>
<td>01/17/1994</td>
<td>1,034,771</td>
<td>3</td>
</tr>
<tr>
<td>Wind</td>
<td>01/03/1995</td>
<td>338,222</td>
<td>3</td>
</tr>
<tr>
<td>Wind/Rain/Lightning/Flood/Snow</td>
<td>03/08/1995</td>
<td>355,179</td>
<td>3</td>
</tr>
<tr>
<td>Rain/Wind/Lightning</td>
<td>10/29/1996</td>
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<td><strong>433,945</strong></td>
<td><strong>7</strong></td>
</tr>
</tbody>
</table>

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2 LA County OEM EMERGENCY RESTORATION ACTIONS, December 22, 2011
3 Further data analysis showed total customers affected to be 408,154
History of the Event

4.1. **November 30, 2011 Windstorm and SCE’s Response**

In the early morning hours of November 29, the National Weather Service (NWS) issued a high wind watch for the SCE service territory. By later in the day, the watch was upgraded to a warning, with the potential for strong winds starting on November 30 and possibly continuing through December 3. As a counter-clockwise low pressure system moved from the Rocky Mountains west, a high pressure system (following a cold front) hovered over Arizona, Nevada, and the Great Basin, causing a gradient to form between the systems and driving winds across California and into other western states – including Nevada, where winds in Las Vegas were gusting at 29 mph and Utah, where gusts of 100 mph were reported.

On November 30, the NWS was predicting that the expected winds could be the strongest windstorm in five to 10 years, with the peak occurring early on December 1. Wind gusts of approximately 80 mph or higher were expected in the Los Angeles and Ventura County areas with gusts of up to 60 mph in the valleys and coastal areas of southern California. Experts said one reason for the extensive damage was that the winds were remarkably unpredictable. In some places, winds suddenly shifted from 10 mph to 20 mph to more than 80 mph. Prior to the event, NWS meteorologist James Thomas indicated that “wind gusts this strong will be able to topple trees and power lines.” Meanwhile, AccuWeather indicated that the event could be a “once-a-decade-type windstorm.” On November 30, the NWS predicted that “a cold low pressure system over Arizona will continue to generate strong north to northeast offshore winds over most of Los Angeles and Ventura counties through [December 2, 2011]. Peak sustained winds are expected to exceed 40 mph...especially across portions of the valleys and mountains...with peak wind gusts likely exceeding 60 mph.”

*Figure 3: Predicted Event Winds*
In response to these forecasts, SCE conducted a pre-event conference call at 7:43 a.m. on November 30 to discuss preparatory activities. At 4:59 p.m. on November 30, SCE’s Ridgecrest district declared a Category 1 storm and two hours later, when the El Nido district opened its storm room, the event was elevated, based on SCE’s Emergency Response and Recovery Protocol, to a Category 2 event. SCE’s Call Center began experiencing an increase in customer calls at approximately 8:00 p.m., when fewer than 10,000 SCE customers were without power. In preparation for the event, Call Center staff were held over to cover incoming call volume. At 9:45 p.m., SCE activated its Business Unit Storm Support, which is a “temporary, round-the-clock coordination center to expedite repairs and service restoration.”

When the windstorm struck California, it subjected the state to sustained winds ranging from 20 to greater than 60 mph and NWS meteorologists characterized it as the strongest to affect the area in ten years. Gusts of approximately 90 mph were measured on Mt. Elizabeth, near Sonora, 105 mph near Mt. Shasta, 95 mph on Whitaker Peak, 70 mph in the San Rafael Hills near Glendale, and 80 mph in Acton. The summit of Mammoth Mountain registered winds in excess of 120 mph for several hours.

Inspections by the United States Department of Agriculture (USDA) of the root systems of trees uprooted in the Inyo National Forest indicated that because of the unusual direction of the wind, trees were overwhelmed (root system structures that had protected against winds from the south, southwest, west, and northwest did not protect against the north winds). Although winds began to dissipate on December 1, an NWS high-wind advisory and red-flag warning (risk of wildfires) remained in effect through December 2.

The storm caused a significant number of SCE customers to lose power (more than 220,000 at peak) but damage was extremely concentrated in a 114-square-mile area. Peak outages occurred on December 1 at 4:00 a.m. Within 24 hours, SCE had restored slightly more than 47% of customers out at peak. At that time, there were approximately 1,100 line crews and 170 tree crews on system. Also on December 1 at 1:00 p.m., SCE activated its Mobile Command Center (MCC) at the Santa Anita racetrack. According to the company’s Emergency Response and Recovery Plan, the MCC is “an operationally ready emergency management and communications center, which is deployed to the scene of an emergency event.” On December 2, SCE reduced the event level from a Category 2 to a Category 1 event due to the closing of three storm centers. At the time of the category re-classification (approximately 4:30 p.m.), more than 60% of customers out at peak remained without power. On December 2, SCE released a message indicating that the company expected to have 99% of service restored by December 4 at 8:00 p.m. On December 4, however, the company revised the initial 99% Estimated Restoration Time (ERT), indicating instead that SCE expected to have 95% of the customers who had experienced an outage restored by December 4 at 8:00 p.m. and 99% by December 5 at 8:00 p.m. At 8:00 p.m. on December 4, SCE had 93% of peak customers out restored and reached the 95% mark at 5:00 a.m. on December 5. 99% of peak customers out were ultimately restored on December 6 at 4:00 p.m.
During the event (from November 30 until December 7) a total of approximate 194,000 customer outage related calls were answered, representing 16% of the average, total number of calls received each month. The SCE Interactive Voice Response (IVR) handled approximately 59% of customer calls and customer service representatives (CSRs) handled approximately 65,000 calls. For outage calls, the longest wait period was between 4:00 a.m. and 8:00 a.m. on December 1, ranging from nearly 22 minutes to approximately 29 minutes. On December 1, 19% of calls were abandoned and on the next three days (December 2, 3, and 4), between 8% and 9% of calls were abandoned.

The graphic in Figure 4, below, depicts: the restoration curve (blue line); SCE and contractor line resources (red line); total number of tree trimming resources on the system (green line); and some key points in the restoration (amber diamonds), which are described in the graph itself.

Figure 4: November 30 Windstorm Resource and Restoration Timeline

4.1.1. The Response Simulation Key Points
In the simulation graphics included in this section, the following key applies:

- The shaded circles represent the following areas: Lightripe; El Nido; Vista; Mesa; Mira Loma; and Ridgecrest.
History of the Event

- The wind gusts and sustained winds are reflected by star figures (dark pink for gusts and light pink for sustained winds) with the direction of the wind represented by an arrow.
- The size of a circle reflects the number of customers served in each area in relation to the other areas. The more customers served within an area, the larger the circle.
- The percentage of customers without power in particular areas is designated by the color of the circle – ranging from less than 5% without power (gray-blue) to 46% or more without power (black).
- The blue and orange cells represent the numbers of crews assigned to each area. Blue shaded cells reflect the total number of line crews, including SCE crews and contractor crews. Orange shaded cells represent the total number of vegetation management crews.
- While the “storm phase” of the simulation provides hourly data for the storm period, the “restoration phase” has daily information, updated at 6:00 p.m.
- Certain graphics (the storm phase) include a radar depiction of the storm passing through the service territory.

The granular data used to develop this simulation is based on the hourly estimate of customer outages at the service center level that were captured during the restoration. It is important to note that in a meteorological event such as this windstorm, wind speeds can vary widely from one mile to another and from one elevation to another. Whereas a hurricane can produce relatively consistent wind speeds and consistent damage across a wide area, this windstorm created very acute areas of intense winds while sparing areas in relative proximity. The response simulation used all available meteorological data, but due to wind speed capture methodologies and monitoring site locations, additional microbursts may have occurred and may have caused intense winds that are not depicted in the simulation.

As of 5:00 p.m. on November 30, the SCE territory began to experience winds in excess of 55 mph. By 8:00 p.m. the Henninger Flats weather station reported wind speeds in excess of 155 mph. By 4:00 a.m. on December 1 peak outages occurred, with more than 49% of customers in Mesa and about 6% of customers in Vista without power. On December 1, 437 line resources and 174 tree resources were assigned to the Mesa sector and 221 line resources were assigned to the Vista sector. These resources accounted for 57% of the total line resources and 98% of the total tree resources on SCE’s system.

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4 SCE was able to provide the resources available per day and not the resources available at any given hour of the day.
By 4:00 p.m. on December 1, Mesa’s percentage of customers out had decreased to 45% (155,573 customers out) and Vista had less than 5% of customers without power (11,786). The resources remained the same as at peak (Mesa and Vista accounted for 57% of line and 98% of tree resources and 95% of customers out). By 6:00 p.m. on December 2, SCE had restored power to approximately 61% of the customers that were out at peak. Mesa, with approximately 86,500 customers out, accounted for 99% of the customers that remained out at that time.
As depicted above, in Figure 6, by 6:00 p.m. on December 2, SCE allocated 795 line resources and 134 tree resources in Mesa. At that time, those resources accounted for 63% of total line resources and 98% of total tree resources working the storm. By December 3 at 6:00 p.m., SCE had deployed an additional 153 line resources and 176 tree resources to Mesa to work on restoring the more than 36,000 customers who remained without power.
By December 4 at 6:00 p.m., less than 5% of customers in Mesa remained without power (16,419) and all other sectors were fully restored. Restoration was completed on December 8.

In the initial stages of the restoration, SCE resources were focused on storm restoration activities in their respective areas. On December 2, once the majority of the customers were restored in the less affected sectors, SCE began to redeploy resources into the most heavily damaged Mesa sector. This is consistent with resource allocation practices in other utilities for this type of event. Based on the simulation, a portion of resources involved in storm restoration continued to report into the sectors which were fully restored. The simulation cannot conclude whether these resources conducted work in the Mesa sector or how effectively they would have been utilized.
4.2. **The Benchmark Comparison**

While using benchmarking information to compare the different aspects of storm restoration among companies can be useful to identify potential opportunities for improvement, it is important to understand that each storm is different and that each company has different operating conditions. Each storm can be different based on wind direction; level of precipitation during event; the amount of precipitation prior to the event (affecting the soil saturation and vegetation growth); and geographic area affected. Different utilities have unique operating conditions, such as system characteristics (e.g., level of automation), customer density, type of construction (overhead or underground), accessibility to the lines (e.g., rear lot construction) and vegetation density. Lastly, the speed of response may also depend on how widespread an event is and how much advance notice a utility has. This will affect the number of resources available to support the restoration and the time to prepare for a disaster. It is also important to understand that some of the statistics used in the comparison have not been finalized. Understanding these limitations, using the available benchmark data to compare storm restoration performance, allows companies to identify potential areas for further exploration. This section summarizes the relevant comparison for the November 30 windstorm.

4.2.1. **Benchmark Analysis Results**

Because of the nature of the November 30 windstorm and the weather monitoring sites/methodologies, a direct comparison of this event with easily classified storms (hurricane, tropical storm, snow or ice, etc.) is difficult. As described above, the wind speeds for this storm varied greatly by localized geographic area, with Henninger Flats indicating gusts in excess of 155 mph and other monitoring stations indicating winds in the high 30s at the same time. Based on number of peak outages, approximate wind speeds of the event at the time that it affected the service territory, and damage (number of poles, transformers, etc. replaced), Davies Consulting identified 29 comparable events in the Storm Restoration Benchmark Database. These events are generally significant windstorms, thunderstorms, sub-tropical events (hurricanes that have been decreased in classification following landfall), and tropical storms.

Figure 8 illustrates the time to restore all customers relative to the comparable events. When compared against the storm types previously noted and included in the Davies Consulting database, SCE’s seven day restoration\(^5\) was longer than a majority of comparable events but not the longest. There were seven comparable events that took longer to restore all customers.

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\(^5\) SCE’s actual restoration was 7.33 days. SCE’s restoration duration was rounded to the nearest day in the Benchmark Database.
Figure 8: Restoration Days

Figure 9, below, illustrates the percent of customers out at peak at SCE versus the comparable storms, noted above.

Figure 9: Percent of Customers Out at Peak

The graph above indicates that SCE had less than 5% of its customer base out at peak.
Given the relatively small percentage of customers out compared to other benchmarks, SCE was in a better position to restore without using external resources. This data does not address the intense, complex nature of this storm, which, regardless of the percentage of customers out, caused significant amount of damage in a small portion of the service area.

The number of poles that have to be replaced after an event is a good indicator of the amount of damage that a utility’s system experienced.

Figure 10, below, provides a comparison of the number of poles that SCE replaced against other events in the database.

**Figure 10: Poles Replaced per Thousand Customers at Peak**

SCE replaced 1.1 poles per thousand customers out at peak, which is slightly above median for similar storms.

The next benchmark to review is the ratio of line resources per thousand customers out at peak. While this metric does not address the speed at which off-system resources were acquired, it can be used as one factor in determining whether the utility efficiently used resources. The number of resources represents the highest number of line full time equivalents (FTEs) at any point of restoration.
As depicted in Figure 11, above, despite using only internal resources (SCE and sustaining contractors), SCE appears to have deployed an adequate number of resources when compared to other similar events. This graphic does not, however, address whether those resources were deployed appropriately to the hardest hit areas or used optimally throughout the restoration effort.

**Benchmark Conclusion**

Based on the benchmark data analysis above, which compares SCE’s November 30 windstorm restoration to similar major events restored by other utilities, it appears that while the SCE system suffered a comparable amount of damage to other major storms, the company deployed a sufficient number of line resources to restore the power to customers. However, the time to restore all customers was longer than the majority of other events, but not the longest.
5. Findings and Recommendations

The findings and recommendations listed in this section were developed through interviews conducted by Davies Consulting in January and February 2012; a review of SCE data provided in response to Davies Consulting requests; and a review of SCE’s internal Root Cause Evaluation (RCE), which assessed the reasonableness of the restoration time for SCE’s customers and the timeliness and accuracy of SCE’s communication to its customers. The findings and recommendations are grouped into the key focus areas identified in Section 2.3: Emergency Planning and Preparedness (EPP); Safety (S); Resource Acquisition and Mutual Aid (RA); Crisis Communication and ERTs (C); Damage Assessment, Analysis, and Planning (DAAP); Restoration Execution (RE); Information Systems and Technology (IT); Logistics (L); Call Center Performance (CC); Maintenance and Vegetation Management (M-VM); and Transmission (T). In addition, a separate section addressing transmission system findings and recommendations is included.

The following keys should be used with the tables in this section:

Table 3: Findings and Recommendations Keys

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<tr>
<th>Initial</th>
<th>Grouping Description</th>
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<td>Emergency Planning and Preparedness</td>
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<td>Resource Acquisition and Mutual Aid</td>
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<tr>
<td>C</td>
<td>Crisis Communication and ERTs</td>
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<td>DAAP</td>
<td>Damage Assessment, Analysis, and Planning</td>
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<td>RE</td>
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<td>IT</td>
<td>Information Systems and Technology</td>
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<tr>
<td>L</td>
<td>Logistics</td>
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<tr>
<td>CC</td>
<td>Call Center Performance</td>
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<tr>
<td>M-VM</td>
<td>Maintenance and Vegetation Management</td>
</tr>
<tr>
<td>T</td>
<td>Transmission</td>
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The following color codes have been utilized in assessing the relative value, ease of implementation, and costs for each recommendation.

Table 4: Value Key

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<th>Low Value</th>
<th>Moderate Value</th>
<th>High Value</th>
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Table 5: Ease of Implementation

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<th>Moderate to Implement</th>
<th>Easy to Implement</th>
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With regards to “Implementation Timeframe,” the following definitions apply:

<table>
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<th>Immediate</th>
<th>Within 6 months</th>
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<td>Mid-term</td>
<td>Within 6-12 months</td>
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<tr>
<td>Long-term</td>
<td>Greater than 12 months</td>
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5.1. Findings and Recommendations Overview

As noted previously, the findings and recommendations in this report are based on interviews, a review of the internal SCE RCE, and an analysis of restoration data. While it is important to understand that each storm is different (e.g., different path, wind speeds, precipitation levels, etc.) and that each utility system is inherently different from the perspective of customer density, geography, and operating philosophy, the general practices in emergency preparedness and response should not vary greatly across the industry.

Following the November 30 windstorm, SCE restored all of its customers within seven and a half days and did so without any serious injuries to SCE staff or the public. In addition, SCE’s logistics practices (from a food and stores perspective) and the transmission group performed well during the response to the event.

Although SCE is a process- and data-driven company, that drive exposed numerous opportunities for SCE to improve its preparedness for and response to events. Opportunities for improvement include: enhanced emergency management plans; response organizational structure, and training; the ability to understand the complexity and needs of the event (situational awareness); an improved planning and analysis function, with a robust damage assessment process; enhanced communications processes, including development and release of ERTs; and crew management practices.

As a process- and data-driven company, SCE is well-positioned to adopt new restoration strategies and implement the Incident Command System (ICS) throughout the organization. SCE has most of the skillsets to accomplish these goals within the company currently.

Figure 12, below, provides an assessment of SCE’s performance in key areas when compared to industry standards and best practices. More specific explanations for each rating are provided under the detailed discussions of each area.
The following sections detail more than 80 findings and 70 recommendations, separated into the key evaluation areas noted above: Emergency Planning and Preparedness; Resource Acquisition and Mutual Aid; Crisis Communication and ERTs; Damage Assessment, Analysis, and Planning; Restoration Execution; Information Systems and Technology; Logistics; Call Center Performance; Maintenance and Vegetation Management; and Transmission.

Key recommendations across all evaluation areas include:

- Develop an emergency response vision and guiding principles;
- Consider the creation of an SCE emergency management group;
- Define restoration strategies;
- Fully implement an ICS response structure;
- Define expectations with external Emergency Management Agencies;
- Standardize shifts during events;
- Enhance the Mutual Aid Annex to the ERRP;
- Coordinate all externally facing staff under a single communications team to better execute a “one voice” approach;
- Enhance process for developing and releasing ERTs;
- Enhance LPA program;
- Implement a comprehensive Damage Assessment, Analysis, and Planning process;
Findings and Recommendations

- Improve weather and forecast monitoring;
- Develop and implement a restoration strategy for different size events;
- Develop and implement, in collaboration with communities, a prioritized weighting mechanism;
- Strengthen OMS training;
- Ensure that software and hardware to operate OMS during peak usage are sufficient;
- Fully deploy MDTs and provide appropriate training;
- Formalize agreements with key staging and satellite sites;
- Ensure adequate health and sanitation facilities at staging sites;
- Develop a protocol for changing the default page of sce.com to the storm page; and
- Develop and implement a detailed transmission prioritization tool.

Figure 13, below, depicts all of the recommendations detailed in the following sections in a prioritized matrix. More specifically, each recommendation has been evaluated by the Davies Consulting team and, based on several factors, including effect on customer satisfaction, effect on restoration efficiency and success, and the suggested timeline for implementation, assigned an overall value. Each recommendation was also assigned an ease of implementation score (ranging from easy to hard), which was based on consideration of several factors, including cost, required collaboration with outside agencies/entities, and amount of change to existing processes and culture.

It is important to recognize that while a number of the recommendations are relatively easy to implement in isolation, this report includes a large quantity of recommendations of varying importance, which if accounted for in total, present a significant challenge to implement simultaneously. Therefore, SCE will have to consider how best to ultimately prioritize and implement these recommendations based on the available resources and funding.
Figure 13: Summary Recommendations Matrix
5.2. Emergency Planning and Preparedness

Across the electric utility industry, formal emergency management programs and organizations have been established and corporate boards and executives are outlining emergency response visions and guiding principles that clearly communicate a focus on emergency planning and response. These steps illustrate that the industry recognizes the risks associated with a variety of hazards – both in events themselves and in failing to respond to events effectively. As more utilities realize that structured emergency management organizations act as an insurance policy against catastrophic events, they are beginning to tie employee and corporate performance to emergency response and preparedness goals and objectives. Utilities are seeing that the costs associated with funding robust emergency management structures are justified when compared to the risk of having a less-than-successful response to a catastrophic event. As boards, executives, strategic stakeholders, and customers increasingly call for more efficient responses to emergencies, utilities are making emergency management a core competency of their business models.

In addition to the establishment of an emergency management business group and development of a vision and guiding principles, additional best practices to consider related to emergency planning and preparedness include:

- Incorporation of the Incident Command System (ICS) into the emergency response organization and event management;
- A formal process for assigning, evaluating and removing staff from second role positions, that is tied to Human Resources (HR) and training systems;
- Annual system-wide exercises designed to stress response processes and enable the company to identify improvement opportunities prior to an actual event;
- Coordinating with local and state agencies in exercises and planning efforts;
- Developing and executing training programs to ensure utility staff are prepared to adequately fulfill their second roles during emergency;
- Establishing partnerships with regulatory stakeholders to ensure that the emergency management organization is appropriately staffed and resourced; and
- Tying emergency preparedness and response performance to key performance indicators for staff.

Adopting the above practices drives organizations to internalize emergency management strategies into everyday management decision making rather than only during an event.

5.2.1. Findings

In the last couple of years, SCE has recognized the importance of implementing the Incident Command System to ensure that the company is effective in responding to and managing events. At the time of the November 30 windstorm, however, ICS was not fully implemented at SCE and a number of response staff were not fully trained to
Findings and Recommendations

effectively utilize the system during an event. SCE’s existing plans and procedures appear to be overly focused on the operational aspects of response, without fully recognizing that an outage event affects the entire community. Additional improvement areas related to emergency planning and preparedness include: insufficient focus on emergency planning and preparedness during blue sky days; emergency plans that are not detailed enough to provide incident managers with sufficient direction; an event category matrix that does not clearly and sufficiently address large and complex events; insufficient training and functional exercises; and the lack of fully defined “incident” response roles, which is a role or task that a person performs during emergency conditions that is different from their normal work activities.

SCE does not have a clearly defined emergency management vision or guiding principles.

An emergency management and response vision clearly communicates the company’s approach to emergency management, including both response and preparedness. Through the process of developing a vision, senior management staff identify, from the company’s perspective, the key elements to a successful event (whether it be safety, communications with customers, collaborating with communities before and during events, training, etc.) and then, through internal education campaigns, ensure that all company staff understand the vision and its importance to the company. Having a well-communicated and understood vision prior to an event helps company personnel understand and internalize that responding effectively to emergencies (including communicating effectively and restoring power) should be a core competency of the utility.

SCE’s current plans and protocols do not provide adequate direction to SCE personnel in responding to a significant event.

SCE’s Corporate Emergency Response and Recovery Plan (ERRP) addresses the following high-level topics:

- Concept of Operations;
- Administrative Practices; and
- Response and Recovery Activities.

The objective of the plan is “to articulate SCE’s strategies and priorities; to summarize the plans and procedures of SCE’s business units and departments to meet SCE’s goal of protecting and restoring electric service during emergencies. The plan provides a framework for coordinating and integrating the outage response and recovery activities of all organizations and informing all stakeholders from the onset of the event until the deactivation of emergency status.” There is, however, a lack of clarity in how the ERRP relates to other plans. It does not clearly define:
Findings and Recommendations

- The organizational structure used during an event response—and how this organizational structure differs from day-to-day operations;
- The roles and responsibilities of staff, including checklists, detailed process descriptions and/or maps to assist personnel in responding to an incident; or
- A detailed methodology/process for event categorization.

The purpose of the Transmission and Distribution Unit’s (TDBU) ERRP is to establish procedures to ensure the restoration of the transmission and distribution systems and was specifically developed “to accommodate the increased volume of customer trouble calls and other activities associated with major outages that affects 10 percent of the electric utility’s serviceable customers simultaneously.” Even though the TDBU ERRP has detailed role and responsibility descriptions and checklists, the plan lacks detailed processes for key functions required during a significant event. As written, the plan only considers an event that causes 10% of its customers to lose power. Although there are some associated protocols, not addressed in the plan, which could be used in larger scale events, the TDBU ERRP itself does not address larger scale outages. The TDBU ERRP did not provide appropriate process detail in the key functional areas (e.g., damage assessment) during the November 30 event, an event which only caused 5% of the customers to lose power.

SCE’s event classification matrix did not adequately address a complex, geographically focused event.

SCE’s emergency response plans are focused on restoring outages and not on responding to a community event.

The TDBU ERRP is the primary response plan for storm restoration and adopts an operational focus to restoring the power. It does not fully recognize the importance of communicating effectively with external stakeholders and coordinating the response with other community organizations, including local government, first responders and other entities involved.

SCE’s Business Continuity Group’s position within the company limits its ability to effectively prepare the company for emergency response.

Responsibility for emergency management within SCE lies within the Business Support Organization, which also has responsibility for: Business Continuity and Resiliency; Safety; Security; Materials Management; Janitorial Services; etc. As a result, the emergency management group does not appear to have enough visibility and authority to drive improvement in emergency preparedness and response across SCE. The creation of a formal emergency management group, with senior executive leadership, is critical to effective emergency response because it not only ensures that adequate focus is placed on the preparations (planning, training, collaborating with external stakeholders, etc.) necessary for effective response, but also demonstrates to utility staff that preparedness is part of the company’s fabric.

SCE’s event classification matrix did not adequately address a complex, geographically focused event.
In addition to including an adequate number of event levels to address a catastrophic event (based on customer outages and/or outage orders), a robust event classification matrix will generally include:

- Number of typical outage orders;
- Number of typical trouble tickets;
- Customers out of service;
- Expected restoration duration;
- Typical weather associated with event category; and
- A general description of the event category, including regions affected, need for external resources, decentralization process, and restoration strategy to be used.

The three event categories defined in the TDBU ERRP do not provide proper guidance for declaring events – beyond the time required for restoration and the number of zones affected. More specifically, the TDBU ERRP provides that following definitions for each event category:

Table 6: SCE Event Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Event is localized to a geographic area and resources at the zone level are sufficient to manage response and recovery activities.</td>
</tr>
<tr>
<td></td>
<td>▪ Five or more circuit interruptions, area outs, or combination thereof, in any one regional sector in the same zone within a two hour period or at the direction of the Storm Management Center Manager</td>
</tr>
<tr>
<td></td>
<td>▪ Sufficient DC&amp;M resources can be deployed to provide assistance</td>
</tr>
<tr>
<td></td>
<td>▪ Storm Management Center for the impacted area will be activated</td>
</tr>
<tr>
<td></td>
<td>▪ T&amp;D storm reporting system will be activated</td>
</tr>
<tr>
<td></td>
<td>▪ Minimal staffing of the Business Unit Storm Support (BUSS)</td>
</tr>
<tr>
<td>2</td>
<td>The event is escalating and a second zone is involved</td>
</tr>
<tr>
<td></td>
<td>▪ Multiple zones are impacted, and requirements for additional resources need to be coordinated at a higher level to ensure efficiency</td>
</tr>
<tr>
<td></td>
<td>▪ Resources are deployed from the closest region regardless of division boundaries</td>
</tr>
<tr>
<td></td>
<td>▪ All Storm Management Centers will be activated</td>
</tr>
<tr>
<td></td>
<td>▪ The BUSS is staffed at varying levels</td>
</tr>
<tr>
<td>3</td>
<td>The emergency or event requires additional assistance because SCE resources are fully committed and restoration will be prolonged beyond 72 hours.</td>
</tr>
<tr>
<td></td>
<td>▪ Service restoration cannot be completed within a 72 hour period, utilizing available SCE resources, because of the extent of damage to the electrical grid</td>
</tr>
<tr>
<td></td>
<td>▪ T&amp;D Storm Recovery Manager may request mutual assistance</td>
</tr>
<tr>
<td></td>
<td>▪ The BUSS is fully activated</td>
</tr>
<tr>
<td></td>
<td>▪ Ongoing notification/updates to key T&amp;D Managers and field personnel</td>
</tr>
</tbody>
</table>

The event categorization matrix, as provided above, does not provide SCE staff with flexibility to quickly determine an appropriate event category, particularly where events are significant or complex but limited in geography (i.e., the November 30 windstorm).
SCE’s existing restoration strategy is not optimal for an event of the size or complexity of the November 30 windstorm.

A clearly defined process for identifying an appropriate restoration strategy (order-, area-, or circuit-based) and transitioning from one strategy to another is imperative to a successful restoration. In order-based restorations, which are typically limited to small events, the company manages resources and work based on OMS orders. In area-based responses, a utility will decentralize crew and work management to regions or divisions, with a centralized System Operations group retaining control over crews restoring feeder lockouts and responding to 911 calls. All major restoration work is referred to the decentralized region, where work is prioritized, resource needs identified and resources managed, and ERTs developed. In circuit-based restorations, resources are assigned to work on a circuit or portions of a circuit, and the circuit is isolated, defeating the ties between the circuits, and transferring switching authority to the field supervisor. This approach typically eliminates the bottlenecks in switching and tagging. An example of how a restoration strategy can be graphically represented is shown below, in Figure 14.

Figure 14: Restoration Approach Example

SCE recognized the need for a circuit-based restoration strategy during its response to the November 30 windstorm. However, the company had not previously identified the processes or procedures necessary to execute a circuit-based strategy and had not trained internal staff on the process for decentralizing.

The SCE ERRP and TDBU ERRP appear to be inconsistent with regards to incident management roles and responsibilities.

According to the SCE ERRP, the Officer-in-Charge will, during “major service interruptions” and “storms or severe weather,” lead the initial recovery efforts and will determine the level of activation for the Emergency Operations Center (EOC).
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Furthermore, the OIC will have responsibility for recovery operations and has “authority to direct all company activities and resources.” At the same time, the SCE ERRP also indicates that “overall accountability for storm recovery efforts rests with the TDBU Storm Recovery Manager” and the TDBU ERRP provides that “Grid Operations, Design, and Construction Maintenance management shall manage events using the Event Response Strategy.” The two plans seem to be in conflict regarding what role is ultimately responsible for managing a significant event. As a result, during SCE’s response to the November 30 event, SCE staff were unclear who had ultimate responsibility for the company’s response to the event. While the Storm Recovery Manager or “storm boss” role was well-understood, overall responsibility for the storm on a corporate level was not well-defined.

While certain executives were involved in the storm and adopted a limited command role, there was no escalation of command beyond the TDBU Storm Recovery Manager. Since this was consistent with SCE’s plan, it demonstrates that the current plan does not consider escalation beyond a single business unit. It also appears that the current plans are focused on operations and do not adequately recognize the importance of other responsibilities, such as communications, planning and forecasting.

**SCE developed an ICS implementation plan prior to the November 30 windstorm and committed to conducting ICS training in 2010, but the company’s current response structure does not align with ICS.**

ICS is a standardized, on-scene, all-hazard incident management concept, which allows responders to adopt an integrated organizational structure to match the complexities and demands of single or multiple incidents without being hindered by jurisdictional boundaries. ICS, which is increasingly being used by electric utilities as the foundational structure for emergency response organizations, was first developed as a result of a series of devastating wildfires in California in 1970. During the fires, local and state fire services found themselves ill-prepared to manage a response to a large multi-jurisdictional incident, particularly with regard to coordinating fire departments, police, forest and land agencies, hospitals, rescue teams, and electric and other utilities. The varied response organizations, communications, and terminology used by the agencies caused deficient communications, coordination, and management. According to the Federal Emergency Management Agency (FEMA), ICS is designed to:

- Meet the needs of incidents of any kind or size;
- Allow personnel from a variety of agencies to meld rapidly into a common management structure;
- Provide logistical and administrative support to operational staff; and
- Be cost effective by avoiding duplication of efforts.

Through the use of span of control management (generally one supervisor to between three and seven reports) and a top-down organizational structure, ICS helps ensure full utilization of all incident resources, decreases confusion, and improves communication.
ICS places emphasis on the development and use of Incident Action Plans (IAPs) to identify and communicate incident objectives to response personnel. Additional benefits to adopting ICS at SCE include:

- Replaces a personality-based organization with clearly defined roles and responsibilities and a *response* organizational structure that leverages incident management capabilities, regardless of blue sky role;
- Engages SCE with the local emergency management and public safety communities;
- Prepares SCE to leverage local and nationwide resources during a disaster; and
- Places SCE as a leader in utility emergency response.

The ICS organization uses five functions as the foundation for emergency response management. These functions include:

**Figure 15: Basic ICS Structure**

- Incident Command: Sets incident objectives, strategies, and priorities and has overall responsibility at the incident or event;
- Operations: Conducts tactical operations to carry out the plan;
- Planning: Prepares and documents the Incident Action Plan to accomplish the objectives, collects and analyzes damage information, evaluates resource status and identifies resource needs;
- Logistics: Provides support, resources, and all other services needed to meet the operational objectives; and
- Finance/Administration: Monitors costs and provides accounting, procurement, time recording, and cost analyses.

Incorporation of ICS into a utility’s business plan can enhance cooperation with key stakeholders and external entities, such as governments, first responders, and other utility providers.

Prior to the November 30 event, SCE developed a multi-year ICS plan, which established:

- Three partially-staffed Incident Management Teams;
- Position-specific training; and
- Training across a broad swath of SCE response and recovery positions.

The ICS training began around 2010 and the plan defines how SCE will implement ICS through 2015. SCE created a Board-level goal to conduct initial ICS awareness training in 2010 and continue training corporate operational staff in 2011.
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The plan does not, however, address how all SCE staff with a response role will be trained on ICS. In complex incidents such as the November 30 windstorm, all SCE staff, from front line supervisors to planning staff and external liaisons, should have a detailed knowledge of ICS and its key principles, including incident management, scalability, and span of control. Any organization, including a large utility, will be challenged by implementing a culture change as significant as ICS. In SCE’s case, there were functional areas in the company, including influential transmission and distribution staff, who indicated an initial reluctance to transition to ICS. Had SCE been able to partially implement ICS prior to the windstorm, which would have been an extremely aggressive timeline, it is impossible to determine how differently the overall restoration would have been executed. This is because ICS is only fully effective once it is integrated into all event responses -- whether a single pole down or an earthquake or a pandemic -- which can take 5, 10, or 15 years to accomplish. Since the storm, key SCE staff have identified the benefits of ICS not only in managing an emergency effectively, but also in collaborating and communicating with internal and external stakeholders. SCE leadership understands the need to work with state, local and regional public safety officials, elected leaders, and communities under the umbrella of ICS.

*SCE does not widely use incident response or “second roles” during events and senior management event response roles are not well-defined.*

An incident response role is defined as a role or task that a person performs during emergency conditions that is different from their normal work activities. In electric utilities, a significant number of employees are typically assigned and trained on second jobs that are activated when a major incident occurs – this is necessary because utilities are designed to be as cost-effective as possible. Therefore, during a substantial incident, resources are required to undertake responsibilities that are not typical of their day-to-day roles (such as wire down guards, damage assessors, planning staff, incident commanders, etc.). Included in a robust incident response role procedure is the development of a formal process for assigning, evaluating, and removing staff from second role positions that is tied to HR and training systems. SCE does not currently have a defined process for assigning, tracking, training, and/or evaluating incident response role personnel. SCE has used incident response roles sporadically (such as using Meter Electricians as Wire Down Guards or engineers as damage assessors) but has not utilized the functionalities available in its HR system (SAP) to track incident response roles.

Industry-wide, utility executives grapple with their roles in an emergency response. Many executives are eager to contribute during restoration, but, injecting opinions can, if not carefully delivered, disrupt the restoration hierarchy and may adversely affect communication and candor at the middle and lower ranks of an organization. During the November 30 response, the lack of clarity in roles and responsibilities may have stifled some staff from questioning decisions made by senior executives without clear storm roles.
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There were insufficient TDBU resources to manage an event as complex as the November 30 windstorm and SCE staff incident management expertise was not fully utilized.

Interviewees indicated that there were insufficient resources available within TDBU to adequately manage an event as complex as the November 30 windstorm. During the event, staff worked long and possibly inefficient hours to restore the system as quickly as possible. More specifically, there were systematic resource shortages for the following functions:

- Substations;
- Distribution Operations Center (DOC);
- Business Unit Storm Support (BUSS);
- Local Public Affairs (LPA); and
- Service Centers.

SCE’s business continuity group, however, includes staff with extensive experience in incident management practices, including membership in national-level Type I Incident Management Teams. Although these staff members have had experience in incidents more complex than the November 30 windstorm, the lack of a clear incident response role assignment process and lack of implementation of a full ICS structure did not allow the staff to be utilized effectively. Had the TDBU plan leveraged resources outside of TDBU, the restoration would likely have been managed more efficiently and effectively.

SCE conducts periodic table top exercises regularly, but has not conducted system-wide functional exercises since 2008.

Pursuant to the Corporate ERRP, “SCE conducts an annual exercise utilizing . . . emergency plans.” In addition, the TDBU ERRP provides that “yearly corporate exercises must be conducted.” SCE has not recently conducted a system-wide functional exercise to stress test its emergency response structure. Establishing a robust training program and conducting annual table top exercises and a system-wide functional exercise are critical to being able to execute an effective restoration – actual response should never be a substitution for training and exercise. While training is used to teach processes, responsibilities, etc., an exercise is intended to build upon the training and practice restoration processes. Exercises should test a company’s effectiveness at responding to an event, including: how personnel respond to their second roles; the communication flow between operations, the communications group and customers; and the emphasis placed on a community-focused response. Objectives of exercises include:

- Verifying staffing requirements and identifying gaps;
- Verifying that non-operations staff understand their roles and how they interface and communicate with operations, other first responder organizations, and local, state and federal agencies;
- Ensuring that key response staff know their roles and responsibilities;
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- Testing plan scalability and the transition from one event level to another;
- Assessing automated storm tools and programs; and
- Testing internal and external communications processes.

As noted above, SCE has conducted limited tabletop exercises, but has not recently conducted a system-wide functional exercise. Furthermore, SCE has not fully leveraged the SAP system to track training and certification for emergency response across the corporation.

**SCE does not have a well-defined process to evaluate risks, analyze outage impacts, and identify resource needs, anticipated costs, and preparedness options.**

SCE’s service territory is in a hazard rich environment—earthquakes, windstorms, thunderstorms, and other events present the company with a number of low probability but high impact hazards. In terminology, SCE’s current plans are focused on “storm” response rather than on responding to any event type. Effective ICS implementation allows a company to respond to any range of events, from outage to pandemic to financial crisis, in a consistent manner.

Although SCE currently has a structured risk management program to evaluate long-term risks, SCE has not effectively leveraged information provided by external stakeholders (such as the early warnings on the November 30 winds or academic studies on earthquake hazards). Furthermore, SCE does not appear to have a clearly defined process for examining weather forecasts, using historical data, and leveraging the expertise of vegetation management staff to evaluate the risks associated with different weather forecasts or risk predictions. SCE neither had a meteorologist on staff devoted to risk analysis nor used a contract weather service to provide predictions of damage to the company’s system based on forecasted weather.

**SCE has a Local Public Affairs Program that is not fully leveraged to enhance collaboration with local emergency management agencies and meet external expectations.**

During blue sky days, SCE’s LPA program is designed to increase SCE’s visibility in the community through a team of dedicated staff responsible for engaging the community. During an event, the LPA program uses SCE staff to act as liaisons to state and local emergency operations centers. Staff assigned to LPA positions and their supervisors, the Regional Managers, collectively referred to as LPAs; however, have diverse skillsets and while some are able to provide the detailed system and operational information that Office of Emergency Management (OEM) officials expect, others are not. During non-emergency operations, the LPAs are widely lauded for their performance. Unfortunately, during the response to the November 30 windstorm, the LPAs were not only overly taxed, they were often put in a difficult position whereby the local and county officials required information and a skillset that they did not possess. During the response, the LPAs did not have adequate backup and were expected to provide
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personal service to multiple towns and EOCs simultaneously. The external stakeholders have since stated that they require personnel who have a better understanding of the SCE electrical operations and restoration strategy.

With regards to the state, the California Emergency Management Agency has three administrative regions, Inland, Coastal and Southern, which are located in Sacramento, Oakland and Los Alamitos, respectively, and SCE only has a staff member assigned to the Southern region. Furthermore, SCE has not adequately and systematically engaged local or state OEMs in establishing expectations related to information sharing and collaboration between the company and the OEM entities.

**SCE conducts after-action reviews regularly, but does not appear to have a strong process to drive implementation of lessons learned.**

In compliance with both the Corporate ERRP and the TDBU ERRP, SCE regularly conducts After Action Reviews (AARs) following table top exercises and incidents. The Corporate ERRP provides that “Business Resiliency conducts a critique following emergencies and exercises. The purpose of this process is to review the response to the event or the exercise and to identify and address deficiencies in current plans and procedures. Following the critique process, and with assistance from those involved in the emergency response or exercise, Business Resiliency develops after-action reports. These reports are forwarded to organizations for further action.” Although SCE conducts AARs, interviewees indicated that there has been a historical lack of follow-through with implementing changes. It was not possible in the scope of this effort to definitively confirm what percentage of the lessons learned were captured and implemented.

### 5.2.2. Recommendations

**EPP-1: Develop an emergency response vision and guiding principles/expectations for SCE event response.**

SCE senior management should create a common vision statement and develop key guiding principles that define the overall expectations for the company’s emergency response. This will ensure that the entire senior management team is aligned around the expectations and that the rest of the organization has clear direction and a framework for implementing key improvements going forward.

As part of the emergency management vision, SCE should also recognize the importance of emergency management and emergency response skills to the long-term sustainability of SCE and its ability to respond to catastrophic events. SCE should establish key performance metrics for evaluating the level of preparedness and include those metrics as part of the performance appraisal system.

**EPP-2: Consider the creation of an independent emergency management organization at the executive level.**
SCE should consider formalizing an emergency management organization within the company that is independent or semi-independent and manages the entire company’s emergency management programs across business units. Best-practice utilities appoint a Vice President to oversee corporate-wide emergency management efforts. The group should have responsibility for leading business resiliency, emergency planning, and preparedness processes, including, but not limited to:

- Serving as the primary liaison on emergency preparedness issues to local, state, and federal emergency management agencies;
- Developing, coordinating, facilitating, and participating in emergency management training, workshops, conferences and exercises;
- Managing all preparedness activities, including training and exercises;
- Overseeing all SCE response, continuity of operations, pandemic, etc. plans;
- Managing second-roles assignment, evaluation, and removal; and
- Supervising, planning and conducting special studies and surveys related to emergency management activities.

An emergency management group is critical to effective supervision of preparedness activities (training, functional and table top exercises, etc.), planning, and response. This holds true of emergency management at SCE and EIX. It is important that incidents requiring escalation to EIX utilize common emergency management plans, policies, and procedures. Therefore, SCE should consider mirroring this emergency management organization at the EIX level.

**EPP-3: Review and revise SCE’s emergency plans to incorporate necessary detail for key response functions and ensure consistency in response across business units.**

SCE should revise both the Corporate ERRP and TDBU ERRP to provide substantive detail around key processes and ensure that the objectives and scope of both documents are consistent. More specifically, SCE should develop integrated plans and processes, including interdependencies, for the following key functions:

- Damage assessment and planning (prioritization, resource needs identification, ERT development);
- Operations (restoration strategies, crew assignment and management, order management, vegetation management, wires down);
- Mutual aid;
- Logistics (fuel, lodging, food, transportation, laundry, etc.);
- Stores and material;
- Storm forensic analysis process; and
- Finance and administration.

Detailed plans would include: organizational structure for each function (including how the function reports into the larger ICS organization); roles and responsibilities for each role; checklists for each role (pre-, during, and post-event); form templates (for example, for mutual assistance, forms would include group rosters, request forms,
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responding company information forms; and travel status forms); detailed process descriptions (a process description for the planning section, for example, would include, but not be limited to, details of how damage assessment is mobilized and how the assessment is conducted (pre-assigned circuits, order-based, how information is gathered, the method of providing damage information back to the planning section, how circuit versus lateral damage is captured, how damage information is compiled, how prioritization of work is accomplished, the method for identifying resource needs, the methodology for developing ERTs based on damage assessment data, the process for developing work packages, etc.); process maps; and training requirements. It should be noted that a robust planning group plan, alone, may be in excess of 100 pages.

After developing plans for the key functions noted above, SCE should ensure that the plans are effectively integrated across the response functions and clearly identify coordination requirements between all SCE business units, EIX’s operating units, external stakeholders such as state, local and federal governments, other utilities, and necessary private or public sector companies.

**EPP-4: Modify SCE’s current event categorization matrix to ensure that is scalable to an event of any type, size, or geographic distribution.**

SCE’s categorization matrix should be refined to address the scale of damage, the resources required, and the management support structure needed during a complex incident. This complexity analysis should include the following details:

- Number of typical outage orders;
- Number of typical trouble tickets;
- Customers out of service;
- Expected restoration duration;
- Percent of SCE’s operating system affected;
- Likelihood that the incident will affect SCE’s standing amongst its stakeholders;
- Typical weather associated with event category; and
- A general description of the event category, including regions affected, need for external resources, decentralization process, and restoration strategy to be used.

The categories should range from less than 10% of customer base out of power to greater than 80%. In doing so, SCE will be able to adequately define the relative impact of different events (by size, geographic spread, etc.) on the company and its restoration efforts and communicate these differences to stakeholders. These categories should not merely consider size, but also complexity and should be applicable to all event types. For example, the November 30 windstorm was a relatively small (in terms of geographic impact and number of customers out compared to customer base) but complex event and the existing categories did not adequately account for an event of that type. In addition, the categories should identify the potential functions that may be activated as the incident escalates. Stakeholders will then better understand and be better able to prepare for events that are predicted to result in prolonged outages.
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EPP-5: Define restoration strategies, including the type of strategy to be used depending on event size and type.

Having a clear process in the ERRP for determining what restoration approach the company will take in any type or size event is critical to a successful response. Once SCE has clearly established an effective event categorization system, SCE should define the restoration strategies it intends to use, the transition process for moving from one strategy to another, the strategies that should be applied to different event sizes, and any other applicable processes required to effectively undertake each strategy.

EPP-6: Fully implement an ICS response structure with defined roles and responsibilities, including accountability for incident management.

As noted previously, SCE has been moving toward ICS for more than a year. SCE should adopt a fully functional ICS organization, with clearly defined roles, responsibilities, and reporting structures that incorporates all elements of response (from communications to planning to field restoration). SCE’s response structure should adequately consider the company’s large service territory and simultaneously avoid an overly granular approach. The organization should be scalable from a minor incident (such as a broken pole) to a catastrophic incident that results in 80% or more of the company’s system or customers affected. SCE should implement ICS as the all-hazards emergency response management system, unless regulatory or policy bodies proscribe otherwise. More specifically, SCE personnel engaged in day-to-day restoration activities (such as overhead crews, troublemen, supervisors, etc.) must be intimately familiar with ICS and must use it on a daily basis not only for the system to be effective during large incidents, but also to ensure that SCE field resources are able to effectively communicate with external agencies and understand management structures (such as at a traffic accident with a pole down or a wildfire). ICS should be integrated into day-to-day operations to ensure it becomes part of the company’s emergency response culture.

EPP-7: Establish a robust incident response role program that defines the process for assigning, training, evaluating, and tracking roles and is tied to HR systems.

As noted previously, a robust incident response role program includes the following clearly defined processes and metrics:

- Assessment;
- Assignment/Re-assignment;
- Expectations;
- Training;
- Mobilization;
- Evaluation (both by the storm assignment and supervisor); and
- Tracking.

In assigning resources, SCE should ensure that an adequate number of staff are assigned to have primary and back-up roles. For example, if SCE adopts an ICS organization with
Area Commanders assigned to the four zones, SCE should assign at least eight staff members to the Area Command role – ensuring that two shifts are covered for a catastrophic event affecting all four zones. The tracking system should clearly identify second roles, the required training, whether the individual assigned to the position has completed the training and is available for event duty, and should be integrated with SCE’s personnel/HR system (so that upon termination, the staff member’s name is removed from the incident response role database). Once SCE has been able to assign an adequate number of resources to incident response roles, SCE should ensure that only staff who have been properly trained are involved in emergency response. It should be noted that the creation of a robust incident response role program is dependent on development and implementation of the ICS-based response structure.

**EPP-8: Establish and implement a structured certification, training, and functional exercise program.**

SCE should design and conduct a formal schedule of training classes, table top exercises, and functional exercises to prepare staff for future incidents. Given that there are infrequent large scale natural disasters in SCE’s service territory, conducting a formal schedule of training classes, table top exercises, and functional exercises is the most efficient and effective method to prepare SCE staff for an inevitable disaster. Training programs should ensure that staff understand roles and responsibilities and general ICS concepts. SCE should ensure that all personnel assigned an incident response role, including staff interacting with external agencies utilizing ICS, be trained and certified to the appropriate level of ICS.

If SCE’s current training programs are not adequately detailed, FEMA has numerous online classes that would provide response personnel with a detailed working knowledge of ICS. Understanding the importance of strong leadership during a storm and the necessity of a robust ICS structure, however, SCE should identify a cadre of command and general staff officers who can be specially trained to understand the roles and responsibilities of the command and general staff positions. These staff members can then become in-house experts who can assist in training and mentoring other SCE staff in ICS and emergency management.

A certification process should be implemented for damage assessors (see Section 5.5.2). Damage assessment is critical to any restoration effort and the successful execution of the damage assessment process requires trust that the data is accurate. Finally, SCE should commit to conducting annual exercises that test the entire company’s ability to respond to a catastrophic event affecting all of the company’s zones. This should be at least a full-day event and test all aspects of the response – from system operations to planning to communications. SCE should consider engaging outside agencies in the system-wide exercise to improve coordination between the company and external stakeholders.
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**EPP-9: Develop a process to evaluate risks, analyze outage impacts, and identify resource needs, anticipated costs, and preparedness options.**

Based on SCE’s decision not to obtain off-system resources in response to the November 30 windstorm, SCE should clearly identify the risks and outage impacts that such decisions may have on an event response in the early stages of the event. A more aggressive acquisition of off-system resources and pre-staging of company crews will ultimately result in increased storm response costs to the company. It is important for SCE to evaluate the different triggers for crew acquisition going forward based on the weather forecasts and a risk assessment. SCE should use this analysis to gain agreement with regulators on expectations and define the cost recovery mechanisms associated with this process change.

**EPP-10: Define expectations with external emergency management agencies and leverage internal resources to improve collaboration before and during emergencies.**

SCE should engage state, county, and local offices of emergency management and town structures to establish reasonable expectations for engagement during an emergency. Currently, the existing LPA program is used to engage OEMs, the media, and town officials. SCE and its partners should set clear expectations related to SCE response and coordination capabilities during an event. While SCE does not need to replicate the level of engagement it currently has through the LPA program, the company does need to ensure that local, county, and all state regional OEMs have adequate 24x7 coordination capabilities with SCE. Through this engagement, SCE will support a change in external stakeholder perception of SCE’s role in emergency management. By actively engaging emergency management entities, SCE will be recognized as a key emergency management stakeholder alongside public safety, emergency management, and other public works personnel in Southern California.

**EPP-11: Ensure that After Action findings and recommendations are tracked and addressed.**

As noted previously, the Corporate ERRP provides that “Business Resiliency conducts a critique following emergencies and exercises. The purpose of this process is to review the response to the event or the exercise and to identify and address deficiencies in current plans and procedures. Following the critique process, and with assistance from those involved in the emergency response or exercise, Business Resiliency develops after-action reports. These reports are forwarded to organizations for further action.” SCE should adopt a mechanism to track the status of after-action recommendations and assign ownership to a specific business group. The best model for capturing these emergency response or emergency management lessons learned and successfully implementing change is to assign responsibility for the effort to a well-funded emergency management program within the company.
### 5.2.3. Prioritized Matrix

**Table 7: Emergency Planning and Preparedness Recommendations Matrix**

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
<th>Value</th>
<th>Ease of Implementation</th>
<th>Implementation Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPP-1</td>
<td>Develop an emergency response vision and guiding principles</td>
<td>High</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
<tr>
<td>EPP-2</td>
<td>Consider the creation of an SCE emergency management group</td>
<td>High</td>
<td>Moderate</td>
<td>Mid-term</td>
</tr>
<tr>
<td>EPP-3</td>
<td>Review and revise SCE’s emergency plans</td>
<td>High</td>
<td>Hard</td>
<td>Long-term</td>
</tr>
<tr>
<td>EPP-4</td>
<td>Modify SCE’s current event categorization matrix</td>
<td>High</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
<tr>
<td>EPP-5</td>
<td>Define restoration strategies</td>
<td>High</td>
<td>Hard</td>
<td>Long-term</td>
</tr>
<tr>
<td>EPP-6</td>
<td>Fully implement an ICS response structure</td>
<td>High</td>
<td>Hard</td>
<td>Long-term</td>
</tr>
<tr>
<td>EPP-7</td>
<td>Establish a robust incident response role program</td>
<td>Moderate</td>
<td>Hard</td>
<td>Long-term</td>
</tr>
<tr>
<td>EPP-8</td>
<td>Establish and implement a structured certification, training, and functional exercise program</td>
<td>High</td>
<td>Hard</td>
<td>Long-term</td>
</tr>
<tr>
<td>EPP-9</td>
<td>Develop process to evaluate risks</td>
<td>Moderate</td>
<td>Easy</td>
<td>Mid-term</td>
</tr>
<tr>
<td>EPP-10</td>
<td>Define expectations with external Emergency Management Agencies and leverage internal resources</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Immediate</td>
</tr>
<tr>
<td>EPP-11</td>
<td>Ensure that After Action findings and recommendations are tracked and addressed</td>
<td>Moderate</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
</tbody>
</table>
5.3. Resource Acquisition and Mutual Aid

Utilities are designed, in organizational structures, staffing levels, and system composition, to provide safe and reliable service to their customers on a blue sky day in a cost-effective way. Therefore, the number of internal line resources utilized by each utility is determined by evaluating the staff needed to complete the capital investment and operations and maintenance work required to operate the utility’s infrastructure while keeping staffing levels reasonable. As a result, during major events, utilities need to acquire additional resource support in order to restore customers in a reasonable amount of time. Effective management of mutual aid resources is one of the most important aspects of successfully responding to a significant event.

In order to acquire these additional resources during peak periods, utilities participate in regional mutual aid groups (RMAGs). These RMAGs collectively utilize their resources to address the needs of their members. As one might expect, when there are widespread weather events, each of the RMAG members may experience significant outages on their respective systems, thus precluding each one’s ability to provide resources for other utilities within the region. As a result, some utilities participate in more than one RMAG in an effort to increase the likelihood of being able to procure additional resources when widespread events occur. During regional events, when all of one RMAG’s resources are engaged in restoration efforts and the members need additional resources, that RMAG can request resources from other RMAGs.

In addition to RMAGs, nearly every utility also participates in a nationwide mutual aid agreement through the Edison Electric Institute (EEI). This agreement facilitates sharing of resources among utilities that are not joined together through RMAGs without having to address legal formalities and define financial arrangements during a major event and governs the sharing of overhead, underground and vegetation management resources. The agreements relied upon by the RMAGs and EEI are generally the same, establishing billing requirements, standard crewing requirements, transfer documentation, and rules for making a request. As part of these agreements, the costs of mobilizing and the associated travel time necessary to transport resources to the requesting utility begin when the one utility requests and another commits to provide resources. Resources that are allocated to a requesting utility normally charge a fully loaded rate, which accounts for the costs associated with trucks and equipment as well as medical and pension benefits for the resource. As a result, requesting and using mutual aid resources can be a costly undertaking for any utility and it is further increased by paying the cost of travel as the distance to reach the requesting utility increases.

In addition to relying on mutual aid organizations, utilities often leverage their partnerships with contract organizations that are normally utilized to address the peaks and valleys associated with capital/O&M programs. In these instances, utilities often negotiate, in advance of an event, the ability to draw upon large contractor resources that may be otherwise working on projects for other utilities (home utilities still have to
release those contractor resources. These agreements are generally tailored to the needs and desires of the utility and are dependent on the capability of the contractor, so the process and standard principles are not as standardized as they are in the mutual aid agreements.

As a result of the complexities associated with acquiring mutual aid resources and the significant adverse impact of not being able to procure resources to address the inevitable weather events, many utilities have a mutual aid strategy as part of their emergency management plan. The strategy and plan may include:

- Detailed description of the company’s mutual aid strategy (when mutual aid is used, how requests are made, how resources are on-boarded and managed during an event, demobilization, etc.)
- Descriptions of mutual aid group processes, roles, and responsibilities;
- All agreements between the utility and mutual aid partners/RMAGs/contractors;
- Damage assessment retainers with third party providers;
- Mutual aid group rosters;
- Mutual aid request forms;
- Responding company information forms; and
- Travel status forms.

Once mutual aid has been procured by a utility, it is imperative that the utility manage the process to utilize the resources effectively. This is usually the most challenging part of acquiring and utilizing mutual aid resources. Every utility designs its day-to-day organization to manage the number of resources that are normally on the property, but during a widespread event, it is not uncommon for a utility to acquire many multiples of resources to effectuate a timely restoration. This significant increase in resources presents various challenges beyond the expected logistics of lodging, providing food, supplying gas for vehicles, and providing appropriate material for reconstruction. The often overlooked challenges focus on actual utilization and optimization of the resources. Usually, the sending utility sends a supervisor for every 5 to 10 crews (approximately 10-20 full time equivalents), but the supervisors are not usually familiar with the work rules and the system that they are going to and are often not familiar with the area from a navigation standpoint. In an effort to address these issues, utilities often provide incoming mutual aid crews with someone who is familiar with the system and/or service territory (“bird dog”). In some cases, the bird dogs can help manage crews and facilitate organizing incoming groups of crews into discrete qualified teams to address system problems. In many cases, however, utilities are unable to spare “qualified” personnel to manage incoming resources. Since the utility does not operate on a day-to-day basis with the number of resources that are necessary during significant events, the utility does not retain the number of underlying support staff required to evaluate and properly identify, assign, and manage work and track progress and record completion. It is therefore important for utilities to identify staff capable of managing field resources by creating storm rosters that include former field staff who may
perform other functions, retirees and even some third party supervisors that can be deployed during an emergency. In addition, having clearly defined processes and supporting technologies helps ensure a more effective use of off-system resources.

5.3.1. Findings

During this event, SCE’s acquisition of resources and their use of mutual aid was a source of great contention in the days and weeks following the windstorm. One challenge was that SCE did not appear to have pre-established criteria to evaluate whether it should acquire any mutual aid resources to support the restoration. Analysis of the SCE event against other storm responses contained in the Davies Consulting database, however, suggests that SCE’s response was in line with other utilities in the number of resources devoted to the restoration per customer out of service. SCE relied on its internal resources and contractor line crews to restore the damage caused by the November windstorm. Given the size and diversity of the SCE service territory, some company crews continued to conduct plan worked in areas that were not affected by the storm, and 74% of the SCE line crew resources were assigned to support the restoration. Once the majority of the customers were restored in the less affected sectors, SCE began to redeploy resources into the most heavily damaged Mesa sector. This is consistent with resource allocation practices in other utilities for this type of event. Based on the simulation, a portion of resources involved in storm restoration continued to report into the sectors which were fully restored. It is difficult to determine with a high degree of confidence, whether additional crews would have made an incremental difference in restoration times or whether SCE could have used its internal resources more effectively instead. It is certain that mutual assistance would have helped improve the public perception that SCE was doing all that it could to restore customer faster. Based on the review, however, there does not appear to be some hesitance to utilize mutual aid crews given concerns for their safety and for their familiarity with the SCE system, processes and procedures.

The Company did not use off-system resources (mutual aid) to support the restoration of the windstorm event.

Since the windstorm affected only a portion of the SCE service territory, the company did not acquire off-system line resources to support the restoration, instead, incident management relied on SCE line resources and sustaining contractors. In anticipation of the forecasted winds (initially predicted to affect PG&E service territory), PG&E initially retained its crews in preparation for restoration work. SCE did consider bringing in mutual aid crews to backfill its own crews in unaffected areas in case another weather system approached SCE’s service territory but there was no foreseen hazard that indicated backfilling was necessary.

Given the compact size of the affected area (primarily the Mesa sector), the delay in obtaining solid information regarding the level and location of damage, and the order-
based restoration strategy that was primarily used, it is difficult to determine whether off-system crews would have been deployed efficiently during this restoration. In addition, the mutual aid process across the west coast of the United States does not seem to be well-established. The companies mostly depend on bilateral discussions to help each other in case of a large event. Given the size of the west coast utilities, they do not often require mutual aid, and therefore have not created a strong central clearinghouse to acquire and allocate mutual aid crews in case an event affects multiple utilities.

**SCE's mutual aid process does not seem to be robust.**

The current approach to identifying the need, onboarding, and managing mutual aid crews does not provide for the effective acquisition and use of off-system resources. Over the years, SCE has built strong relationships with on-system contractors and depends on them to provide additional resources, when necessary. However, there appears to be a concern within SCE regarding the ability of off-system mutual aid crews to work safely and productively on SCE’s system due to the lack of familiarity with the system. Utilities in other parts of the country have leveraged mutual aid process to relatively quickly restore outages after large events, such as major hurricanes and ice storms. Utilities in the south and along the East Coast of the United States have embraced the need to efficiently use mutual aid crews to support operations and have created processes to effectively manage a large influx of off-system resources. In California and SCE in particular, geographic isolation and perceived strict and unique California laws and regulations, create a situation whereby mutual aid crews are rarely used and there is great discomfort within the utility to use these off-system crews.

### 5.3.2. Recommendations

**RA-1: Enhance mutual aid annex to the ERRP**

SCE should consider enhancing the Mutual Assistance Crew Assimilation Plan and create a robust Mutual Assistance Annex to the ERRP, with accompanying processes and policies, to outline how SCE should handle mutual aid crews during a large scale or complex incident. In addition, and in coordination with revising its current event categorization matrix, SCE should develop a storm matrix for various event categories that identifies the mutual aid resources necessary to restore customers within a prescribed period of time. Additionally, the matrix should identify different types of events (i.e. rain versus wind) and establish resource requirements specific to those types of events, (i.e. pole events requiring auger trucks versus fuse events requiring line trucks). Included in this annex should be: trigger points for when to call for in-state and out-of-state mutual aid; considerations for how to manage MA crews based on different restoration strategies (order-, circuit-, or area-based); and overall management of mutual aid crews (California-based and other states). This document should also identify all the necessary resources to handle a large event and determine the maximum
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number of off-system resources that SCE can effectively manage during a restoration event.

**RA-2: Work with the CPUC to clarify what regulations, if any, need to be adjusted to support SCE’s use of out of state mutual aid crews in large scale or complex incidents.**

It is unclear what role CPUC regulations play in SCE’s approach to requesting and managing out of state mutual aid crews. While these findings do not support or deny an argument that out-of-state mutual aid crews should have been used during this storm, SCE should include in its planning assumption the use of out-of-state mutual aid crews to support large scale, complex restorations in the future. When developing these planning assumptions, SCE should engage the CPUC to ensure that both the regulations and the planning assumptions support the efficient management and beneficial use of out-of-state mutual aid crews.

**RA-3: Define triggers for suspending normal-day planned work during an incident.**

While the SCE service territory is large and typically only portions of it would be affected by a major event, SCE should develop criteria for suspending normal business during incidents in order to support restoration and communication efforts. This would help the incident command structure determine the available resources and allow the incident commander to make a quick decision regarding the allocation of resources, including rest times and shift schedule for the duration of the restoration effort.

### 5.3.3. Prioritized Matrix

**Table 8: Resources Acquisition and Mutual Aid Recommendations Matrix**

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
<th>Value</th>
<th>Ease of Implementation</th>
<th>Implementation Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA-1</td>
<td>Enhance the Mutual Aid Annex to the ERRP</td>
<td>High</td>
<td>Moderate</td>
<td>Long-term</td>
</tr>
<tr>
<td>RA-2</td>
<td>Engage regulators regarding out-of-state mutual aid</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Long-term</td>
</tr>
<tr>
<td>RA-3</td>
<td>Define triggers to suspend blue sky work during incidents</td>
<td>High</td>
<td>Easy</td>
<td>Mid-term</td>
</tr>
</tbody>
</table>
5.4. Crisis Communication and ERTs

Communicating effectively not only to external stakeholders (customers, regulators, elected officials, media, etc.) but also to internal company staff is at least as important as restoring power. In order to meet expectations and maintain customer and stakeholder satisfaction during major power outages, a utility must:

- Demonstrate that it knows the customer is without power;
- Convey a sense of urgency about restoring power;
- Provide consistent and accurate information on restoration progress; and
- Provide customers with accurate and reasonable estimated times of restoration.

Keeping the objectives of communication in mind, the high-level questions to be evaluated related to communication and ERTs include:

- Have processes been put in place to ensure “one voice” communication during major events, and are these processes followed?
- Is there a process for creating and managing ERTs that is sufficiently granular to meet the needs of stakeholders?

The utility should designate a single individual who is responsible for communicating with the media and public, leaving the rest of the utility free to focus on the restoration. The content of the messages delivered during the restoration should be confined to helping customers understand the prioritization and restoration process, issuing safety advisories, delivering progress updates, and providing ERTs. Introducing additional voices during a major restoration effort can lead to inconsistencies in information. This creates confusion that must be addressed, and ultimately draws resources away from the restoration effort.

The occurrence of a major event requires a utility not only to mobilize en masse to restore service in a safe and timely manner, but also to keep customers apprised of its progress. To succeed in each of these tasks, the utility must do more than simply work faster than they would during normal operations: roles shift, the complexity of the operation increases, and the need for structured internal communications increases dramatically.

5.4.1. Findings

As noted previously, SCE did not approach the November 30 windstorm and its response as a community event, where communicating effectively, including providing accurate and timely information, was as important as restoring power. The company’s existing communications plans and structure do not promote the adoption of a “one voice” approach to communications. In this type of approach, representatives from all externally facing groups (Customer Service, LPA, Regulatory, etc.) are integrated in a single communications group that reports to the incident commander and is co-located with the incident management team. In addition, the process for establishing,
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communicating, and managing ERTs is not well-defined and responsibility for managing the process is not clearly assigned. Additional potential improvement includes collaborating with government agencies and public organizations, like the Red Cross, to ensure that SCE is not undertaking efforts typically under the authority of emergency management organizations and is, instead, focused on communicating information and working with the communities to identify priorities for restoration and to conduct customer education.

*Although SCE’s Corporate Communications group has a detailed Incident Communications Plan, key details that would assist the company in communicating effectively during an event are not fully addressed.*

The Incident Communications Plan, which was updated most recently in January 2012, includes both tactical materials and a strategic guide designed to “provide resources and guidance to the Corporate Communications team responsible for handling communications following or during an incident.” The tactical materials include:

- Key questions;
- Checklists
- Agendas;
- Contact lists (internally and external subject matter experts);
- Incident Action Plan samples and templates;
- High level communication practices for Corporate Communications during crises;
- Messaging templates;
- Key talking points by event type; and
- General procedures.

The strategic guide includes:

- Plan scope and objectives;
- An overview of ICS, particularly related to Corporate Communications;
- A high level organizational structure; and
- General protocols, including activation, response, and recovery.

The Incident Communications Plan does not, however, include detailed process flows, descriptions of how Corporate Communications integrates with the SCE response organization and obtains/shares data, a detailed organizational structure, role descriptions, pre-drafted releases to assist in communications – particularly related to outage response, and descriptions of pre-event procedures (for known events). This is a key gap, with one external stakeholder noting that it was obvious that the decision makers were not aware of what was actually happening or they would not be saying one thing while the reality on the ground indicated a different situation.

*The TDBU ERRP and the Incident Communications Plan are inconsistent regarding accountability for communications effort and SCE’s Incident Communications Plan*
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*does not clearly establish a “crisis information center” that incorporates all communications/externally facing staff.*

According to the TDBU ERRP, the T&D Communications Manager, who reports to the Storm Recovery Manager, is “accountable for all storm communications interfaces once the BUSS is activated.” The plan further provides that the Communications Manager position acts as a central point of contact for storm communication activities and manages the Storm Management Center. Responsibilities listed are to collaborate with the Communications Liaison and T&D Report Supervisor in the preparation of press releases as necessary, to coordinate media requests for filming opportunities, to coordinate photography for post-storm use, and to act as an external information focal point. As noted previously, the BUSS was activated on November 30. At the same time, the Incident Communications Plan provides that during an incident, the Corporate Communication Incident Command System (CCICS) will “serve as the focal point for Company communications.” These responsibilities, while appropriately under the purview of CCICS, directly contradict the responsibilities assigned to the T&D Communications Manager in the TDBU ERRP. Although the T&D Communications Management once functioned as prescribed, over the last few years, it has been focused on executive summary reporting, including compiling daily reports of storm statistics for distribution to the executives. The TDBU ERRP establishes several other communications-focused roles, including the Zone Communications Manager and Corporate Communications Liaison.

Notwithstanding that the ICP contains a substantial amount of useful information, how the CCICS group, which seems to be comprised of Corporate Communications personnel only, integrates with other key functions within SCE is not clear. By not incorporating all externally facing staff (Corporate Communications, Contact Center, LPA, key accounts, regulatory/government relations) and TDBU communications personnel (T&D Communications Manager, etc.) into a “crisis information center,” stakeholders may be provided with inconsistent information, talking points, messaging, etc. Finally, the apparent lack of communications liaisons, who report to the CCICS may complicate the effective flow of information from the operations side of an event (particularly a restoration) and the field to the centralized communications group. During the November 30 response, this was apparent in the conflicting requests from storm managers regarding how to derive statistics to be included in executive reports.

*SCE does not have a unified “crisis information team” in the plans; during the November 30 response and the TDBU ERRP communications processes were not followed.*

As noted above, the current communications structure, with some communications staff reporting to the T&D Storm Recovery Manager and others reporting under the CCICS, is an opportunity for improvement. Even as written, and taking into consideration that improvements can and should be made, however, the plan was not
Followed during the response to the November 30 windstorm. More specifically, the T&D Communications Manager (and the alternates acting as backups) did not report to the BUSS, but instead reported at GO-3, which Section 8 of the TDBU ERRP describes as a secondary BUSS location intended to provide engineering, system protection and other technical assistance. As a result of being located at GO-3, the T&D Communications Manager was unable to provide Corporate Communications, LPA, and other groups with the information they sought.

One of the key drivers behind the establishment of the BUSS communications function (which should, going forward, report through the CCICS or a crisis information team) was to provide restoration information, including ERTs, to LPA staff. Interviews indicated, however, that the LPA staff is not consistently contacting the BUSS to obtain storm restoration information for community officials. In one instance, it was reported that an LPA staff member needing restoration information contacted a Customer Contact Organization (CCO) supervisor to determine if that supervisor had, or could get, the required information. The Customer Contact supervisor then had a Customer Support Specialist make some calls to see if she could help the LPA. The Customer Support Specialist then contacted the DOC and was informed that while DOC staff did not have time to assist, the BUSS would have the information. This example demonstrates an internal communication process that should be enhanced by establishing a “clearinghouse” for information in the form of a crisis information team.

SCE’s CCICS uses a number of effective tools to communicate with stakeholders.

Recognizing the many differences in customer and other stakeholder communication preferences, SCE has developed a number of different methods to communicate during major events. At the time of the November 30 windstorm, those communications channels included the following:

- Telephone contact through the Customer Contact Organization;
- IVR outbound calls to customers who requested outage updates and load restoration calls;
- An outage map;
- E-mail, text, and Text Telephone (TTY) for Medical Baseline customers who have indicated a preferred communication method;
- E-mail and text for large business customers;
- Press releases;
- Interviews with news media;
- Twitter (monitoring and calling of users asking to be contacted);
- Phone, e-mail, and in-person communications with cities and communities through LPA staff;
- Customer Storm Distribution Centers to provide customers with emergency supplies, safety information and responses to other inquiries; and
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- Meter Readers and Field Services personnel who canvased neighborhoods heavily impacted by the storm to provide safety information, general restoration information, and directions to Storm Distribution Centers.

SCE’s Corporate Communications developed 16 press releases, after coordination with operations personnel, and arranged numerous media interviews (including one by an SCE Distribution Business Line Director from a helicopter while surveying damage and restoration work) during the windstorm response. In an attempt to follow a “one-voice” approach to communications, Corporate Communications had all press releases approved by both the Legal Department and the President before they were released and all messages were provided simultaneously to internal and external staff. It should be noted, however, that a best communication practice is to provide internal staff key messaging, talking points, and press releases prior to external release. During the event, SCE used a business and communications intelligence firm that provided media research, monitoring, and communication evaluation support. The use of such support firms, during events, to independently evaluate message tones and effectiveness is a best practice and allows a company to proactively adjust its communications strategy as an event unfolds.

As noted above, at the time of the storm, the company had a Twitter account. Corporate Communications monitored Twitter closely to ensure the Company’s responsiveness and some of the tweets were passed along to CCO Specialists for response. Not long after the windstorm response, the company also added Facebook to its social media communications channels. For many years, SCE has recognized they need to improve communications with customers during outages and has formed cross-functional teams to work on various initiatives to improve outage communications. These efforts, which have resulted in the implementation of new customer communications tools, have also improved customer communications during planned outages. Since the outage event in 2011, SCE has improved its website. SCE’s website improvements, which were launched on December 10, 2011 and included outage reporting capabilities and outage status updates, had been in development since May 2011. SCE has also provided customers with the ability to receive ERT updates and power restoration messages via e-mail and text.

Although SCE’s Corporate Communications organization proactively mobilized, its communication strategy was overly focused on public safety and did not provide key information that stakeholders sought.

Corporate Communications initiated its crisis communications procedures and began conducting media calls on the topic of public safety prior to the windstorm affecting SCE’s service territory. Furthermore, two weeks before the storm, Corporate Communications staff had conducted a media “boot camp” for external media representatives to provide information on SCE’s wires down policies. Corporate Communications’ messaging strategy beyond public safety, however, was not pre-
planned, including through development of messaging related to damage assessment and restoration practices. Such materials require time and thought in describing engineering concepts in a manner understood by the general public.

In addition, SCE did not have a clear strategy aimed at developing or releasing key estimated restoration time (ERT) information. At 6:00 p.m. on December 2, SCE released a message indicating that the company expected that 99% of customers would have service restored on December 4 by 8:00 p.m. In this initial release, SCE did not distinguish between 99% of total customers or 99% of customers that had been without power at peak. As of 8:00 p.m. on December 4, SCE restored 96% of total customers, which correlates to 93% of customers out at peak.

On the afternoon of December 4, SCE modified its initial statement, indicating that “field crews are continuing to work today, with the expectation that power will be restored by 8 p.m. tonight to 95% of customers whose service was interrupted by the windstorm. The company expects power to be restored to 99.9% of customers who lost service by 8 p.m. [on December 5]“. Based on the information available at the time, the Company publicly stated that it did meet the 95% goal. However, during the course of this assessment, and based on the revised data from SCE, it is apparent that SCE in fact restored 95% of total customers interrupted by the windstorm by 2:00 p.m. on December 4, six hours prior to the deadline. When peak customer outages are considered, SCE restored 95% by 5:00 a.m. on December 5. SCE did not, however, proactively address the inaccuracies or adequately manage customer expectations, since the company did not identify the steps that would be taken if the goal was not met.

All externally facing SCE organizations were not represented in the communications strategy development process.

During the November 30 windstorm response, communications plans were primarily developed by Corporate Communications and Operations, with some LPA involvement. For the most part, Customer Service, which includes CCO (responsible for the Customer Contact Center, IVR, and website), the Business Customer Division, and Consumer Affairs (responsible for medical care customer communications), were not involved in communications discussions. Although representatives from these customer-facing organizations were included in the daily storm conference calls, wherein communications was covered toward the end, those calls are not designed for in-depth discussion of communications strategies. Furthermore, there were no communications-specific conference calls that included all externally-facing functional groups. Finally, the TDBU ERRP does not adequately address collaboration between the various functions responsible for communications. Not being on the “inside track” in thinking through how to address stakeholder communications needs was one of the main factors contributing to a lack of situational awareness of the storm’s significance on the part of many key externally-facing personnel.
The majority of customers received multiple inaccurate ERTs.

It is not possible to do a detailed analysis of the number of inaccurate ERTs or the number of ERTs that any customer may have received because when an Outage Alert Note is updated, the previous information, including the earlier ERTs, is deleted. SCE is working to implement a system change to retain the data in the future. OMS is designed to provide or allow system-generated ERTs, dispatcher-generated ERTs, and field-generated ERTs, which dispatchers enter into OMS once they receive information from field personnel or once a work order is generated and goes to the field.

During the first four hours of an outage, OMS defaults to an ERT of 4 hours. Dispatchers entering ERTs can choose from various options (8 hours, 12 hours, 24 hours, etc. up to 72 hours). During the November 30 windstorm response, and as ERTs expired, dispatch supervisors advised dispatchers to simply add 24 hours to the ERT. Unfortunately, there was little discussion outside of the DOC to determine whether this strategy was the appropriate course of action. On December 3, when SCE’s restoration strategy was modified, some field-generated ERTs were entered in OMS. An analysis of these ERTs revealed that on Wednesday, 9% of all ERT Outage Alert Notes were field-generated. On Thursday, 10% had an ERT from the field, on Friday 4%, on Saturday 45%, on Sunday 53%, on Monday 84%, on Tuesday, 88%, and on Wednesday 78%. These ERTs had some field perspective versus those that the DOC dispatchers had entered without any substantive data intelligence.

SCE did not have an approach for how to address the company’s system-generated ERTs, which are automatically generated through SCE’s OMS. Although many utilities have such automated capabilities, the ERTs generated are typically developed using an algorithm in OMS that calculates an ERT based on existing resource numbers and assumed damage (based on number of calls and predicted device outages), these systems are typically manually turned off during an event because ERTs provided can be inaccurate as outage numbers rapidly increase. An SCE analysis of these ERTs revealed that the average ERT on Thursday was 12 hours, on Friday was 27 hours, and on Saturday was 22 hours. In SCE’s case, the system-generated Outage Alert Notes underestimated ERTs by, on average, 21 hours for the period from November 30 to December 6. SCE did not, however, have a process in place for managing the Outage Alert Notes, which were provided to Customer Support Specialists, to the IVR systems and to the website.

Furthermore, and as noted previously, SCE issued two press releases with 99% and 99.9% restoration goals that were not met. As a result, external stakeholders lost faith in the information being communicated by the company and perceived that SCE did not understand the scope of damage to its own system.
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Although SCE’s Customer Storm Distribution Centers establish an SCE presence and provide customers with various supplies and information, SCE should exercise care to avoid the perception that it will provide essential services for customers during extended outages.

On December 3 through December 6, SCE opened seven Customer Storm Distribution Centers in six cities in areas most affected by the windstorm. These centers provided customers with emergency supplies (water, ice, and flashlights) and safety and other information. These centers were staffed with Consumer Affairs, LPA, Field Services, and other personnel. It was estimated that the company interfaced with approximately 4,500 customers at these centers. A utility’s primary objective during a restoration should be to efficiently and safely restore power while keeping customers informed. A utility should not utilize valuable resources to undertake activities (such as water and ice distribution) that are better left to local/state government agencies (emergency management, health and human services, etc.), or other private and public entities such as the Red Cross. Indeed, in recent years, the industry has almost entirely moved away from distributing these supplies. Before events, however, utilities collaborate with government agencies to develop messaging and ensure that coordination is effective during an event. During an event, utilities will work with these agencies to obtain information on distribution centers that the utility can then provide to its customers through pamphlets, etc.

While SCE’s LPA program is a good concept, opportunities for improvement exist.

While interacting with elected officials and customers through the LPA program is a good practice, the fact that LPA staff do not report directly into the CCICS or a crisis information team during an event places them outside of the communications structure and results in LPA staff obtaining information from varied sources outside of the communications group – a direct contradiction to the one-voice approach. During the November 30 windstorm response, LPA directors and managers had difficulty obtaining accurate and detailed information that community officials sought. As noted previously, the failure to include LPA staff in a single crisis information team created issues related to information sharing – particularly since LPA personnel were not being briefed on restoration activities. Although some LPA staff were able to gather information from varied sources (DOC, BUSS, CCO, Business Customer Division, etc.), the process was not consistent and, as a result, the quality of the information likely varied and was inaccurate (for example, ERTs provided were inaccurate). Indeed, community officials interviewed consistently indicated that SCE lacked information on the extent of the damage and restoration times. These interviewees also said that, based on the conflicting information communicated by the company, they believed that there were internal communications issues within SCE. In at least one area, LPA staff repeatedly informed community officials that the community had been restored, while the officials knew the information was inaccurate from having driven through the area and seen that restoration had not been completed.
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Although most community officials interviewed during this evaluation expressed appreciation for the work performed by LPA representatives, a majority also indicated that having LPA staff with more operational knowledge would be a benefit. Community officials indicated this would be a benefit during both restoration events, during blue sky days, and for participation in OEM drills and exercises.

*SCE has not adequately educated or effectively collaborated with external stakeholders (customers, elected officials, businesses, etc.) on community priorities, restoration practices, and coordination opportunities.*

Customers, elected officials, and other external stakeholders have not been adequately educated on restoration practices or engaged in developing restoration priorities. A robust customer education plan may include, but not be limited to:

- Restoration practices;
- Restoration priorities (including the logic behind each);
- Safety practices; and
- Communications expectations.

Although SCE currently has a circuit prioritization scheme, communities have not been engaged to either review and confirm existing priorities or develop new priorities. One approach to prioritizing is to develop a “weighted customer count” for all facilities across the company. Communities are engaged to identify their key facilities (hospitals, senior living facilities, cooling centers, lift stations, waste water treatment centers, fire/police stations, schools, etc.) and the utility incorporates the priorities into the weighting scheme.

*In response to customer survey data, SCE has made steps to improve communication practices, which had a positive effect on the November 30 windstorm response.*

For many years, SCE customers have indicated in periodic surveys the desire for improved communications during outages. In response, SCE established a cross-functional team, comprised of TDBU, CSBU, Consumer Affairs, LPA, Contact Center, Corporate Communications, and an Executive Sponsor Team, with the objective of addressing customer concerns, first by addressing easier to resolve “issues” and then more complex issues. In large part due to this team’s work, customer survey scores improved from 60% in 2007 to 68% in 2011.

The team started its work by improving communications related to planned outages, focusing on both residential and large business customers. More specifically, SCE established an Outage Communications Team (OCT) originally tasked with improving communications on planned outages with large business customers. The OCT has become, however, the communication hub for account executives and others in the Business Customer Division during both storms and planned outages. As a result of this team, the communications experience for large business customers was much more positive than it was for customers overall.
In 2011, the cross-functional team began working on unplanned outages (for example, outages caused by vehicles hitting SCE poles). Although the team intends to begin a review of “storm” or large event communications, additional communications improvements should take into consideration the need to establish a crisis information team that incorporates all externally-facing staff (including the OCT) into a single communications hub.

*Although the concept of SCE’s Outage Communications Scorecard is a best practice, there are inherent weaknesses in how the metric is currently executed.*

The Outage Communications Scorecard, which is included in the TDBU Results Sharing scorecard, measures information regarding the causes of outages and ERTs. Scores are assigned depending on whether or not these key fields have been populated in OMS and are adjusted according to how timely the update was. For instance if an ERT is not entered within 6 hours of an outage, points are deducted from the scorecard. This measure is one of approximately 50 items on the TDBU Results Sharing scorecard that affect compensation. Two other measures relating to customer satisfaction in outage communications have been added to the TDBU Results Sharing scorecard in the past 2 years—a score measuring same day cancellations of planned outages and one relating to last minute planned outages.

The use of these measures emphasizes the importance of customer communications during outages to TDBU personnel. The measures, however, need to be disaggregated so that they are more “line-of-sight” for operations personnel. They are reported as a singular measure for SCE, which organizes its operations activities into four zones, eight regions, and 35 service centers. Aggregation of performance statistics across the entire company does not allow for either excellent or poor performance in outage communications to be associated with individual directors, managers, and supervisors. That aggregation, combined with the fact that these three measures are among some 50 separate measures on the TDBU scorecard, considerably weakens their significance in providing an incentive for excellent outage communications performance.

5.4.2. Recommendations

*C-1: Review, revise, and enhance the Incident Communications Plan and incorporate any TDBU communications processes into the Incident Communications Plan and reporting structure.*

Enhancements to the Incident Communications Plan should include, but not be limited to:

- A description of how the plan integrates with other SCE response plans;
- Communication strategies depending on event size;
- An organizational structure;
- Clear roles and responsibilities for all communications roles (not merely Corporate Communications);
Findings and Recommendations

- Detailed process flows for all communications processes (including how information is gathered and disseminated, the approval process for messaging and issuance, etc.); and
- Pre-drafted press releases.

The Incident Communications Plan should be revisited to assign responsibility to a single individual (typically the Communications or Public Information Officer) for developing a communications strategy during an event. This person should report directly to the Incident Commander and have oversight of a “crisis information center” that includes representatives/liaisons from all externally facing groups. Furthermore, process improvements should ensure that all SCE customer-facing groups (such as Contact Center, LPA, etc.) and key external stakeholders (elected officials, emergency managers, etc.) receive press releases before the public.

The Communication Plan should be reviewed at least annually (and immediately following any changes that affect roles, responsibilities, or other key facets of event response) and tested at least annually during a table top exercise and a system-wide exercise. The system wide exercise should include development and implementation of a clear communications strategy and messaging.

C-2: Coordinate all externally facing staff under a single communications team to better execute a “one voice” approach to all external stakeholders.

As noted above, a key element to successfully moving toward a “one-voice” communications approach is the establishment of a centralized communications group, reporting to the Incident Commander, with responsibility for developing and releasing all messages, regardless of external stakeholder type. Therefore, SCE should begin the process of establishing a crisis information team that includes representatives from all externally-facing staff (Corporate Communications, LPA, Customer Service, which includes the Customer Contact Organization, the Business Customer Division, and Consumer Affairs, etc.) and includes staff responsible for message development, media monitoring, social media, internet updates, etc. Furthermore, in order to promote communications between communications staff and the operationally-focused staff in zones and/or sectors, SCE should locate communications liaisons, responsible for gathering specific data (crew numbers, outage numbers, etc.) on a pre-defined timeline at each mobilized zone or sector. Finally, the crisis information team should be co-located with the Incident Commander at a pre-established EOC, providing adequate space for a robust team.

C-3: Conduct training on all communications roles, responsibilities, and processes.

After completing revisions to the Incident Communications Plan and establishing new roles and organizational structures in the crisis information team, SCE should conduct training for all crisis information team members. As noted previously, processes outlined in response plans related to communications were not consistently followed
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during the November 30 response, and SCE should work to develop training sessions (including both basic overview presentations and a table top) to ensure that all communications team members are adequately familiar with their roles and responsibilities, including how the communications group interfaces with other response personnel.

C-4: Enhance customer-facing communications tools.

As noted previously, SCE has, since the windstorm event, undertaken improvements to its webpage and the company is currently working on a smart phone application. Additional enhancements or considerations should include:

- The smart phone application should include the ability to report an outage, check on the status of an outage and receive an ERT, view an updated outage map (and zoom to an adequately detailed level), and review news releases;
- The ability to closely monitor Twitter and accept outage information and proactively respond with ERTs or other requested information; and
- Development of a storm webpage that replaces the company’s regular home page during a significant event and provides customers with easy access to outage-related information, including safety messaging, press releases, other key messaging, ERTs, etc.

It should be noted that SCE’s current webpage is difficult to navigate and find important information – such as news releases. As SCE undertakes the system improvements above, the company may consider additional opportunities to enhance the website. While Twitter, Facebook, and many other social media offer a powerful tool for interacting with stakeholders and customers, it is important to consider the expectations of customers using social media in terms of timely responses during major storms or other peak communications periods. As such, SCE should ensure that it has adequate staff identified and processes established to meet customer expectations related to social media. Protocols for handling various storm related issues communicated via social media should be also pre-planned. For instance, SCE should address the process to be followed if a Twitter user reports a downed wire, including whether it should be forwarded to a Customer Service Specialist, the follow-up process, etc.

C-5: Enhance process for developing and releasing ERTs.

The SCE ERT process should be enhanced in several ways:

- Address how Outage Alert Notes will be managed during large events to ensure that customers do not receive inaccurate system-generated ERTs;
- Develop and implement a mechanism to evaluate the accuracy of ERTs and conduct post-event audits;
- Impose goals for releasing ERTs following the end of an event, based on event size and ERT granularity. These ERT goals should be communicated pre-event to media.
and customers so that external stakeholders have reasonable expectations as to when they will receive an ERT;

- Clearly assign accountability for accurate and timely ERTs to a single role and ensure that the Public Information Officer, who must meet established goals for information release, has information needed in time to meet deadlines; and
- Establish an “ERT Monitor” position, reporting to the Incident Commander or Planning Section Chief, with responsibility for monitoring ERT status and notifying his/her event supervisor of impending expirations or the need to revise the ERT.

C-6: Collaborate with local community agencies and the Red Cross in communicating emergency supplies practices in communities affected by storms and other disasters.

While setting up centers such as this to interface with stakeholders can be a valuable tool in managing information, SCE should work with local and state entities (emergency management agencies, health and human services, etc.) to ensure that local/state agencies manage resident needs related to water and ice distribution. Working with these entities, SCE should develop a comprehensive brochure for distribution both before and during events that includes information about the importance of contacting SCE if power is lost, how to find information about safety, dry ice and water distribution, and cooling or warming centers. This coordination will ensure that SCE is properly engaged in emergency management organizations throughout Southern California while simultaneously providing customers with adequate information.

C-7: Enhance LPA program through inclusion of liaisons in crisis information team and conducting operationally focused training for staff.

As noted in C-2, the LPA program should be incorporated into an integrated event communications group (crisis information team) to ensure that LPA staff obtain consistent messaging. In addition, SCE should meet with its city/county/community stakeholders to develop a common set of expectations of the LPA staff skills and abilities required for both blue sky and major event activities. Given that information, SCE should then develop a plan to fill any gaps between the agreed-upon expectations and the skills/abilities of the LPA representatives. That plan might include identification of more “operations focused” individuals to assist the LPAs in storm communications and emergency exercises performed by the city/county/community agencies, training of LPA managers, or replacement of some LPA managers with different skill sets. Alternatively, SCE may consider staffing key Emergency Operations Centers with personnel better trained in emergency management and with a more detailed understanding of SCE’s electrical system and restoration strategies.

C-8: Develop and implement customer education program and work with community officials to identify priorities.

SCE should develop a customer outreach plan for community officials and customers (including large businesses) with the objective of engaging these stakeholders and...
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educating them on restoration practices and communication priorities during an outage event. This effort should be developed as part of an integrated communication plan that incorporates branding, advertising, and outreach/education efforts into a single strategy.

**C-9: Coordinate any event communications improvements developed by its cross-functional team with an integrated communications strategy, managed by a crisis information team established under the Incident Communications Plan.**

SCE’s cross-functional communication improvement team is currently undertaking an evaluation of enhancements that should be made to “outage” communications. This effort should be done in coordination with the enhancements to the Incident Communications Plan addressed in C-1 and the development of an integrated crisis information team, as addressed in C-2. The inability to integrate these disparate efforts into a single event communications project may result in significant inconsistencies in recommendations or processes developed.

**C-10: Improve Outage Communication Scorecard execution.**

The Outage Communications Scorecard should be revised to be more actionable and more “line-of-sight” by disaggregating the current singular metric by district. While the concept of the scorecard is valuable in emphasizing to Operations the importance of providing field information for communication during outages, the method of measurement needs to be revised to provide the correct incentives to get the proper information to use in communicating with customers, which will be different depending on the scope of the outage/storm.

### 5.4.3. Prioritized Matrix

**Table 9: Crisis Communication and ERTs Recommendations Matrix**

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
<th>Value</th>
<th>Ease of Implementation</th>
<th>Implementation Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-1</td>
<td>Review, revise, and enhance the Incident Communications Plan</td>
<td>High</td>
<td>Moderate</td>
<td>Immediate</td>
</tr>
<tr>
<td>C-2</td>
<td>Coordinate all externally facing staff under a single communications team to better execute a “one voice” approach</td>
<td>High</td>
<td>Moderate</td>
<td>Immediate</td>
</tr>
<tr>
<td>C-3</td>
<td>Conduct training on all communications roles, responsibilities, and processes</td>
<td>High</td>
<td>Moderate</td>
<td>Mid-term</td>
</tr>
<tr>
<td>C-4</td>
<td>Enhance customer-facing communications tools</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Mid-term</td>
</tr>
<tr>
<td>C-5</td>
<td>Enhance process for developing and releasing ERTs</td>
<td>High</td>
<td>Moderate</td>
<td>Mid-term</td>
</tr>
</tbody>
</table>
# Findings and Recommendations

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
<th>Value</th>
<th>Ease of Implementation</th>
<th>Implementation Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-6</td>
<td>Collaborate with local community agencies and the Red Cross in communicating emergency supplies practices</td>
<td>Moderate</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
<tr>
<td>C-7</td>
<td>Enhance LPA program</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Mid-term</td>
</tr>
<tr>
<td>C-8</td>
<td>Develop and implement customer education program</td>
<td>High</td>
<td>Hard</td>
<td>Mid-term</td>
</tr>
<tr>
<td>C-9</td>
<td>Coordinate any event communications improvements developed by its cross-functional team with an integrated communications strategy</td>
<td>High</td>
<td>Moderate</td>
<td>Immediate</td>
</tr>
<tr>
<td>C-10</td>
<td>Improve Outage Communication Scorecard execution</td>
<td>Low</td>
<td>Moderate</td>
<td>Long-term</td>
</tr>
</tbody>
</table>
5.5. **Damage Assessment, Analysis, and Planning**

As SCE recognizes, damage assessment, analysis, and planning (DAAP) are critical to the ultimate success of any restoration effort. DAAP provides the foundation on which the restoration effort is organized, work is allocated, information is communicated to stakeholders, and estimated restoration times are determined.

Effective planning and damage assessment is a critical factor in and the cornerstone of a successful restoration. During major events, utilities use damage assessment teams (patrollers) to evaluate damage before a line crew is dispatched to perform repairs. Damage assessors patrol feeders while identifying trouble locations, evaluating the extent of the damage, and developing initial estimates of the labor and materials required to repair the damage. In its broadest utility application, damage assessment:

- Ensures efficient crew work plans;
- Identifies disabling damage greater than predicted by OMS;
- Verifies OMS data and damage predictions;
- Provides a foundation for ERTs, resource planning, daily work plan development, and customer communications; and
- Identifies safety issues/dangerous conditions.

This assessment generates the information required to more effectively identify the volume of work, prioritize restoration efforts, and assign resources. This function is typically handled by line resources or “trouble crews” during day-to-day operations or minor events, but when major events occur, trouble crews should focus exclusively on repairing the electrical plant and restoring power. Second roles, established in a restoration plan, should clearly identify the other resources (engineers, retired linemen brought on system as contractors, and other qualified and trained individuals) that should perform damage assessment.

At the beginning of the restoration, the damage assessment teams work just ahead of the crews, relaying assessment information to the Planning Section in the Area Command. This information is then used to prepare the job site, arrange all appropriate switching, and obtain required material. As the assessment teams outpace the line crews, they continue to provide information about problems on the lines, which the Planning Section uses to prioritize crew work and develop ERTs. Most utilities complete their damage assessment within two to three days of an event that takes seven to ten days to restore. The actual number of days to complete damage assessment should be scalable to the amount of damage and total time to restore.

In evaluating whether the damage assessment process is defined and executed; how damage information is captured and used; and the reliance on planning to optimize crew productivity, consideration of industry “best practices” is necessary:

- Preparation and Planning
  - Utilize training/certification process with re-fresher training
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- Use standard templates/processes/technology to collect and transfer damage data to planning section
- Utilize integrated mobile technologies to streamline damage reporting (MDTs, handhelds, GIS/OMS connectivity, etc.)
- Pre-prioritize feeders

### Damage Assessment Teams
- Use internal teams supplemented by external contractors
- Staff damage assessment teams with field engineers (planners in SCE’s case) as assessors and utility personnel with area familiarity as drivers
- Assign one team per circuit, and multiple circuits to a team

### Mobilization
- Pre-position teams where possible (if potential for outage event is known in advance)
- Deploy teams early (as soon as storm/event is declared over and it is safe to move around the service territory)
- Preliminary assessment of system by staff on pre-assigned feeders (to aid in initial storm level determination and development of global ERT)

### Response
- Ensure adequate information about damage is captured (type of damage: broken poles, spans of wire down, damaged transformers, etc., with estimated man-hours to fix)
- May require multiple damage assessments during certain types of events (e.g., ice storms)
- Complete bulk of assessment during day, with skeleton crew at night, and conduct order management and planning at night
- Provide planning group with damage information as soon as identified (do not wait to provide until end of day/assessment period)
- Complete damage assessment within 48 hours

Finally, leading utilities have implemented a forensic analysis process that allows them to collect enough detailed information on the specific equipment and structure failures during major weather events to conduct statistical analysis and determine if there were contributing causes of outages beyond the natural event itself.

#### 5.5.1. Findings

On a blue sky day, damage assessment is undertaken by line resources commonly referred to as trouble crews. During major events, standard industry practice is to focus trouble crews on restoring power while other trained and certified resources undertake damage assessment. Having the damage assessment teams (DATs) trained and certified is critical because their assessments have to be trusted by those analyzing their reports, creating work packets, and ultimately by the teams restoring power. Damage assessors
provide the greatest value when there are sufficient numbers and they begin their work as soon as it is safe to travel. As noted above, an effective Analysis and Planning function uses the information provided from damage assessors and creates work packets for crews to use to undertake the restoration effort. Depending on the event size, work packets are developed to support an order, area, circuit, or substation restoration strategy. Many utilities use the Analysis and Planning function to develop work schedules for the ensuing 48 hours. Using this approach, utility leadership is able to develop a much more granular picture of the restoration effort and the timeline for total restoration.

As part of its emergency response and restoration initiative, SCE created the role of Damage Assessment coordinator, with responsibility for all steps between determining the requirements for transmission and distribution damage assessment to tracking orders and ensuring effective communications between the DATs and the T&D System Monitor. According to the TDBU ERRP, the DATs are supposed to use a standard form (Repair Order) to capture the system damage and to report the damage to the System Monitor. As noted in the findings below, SCE’s damage assessment and planning processes can be improved in future events. More specifically, damage information was not captured consistently, a robust planning process was not utilized during the event, and as a result, incident management’s situational awareness was not as broad as it could have been.

**Damage assessors require increased knowledge of the system to be effective.**

According to SCE, when troublemen are engaged in restoring power, damage assessment efforts are undertaken by engineers as part of a Damage Assessment Team (DAT crew). During the course of the November 30 event, there were between 50 and 80 FSRs. Similar to other utilities, SCE line resources, however, did not “trust” the damage assessments undertaken by the DAT crews since the DAT crews are generally seen as not being adequately trained to undertake effective damage assessment. Other companies have overcome this attitude by:

- Establishing retainer relationships with vendors to provide qualified damage assessors to assist with emergency events;
- Creating an internal certification program for non-lineman to undertake damage assessment;
- Providing graphic displays to assist the damage assessors in determining the specific parts of the system damaged; and
- Limiting free-text options in damage assessment forms, enhancing consistency and automation in damage capture.

A robust training and certification program for damage assessors is critical in a best practice planning and damage assessment process. Damage assessors need to not only be familiar with equipment on SCE’s system, but also comfortable with the entire damage assessment and planning process flow (how activation occurs, how assessment
assignments are made, how damage information is collected and when it is submitted, and how the information is used).

**Damage information was not captured consistently or in a timely manner and pre-existing forms do not provide enough detail to effectively plan resource and equipment needs and develop ERTs.**

During the November 30 windstorm response, SCE did not follow the damage assessment practice detailed in the TDBU ERRP. As a result, there was limited damage assessment information available in the first two days of the event and, accordingly, those responsible for the deployment of resources did not have a clear picture of the magnitude of the event, the resources required to support the restoration, or the amount of time it was going to take to complete the restoration. Furthermore, DATs did not consistently use the standard form (some used the form, others wrote on circuit maps, etc.) and it took hours for the damage assessment forms to be received by those making resource decisions. In addition, the damage assessment form, referred to as a Repair Order and included in the TDBU ERRP, does not contain adequate detail to plan resource and equipment needs and develop ERTs and relies too heavily on an assessor to enter comments, which leads to inconsistencies in damage capture. As a result of the different methods of capturing data and the lack of detail in data that was captured, the damage assessment information was not used consistently by SCE.

**Implementation of a new wire down process slowed the damage assessment and restoration efforts.**

In 2011, four fatal electrocutions resulted from customers coming into contact with downed SCE wires or conductors. As a result of these tragic events, SCE quickly developed and implemented a “wires down” procedure that prioritized all reported wire down cases as the equivalent to a 911 priority call. In a major event such as the November 30 windstorm response, there may be thousands of wire down calls – frequently over 75% of these calls are for telecommunications or cable wires.

SCE had thousands of wire down calls following the storm and during the event’s initial hours, the company diverted resources that may have otherwise been conducting damage assessments to respond to wire down calls. As a result, damage information was not being gathered and could not be used to plan the restoration effort, allocate work, develop information, and determine estimated restoration times. While the SCE wires down policy had some effect on field resources, it had the greatest impact on OMS and the ability to dispatch non-wires down orders. Since all wires down were considered to be a priority 1 call, on par with calls from police and fire, the wires down calls were prioritized above all other calls (which may have included actual calls from public safety crews). The wire down protocol was officially lifted around 2pm on December 1, likely to acknowledge the decreased risk of a de-energized system while simultaneously attempting to devote resources to restoration.
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SCE’s current damage assessment and planning processes do not adequately support a major event restoration.

Even if damage assessment had not been slowed by implementation of the new wire down process, the SCE assessment practice would not meet standard utility practice, since they are designed for blue sky days or small events rather than large scale events. In order to meet industry standards, a damage assessment and planning process should include:

- Organizational structures, including role and responsibility descriptions of damage assessment personnel;
- Identification of the number of DATs required, depending on event size and type;
- Assignment of damage assessors (whether by circuit, order, etc.);
- Mobilization;
- The process for submitting and capturing data (including templates for paper-based or, in best practices, Mobile Data Terminal (MDT) damage assessment forms);
- How data is used by a planning function to develop work packets, prioritize work, identify resource needs, and develop ERTs;
- How damage data can be used by the Contact Center to provide “color” information to customers; and
- The technology required to support the damage assessment process.

At SCE, a T&D Work Assignment Coordinator is assigned to capture information from the information monitor and assign work to crews. There is a similar function within Substation, Construction and Maintenance. Although this process may be sufficiently staffed on a blue sky day, during a major event where the volume of orders and work increases, this process is not robust enough to support effective restoration planning, work prioritization, and crew management. Specifically, there were not enough resources trained and/or staffed in the hardest hit areas to fill the Work Area Coordinator (WAC) role to support the restoration response shifts.

SCE initially lacked an early and full understanding of the scope of the incident that it was facing and demonstrated a lack of situational awareness.

Internal and external interviewees consistently indicated that SCE did not have a full understanding of the scope of the damage it had suffered as a result of the November 30 windstorm. Whether due to inaccurate information being provided by LPA staff or SCE’s inability to effectively engage external stakeholders through an incident management system, SCE’s lack of situational awareness was a major contributor to its performance during the response and recovery phase of this incident. Data sources that SCE may have relied upon to better understand the potential damage that SCE’s system could experience (in advance of the event) or, once the event had occurred, the damage that had happened included:

- LA County OEM’s November 28 weather advisory;
Findings and Recommendations

- National Weather Service advisories;
- EMS information noting that 117 circuit breakers locked out;
- OMS information;
- Windshield assessments done by crews driving to work on December 1, 2011;
- Feedback from line crews and supervisors;
- Damage assessment information from local governments; and
- Wait times for switching and work orders.

There is no defined mechanism to evaluate the potential risks associated with weather forecasts.

A contributing cause to SCE’s inability to understand the potential impact of the November 30 windstorm was the company’s approach to meteorology. Although there is more than one meteorologist on staff at SCE, they are not generally utilized to proactively assess the potential risk of an event. Before the event, there was no meteorological service contracted to provide tailored forecasts for the company. While SCE did recognize that a potential weather hazard did exist and an advisory was sent out internally on November 29, some of SCE’s external stakeholders had issued alerts as early as November 28 and had been more proactive in mustering resources in anticipation of the windstorm. SCE neither activated extra crews nor proactively called personnel to staff key positions.

SCE’s forensic analysis process was not formally utilized during the storm.

As noted previously, leading utilities collect sample information on specific equipment and structure failures during an event, to the extent compatible with the paramount objectives of safety and prompt service restoration, allowing them to conduct statistical analysis and determine if there were contributing causes of outages beyond the natural event itself. This information can then be used to improve system resiliency, enhance maintenance programs, or improve vegetation management practices. SCE is not alone amongst its peers for not having a formal program for gathering detailed forensic information during a storm.

While SCE has a root cause team of engineers who have a formalized process to evaluate the cause of outages and equipment damage, this process is not formalized in the TDBU ERRP, because, in part, SCE staff believe that this process would delay customer restorations. However, SCE’s Planners and Field Personnel are required to evaluate the loading on replacement equipment to ensure that the replacement equipment is sized properly. In addition, equipment that fails during a storm is intermittently sent to SCE’s Root Cause group for a “post-storm” evaluation when the cause of the failure is not apparent, and SCE’s wood product specialists typically examine the condition of selected poles that fail in a storm.
5.5.2. Recommendations

**DAAP-1:** Develop and implement a robust training and field certification program for all damage assessors/patrollers.

SCE should implement a process for certifying damage assessors including post-event evaluation of how assessors performed. This certification should be completed prior to assignment as an assessor – and those failing to meet pre-identified performance metrics should either have remedial training and be re-tested, or should be reassigned to another role. Following certification, annual refresher training (classroom and on-line module) must be completed to ensure that assessors are up to speed on their roles and responsibilities, the assessment process, and key equipment and damage types. Additionally, establishing clear expectations and requirements regarding the information captured when reporting outages will help storm restoration personnel understand the significance of an event.

**DAAP-2:** Implement a comprehensive Damage Assessment, Analysis, and Planning process directed at managing an event requiring full implementation of ICS and develop appropriate plans.

As noted previously, SCE’s existing damage assessment practices are insufficient to support a major restoration event. The process needs to be consistent across SCE to allow for the flow of information from the field to those develop work schedules, assigning crews and providing updates and ERTs to customers and stakeholders. All damage assessors should perform assessments in the same manner, identify damage using common terminology, capture data in a single tool, and submit that data back to a centralized Planning group. Finally, the information itself should be used across SCE to prioritize and manage work and identify resource needs.

**DAAP-3:** Explore the use of retainer relationships or retirees to augment damage assessors and planners.

During a major event, SCE may have insufficient resources to effectively fill all assessor roles. SCE can alleviate this potential challenge by having relationships with contractors or by making arrangements with retirees. Several contract engineering companies provide utilities with damage assessors who are trained on the retaining company’s processes, data collection forms, and systems.

**DAAP-4:** Improve existing damage assessment forms (the Repair Order form) and incorporate the form into Mobile Data Terminals (MDTs), once launched.

SCE should develop a form that includes, at a minimum:

- Damage location and assessor information, including: assessment crew identifying number; date/time of report; circuit/feeder number; device; outage/trouble ticket #; and circuit map page/grid #;
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- Damage specifics, including: affected section (circuit, lateral, service); phase affected; location (street, rear lot, etc.); whether a tree crew is required; general comments;
- Damage type (specific type of equipment – pole, fuse, transformer, etc.), number of each type of equipment damaged, whether it is accessible, etc.; and
- Required materials, by ID, name, and quantity.

The damage assessment process can be made more effective by implementing technology to support it. This will lead to more effective restoration and more timely flow of relevant information to stakeholders. Therefore, the form should ultimately be available via MDTs or in a handheld computer system that automatically uploads damage information to other systems and tools (e.g., OMS, procurement systems). This integration will assist material and stores management, development of ERTs, and overall management of the event.

**DAAP-5: Revise the new wire down process.**

The new wire down process cannot be effectively implemented as-is during a major event. The process needs to be revised to balance the important safety considerations and the needs of the restoration. The revised process needs to anticipate that even in a major event when substations are de-energized and SCE has rendered a particular circuit safe, it must still consider the hazard of incorrectly installed home generators and the threat to its crews and to the public.

**DAAP-6: Improve weather and forecast monitoring practices.**

SCE should improve its ability to accurately and predictably forecast hazards, specifically weather hazards. There are several methods to achieve this goal: repurposing other meteorologists on staff, hiring a meteorologist, contracting for meteorological services to provide tailored forecasts for SCE, and/or utilizing enhanced relationships with Los Angeles or California State emergency managers to receive weather and other hazard warnings from the Offices of Emergency Management. In this case, if that emergency management relationship had existed in a more robust fashion, it is more likely that SCE would have received the hazardous weather alert as early as the November 28 and would have understood that its external stakeholders were activating resources to prepare for this event.

**DAAP-7: Define the forensic analysis process in the plan.**

SCE should formalize its existing root cause program into an independent forensic analysis process in the ERRP. This process, already defined for non-storm events, should clearly define the requirements for data gathering in the field immediately after a major event and identify the types of analyses that should be conducted using that information. This process should be independent of damage assessment and should ensure that sufficient data is captured to provide an adequate sample for statistical analysis. This information will help identify specific modes of failure for different pieces
of equipment and structures and allow SCE to better evaluate the costs and benefits of different system hardening options.

5.5.3. Prioritized Matrix

Table 10: Damage Assessment, Analysis, and Planning Recommendations Matrix

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
<th>Value</th>
<th>Ease of Implementation</th>
<th>Implementation Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAAP-1</td>
<td>Develop and implement a robust training and field certification program</td>
<td>Moderate</td>
<td>Hard</td>
<td>Long-term</td>
</tr>
<tr>
<td>DAAP-2</td>
<td>Implement a comprehensive Damage Assessment, Analysis, and Planning process</td>
<td>High</td>
<td>Hard</td>
<td>Long-term</td>
</tr>
<tr>
<td>DAAP-3</td>
<td>Explore the use of retainer relationships for damage assessor positions</td>
<td>Moderate</td>
<td>Easy</td>
<td>Mid-term</td>
</tr>
<tr>
<td>DAAP-4</td>
<td>Improve existing damage assessment forms (the Repair Order form) and incorporate the form into Mobile Data Terminals</td>
<td>High</td>
<td>Moderate</td>
<td>Mid-term</td>
</tr>
<tr>
<td>DAAP-5</td>
<td>Revise the new wire down process</td>
<td>Moderate</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
<tr>
<td>DAAP-6</td>
<td>Improve weather and forecast monitoring</td>
<td>High</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
<tr>
<td>DAAP-7</td>
<td>Implement a forensic analysis process</td>
<td>Low</td>
<td>Moderate</td>
<td>Long-term</td>
</tr>
</tbody>
</table>
5.6. Restoration Execution

There are two key components of major event restoration execution: safety and efficiency. Ensuring workforce and public safety during a major event restoration is paramount for electric utilities. With the scope of system damage typical of a large event, the company’s main focus throughout a restoration effort is to take all the necessary steps to ensure safe operations while restoring customer power as quickly as possible. Since each utility has different safety practices, mutual aid contracts typically set the expectation that utilities providing mutual aid will follow their own company safety procedures. Although each off-system/contractor crew is supposed to follow its company’s safety procedures related to personal protection equipment (PPE), the crews are often expected to follow the local utility’s switching and tagging practices, unless they are given an isolated part of the system (e.g., a substation) and can work under local clearance to restore the power to that entire area after coordinating with the system operations center. Since some of the safety concerns are specific to the utility affected by the event, there is a need for on-boarding off-system crews (including contractors), which includes providing them safety briefings.

Leading utilities have created safety booklets that are provided to crews and include key information on the system operating characteristics (e.g., operating voltage, equipment, switching and tagging procedures, etc.), key contact lists with phone numbers, a list of medical facilities in the area, and any environmental issues that may be specific to the service territory (e.g., vegetation and wildlife). Typically, the crews receive safety briefings before each shift, referred to as “tail gates,” when they are provided updates on any emerging safety issues and key safety messages and receive the safety pamphlets (these would be disseminated to all line and vegetation management crews).

In addition to focusing on providing crews with adequate information to promote safety, the industry is beginning to proactively adopt guidelines and policies related to operations. For example, the utility industry is currently establishing guidelines and policies that define safe aerial and outdoor operations, which restrict operations during high winds or other dangerous conditions. A standard practice across the industry is to restrict aerial work if wind speeds in the area are in excess of 35 mph. In general, and mostly due to a heightened focus on safety, performance as measured by the OSHA Recordable Injury Rate is typically better during major storm restoration than day-to-day.

A successful restoration effort begins with a fully developed and tested emergency restoration plan, which is used to implement a restoration strategy that is tailored to the particular needs of a given event. During the incident or, in some cases, immediately before the incident, the particular needs of an event are determined by gaining a comprehensive understanding of the status and general condition of the system. This understanding enables storm restoration personnel to consider which of the strategies established in the plan addresses the particular needs of the event (i.e.,
are there a significant number of poles down that require additional auger trucks or are there a significant number of blown fuses requiring additional bucket trucks). There are many issues that must be considered when choosing a restoration strategy, including whether storm management should be decentralized, the amount of physical damage, the need to coordinate with local governments/local department of public works, the number of downed wires in an event, and the number of single services that are affected. An effective restoration strategy incorporates the capabilities of the system predicated by its design (i.e. is the system a looped overhead system providing alternative power sources as compared to a radial system). Additionally, successful restoration strategies incorporate prioritized restoration of critical infrastructure to the utility and the community it serves. This prioritization ensures the efficient use of resources and helps establish a level of normalcy in the community. Both the efficient use of resources and the establishment of normalcy provide a sound platform from which a successful and effective restoration can be executed.

During large complex events where significant portions of the system are adversely affected, utilities often decentralize restoration execution. This decentralization can be executed in a variety of ways, but it generally focuses on maximizing the use of resources and providing local control over restoration of the system. In some cases, utilities transfer responsibility for the restoration of all circuits supplied by a substation to a substation restoration manager who has sub-breaker control for all of the circuits emanating from that substation. In addition to eliminating many of the processes that often slow down a restoration effort, (i.e., damage assessment and switching and tagging processing), this circuit-based restoration allows incident management to focus efforts on the system while recognizing the limitation set forth by its underlying design (i.e., restoring the mainline distribution system before focusing on the fused laterals). In undertaking a decentralized approach to restoration, it is important to understand the transition to a decentralized model, where crew dispatching is done from a local office or substation and switching and tagging procedures are managed by field supervision instead of the distribution or system operations center. This transition entails changes from day-to-day processes and must be clearly defined, tested, and implemented effectively (and before an incident if possible) to maintain safety for workers and the public.

Some events require coordination with local governments to capitalize on local public works and public safety department resources. These events may include situations where there is limited accessibility to electric facilities due to blocked roads, either from significant snow fall, debris, or trees on the road. In areas with overhead electric lines, some wires may get entangled in the trees and have to be cut clear and made safe in order to allow clearing crews to open roads. Careful coordination of this work between the utility and local government resources is necessary to provide safe access without delaying restoration.
Utilities focus significant resources on downed wires due to the potential impacts associated with public exposure. During major events, there are usually many downed wire locations throughout the service territory. In an attempt to minimize the risk of public exposure to these downed wire situations, many utilities have established a storm assignment role of a “Wires Down Guard,” who receives training to identify utility wires and secure wire down sites. These resources are not trained to determine whether the wire is dead or alive and therefore have to treat each location as though the wire is live. These guards are dispatched to wire down locations in the field to ensure that members of the public stay at a safe distance from the facilities. Some utilities have scaled back their reliance on using “Wires Down Guards” because the number of wires down locations is much greater than the number of available staff. These utilities, instead, have chosen to use public campaigns and communications channels to educate the public on the dangers of approaching downed wires during major events. The utilities continue to focus on wire down locations identified through 911 emergency calls and where wires are visibly arcing, smoking, or on fire. The remaining wires down locations are repaired over the course of the restoration processes according to restoration priorities.

Finally, service lines that serve single residences or small groups of customers are frequently restored at the end of the event because that is where they fit into the normal restoration priorities. In order to address this situation and reduce the duration of outages for these customers, some utilities utilize service crews and electricians who are not qualified to work on primary voltage lines to restore the service drops while line crews work on restoring primary lines. By proactively working on service outages, a utility can decrease the overall outage duration for some customers, because those whose services were damaged will be restored as soon as the circuit or lateral is energized.

5.6.1. Findings

SCE’s response to the November 30 windstorm was accomplished without any serious injuries to the public or its workforce. However, the company’s OSHA recordable rate was higher than its blue sky rate, which is high, although improving. This increase is atypical of restoration efforts, which are usually safer than blue sky days, because of the increased focus on safety, through daily briefings and shift management. Additional findings related to safety include: SCE did not utilize a standard 16 hours on/8 hours off shift schedule during the event and the company does not currently have guidelines that restrict aerial or outdoor activities based on wind speed.

During the event, and as noted previously, SCE had a reasonable number of resources based on the number of customers that were without power. Due to an initial lack of situational awareness of the scope of the damage by incident management personnel, however, the resources that SCE had available were not used optimally. Furthermore, SCE was overly reliant on the categorization matrix contained in the TDBU ERRP, which
caused the company to not activate facilities and/or response structures in a timely manner or at all. Finally, the company’s current wires down policy, which was adopted based on a desire to avoid any public injuries, should be re-evaluated, as it was less than effective and may have delayed restoration efforts.

**SCE did not fully implement and staff the Emergency Response Plan, in preparation for, and at the onset of the storm’s arrival.**

As noted previously, as early as November 28, forecasts indicated that SCE’s service territory would be affected by significant winds. In response, SCE conducted a pre-event conference call at 7:43 a.m. on November 30 – the call was operational and did not involve representatives from key organizations, such as the Call Center. The TDBU ERRP was activated at 5:58 p.m., with the opening of the second sector storm center at El Nido. The Business Unit Storm Support (BUSS), which according to the Corporate ERRP is a “temporary, round-the-clock coordination center to expedite repairs and service restoration,” was convened at approximately 9:45 p.m. on November 30, but was not expanded to include communications personnel until 7:00 a.m. on December 1, three hours after the time that the peak customer outage level was realized. Also on December 1, SCE activated its Mobile Command Center (MCC) at the Santa Anita racetrack, but according to SCE documentation, the MCC “was established to manage the restoration effort in the San Gabriel Valley area, including dispatching damage assessment teams and field repair crews and providing key storm management personnel access to SCE’s telecommunication network and systems.” The MCC was not used as a typical mobile EOC, which manages the entire incident response – from operations to planning to communications.

According to the Corporate ERRP, “SCE has developed four facilities to provide a range of venues equipped for gathering and reporting emergency-related information and for coordinating response and recovery resources and activities.” These four facilities are the Situation Room, the Emergency Operations Center (EOC), an Alternate EOC, and two MCCs. Using an emergency operations center makes the incident management group, including the incident commander, visible to all responders; enhances the ability of field staff or decentralized groups to contact key decision-makers; ensures coordination between responding groups; enhances communication among team members; promotes the use of a “one voice” communications approach; ensures that all response elements follow a consistent response strategy and plan; and improves the entity’s ability to disseminate decisions to all concerned response groups and individuals. However, in anticipation of the event and at the onset of the event, SCE did not fully mobilize its facilities to respond to the storm.

Although SCE’s emergency response plans indicate that the EOC could be operational within two hours of a request and would be fully equipped with computers and communications equipment, information support, and workstations for responding organizations, during the November 30 windstorm response, the EOC was not a
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dedicated facility and was instead a makeshift conference room. It is important to note that SCE was caught midstride in renovating a facility, which was completed in late December 2011, as a dedicated EOC.

The Corporate ERRP provides that during a Category 2 event, “management and coordination of restoration efforts” is centralized to a Storm Management Center. During the response to the November 30 windstorm event; however, SCE never activated any centralized facility to oversee the entire restoration effort. Indeed, SCE did not consolidate corporate decision making into one facility but rather had multiple decision making nodes throughout the company, whether at grid operations, the Monrovia service center, the Mesa substation, or the corporate level. SCE’s failure to attain adequate situational awareness and either proactively activate a centralized EOC or mobilize a full event management structure, including key functions such as the Call Center and Communications, resulted in incident management personnel trying to “catch-up” after the system had been significantly impacted. Because SCE did not fully activate and mobilize its plans, it was unable to effectively respond to the needs of the storm response.

While SCE restored power without serious injuries to the public or its workforce, the company’s OSHA recordable rate for the event was higher than day-to-day.

SCE was able to restore the outages caused by the November 30 windstorm without serious or life threatening injuries to either the public or the company’s workforce, including contractors. The number of OSHA recordable incidents during the event for the company’s field workforce was high, however, with an overall OSHA recordable injury rate of 18.12. This rate was higher than SCE’s day-to-day safety performance for field personnel (including Groundmen, Linemen, Linemen Apprentice, and Troublemens), which was 12.03 in 2011. Typically, a company’s safety performance during a major event is better than day-to-day due to the increased focus on the safety of crews and the public through safety briefings, shift management, and a safety-focused environment.

There were 19 reported incidents that occurred during the restoration, which took a total of 88,279 man hours. The breakdown of the types of incidents during the event is as follows:

- Eight OSHA recordable injuries:
  - Four lost-time;
  - Two restricted duty; and
  - Two non-lost time injuries;
- Four first aid;
- Five incident-only; and
- Two non-work related.
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Five of the OSHA recordable injuries, two first aid incidents, and one incident-only report, were filed after December 8, when the restoration was completed and normal operations resumed. SCE has focused on improving the accuracy and timeliness of safety incident reporting and has established a key performance metric (KPI) as a part of its scorecard, which has created an expectation that supervisors report an incident shortly after being made aware of it.

The company has begun to focus on improving its day-to-day safety record, especially among the field workforce. Table 11, below, shows the improvement in SCE’s OSHA recordable rate for its field workforce over the past two years. Even with this improvement, however, the recordable rate appears to be high.

Table 11: 5-Year Field Workforce OSHA Recordable Injury Rate

<table>
<thead>
<tr>
<th>Injury Year</th>
<th>OSHA Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>15.68</td>
</tr>
<tr>
<td>2008</td>
<td>16.26</td>
</tr>
<tr>
<td>2009</td>
<td>16.07</td>
</tr>
<tr>
<td>2010</td>
<td>14.39</td>
</tr>
<tr>
<td>2011</td>
<td>12.03</td>
</tr>
</tbody>
</table>

**SCE did not use industry standard shifts during the extended restoration.**

Industry standard practice is to work 16 hour shifts with 8 hours of rest per 24 hour period during extended restoration efforts. Although utilities will, during shorter restorations lasting one or two days, sometimes have field crews work longer shifts, during extended restorations, excessively long working hours can detrimentally affect efficiency and, in some cases, safety or concentration. A number of studies have found that as shifts increase in length, adequate rest is required to maintain the level of concentration and attention necessary to ensure safe operations. Some studies link human performance after prolonged work hours (20-25 hours) to a blood alcohol content of 0.10.6 Other studies demonstrate a link between extended work hours and decreases in “speed and accuracy, hand–eye coordination, decision making, and memory.”7 While no studies could be found that specifically addressed fatigue and safety in the utility industry, other industries focused on safety, including aviation, trucking, shipping, healthcare, etc., have recognized the link between fatigue and performance and adopted federal regulations to support safe working practices.

In an effort to move toward industry standard practice, SCE recently adopted the 24-hour shift limit and abandoned its previous 32-hour limit. During this restoration, SCE field resources worked different shift lengths each day, working as many as 24 hours

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7 Ibid.
straight, which was still 50% longer than industry standard. Non-operational staff worked similar shifts. In some positions, such as decision makers and LPAs, staff were never formally relieved during the storm and worked exhaustive hours. For non-operational staff in the utility standard model, shifts can vary depending on the need to overlap positions, but in no case would a shift be longer than 16 hours on with eight hours for rest. For example, an incident commander might work a 16/8 shift schedule, with four hours of overlap between incident commanders at shift change to ensure effective transition and data sharing. Best practices in the industry establish a 12 on, 12 off schedule for non-field operations personnel, which requires adequate staffing and planning.

**SCE does not have clear guidelines for restricting operations during hazardous weather.**

SCE has no guidelines that limit field operations during high windstorms. Utilities are increasingly establishing guidelines that limit crew operations in hazardous conditions. These guidelines typically restrict field crews from performing any aerial operations in winds in excess of 35 mph or any outside work where winds are 50 mph or higher. Failing to follow such guidelines may expose crews to hazardous conditions. During the November 30 windstorm event response, some crews worked in their bucket trucks until they felt personally unsafe. This exposed crews to unnecessary risk – close calls were reported, including small debris hitting crews and at least one case of a perceived near miss with a falling tree.

**The event category matrix was not well understood and may not have adequately characterized the November 30 windstorm.**

One important key to an effective restoration is the acknowledgement, by utility staff, that an extended restoration is a corporate and community event. In addition, as noted in Section 5.2.1, SCE’s event category matrix does not currently provide adequate detail to assist incident command personnel in declaring or managing an event. At the same time, the approach used by SCE to assign the November 30 event a category was overly regimented. More specifically, a Category 2 event is defined as “escalating and involving more than one zone” while a Category 3 event is defined as “requiring additional resources and the restoration will last beyond 72 hours”. On December 1, SCE determined that additional resources (beyond SCE and contractor crews) would not be required. Interviewees indicated that because SCE did not believe external resources would be required, the event could not be classified as a Category 3. By never classifying the event as a Category 3 event, SCE did not place enough emphasis on its significance – including internally, where SCE leaders who could have provided support were not positioned to do so, not because of a lack of willingness, but because of a lack of situational awareness into the significance of the event.
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SCE’s Storm Management Organization was overly focused on the operational aspects of the restoration.

Key to effective restoration is the acknowledgement, by utility staff, that an extended restoration is a community event. During an event, overall accountability for distribution storm recovery efforts rests with the Director of Grid Operations of the Storm Recovery Manager. According to the responsibilities outlined in the TDBU ERRP, the Storm Recovery Manager is responsible for restoration, compliance with the ERRP, providing updates to transmission and distribution senior management, and ensuring that areas of responsibility are providing a high level of customer satisfaction. At the same time, a separate Officer-in-Charge has responsibility for non-operationally focused functions, such as communications, maintaining common messaging, and establishing priorities and objectives. Pursuant to SCE’s categorization matrix, however, the OIC position is only activated in a Category 3 event. Since the November 30 event was never declared a Category 3 event, the OIC role was never activated, and management of the event remained in the Storm Recovery Manager position. The inability to define a single incident commander, with responsibility for all aspects of the response, combined with the inability to activate an OIC likely contributed to the restoration effort being focused on operations to the exclusion of effective communications and coordination with external stakeholders. This appears to be an issue where SCE business units attempted to respond alone and retain decision-making authority, at the expense of engaging leaders from other business units.

SCE’s restoration prioritization process is not clearly defined.

Consistent with the distribution restoration priorities set forth in the TDBU ERRP, during the November 30 windstorm response, trouble orders within SCE’s OMS were prioritized and assigned based on public safety and by the number of customers that could be restored. A robust prioritization scheme is typically pre-established and simultaneously considers the total number of customers and the relative priority of each customer (a hospital versus a waste water treatment center versus a single family home) on each substation, circuit, lateral, etc. This type of pre-planning reduces the burden on the planning group to manage work/outage incidents during an event and ensures that the restoration effort is as optimized as possible. One approach to prioritizing outages is to develop a “weighted customer count” for all facilities across the company. In doing so, a hospital might have a customer equivalent count of 10,000, a fire/police station may have a customer equivalent count of 2,500, and a single family home would have a customer count of 1. As a result, a circuit with both a hospital and a fire/police station would be prioritized above one with only a police/fire station and one hundred single family homes. While prioritizing circuits with this methodology will not be a panacea, it will result in establishing normalcy and ensuring that critical infrastructure is energized expeditiously. This type of weighting is already employed by utilities in anticipation of load shedding during system emergencies. Whatever weighting is used, the method of prioritization should be pre-established and easily
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understandable, developed in coordination with external stakeholders, including state and local governments, and, if subject to outside scrutiny, defensible.

*SCE continued to perform planned work throughout the event, thereby limiting the number of resources that were available to respond to the outage.*

During a significant outage event, standard utility practice is to temporarily suspend scheduled work to ensure that all resources within the company are available to support restoration efforts. This also highlights to every department in the company the significance of the event and establishes the priority of restoring the system. The decision not to suspend all planned work and divert all internal line crews, sustaining contractors, and support personnel to restoration activities likely had an effect—complicating the company’s ability to shift from normal operations to full emergency response operations. Indeed, as of December 1 at 5:30 a.m., SCE had only suspended 50% of the planned work the company had across its service territory.

*The delays in switching and safety work clearances reduced the productivity of available restoration crews and delayed the restoration of the system.*

Effective emergency restoration plans provide clear processes and criteria for decentralizing all or part of the utility’s operational and planning functions during significant outage events. During decentralization, functions including, but not limited to, planning and damage assessment, work prioritization, dispatching OMS orders, switching and tagging, and crew and work management are all managed on a decentralized basis (typically at a pre-established area work center, alternate control center or substation). During a significant outage event, the timely transfer of dispatch, switching, and tagging authority to decentralized entities enhances efficiency. The decision to decentralize switching should have been made sooner during this event because of the geographic concentration and volume of outage incidents. The volume of tripped breakers alone should have initiated the process to decentralize. Indeed, by 7:00 a.m. on December 1, the Mesa switching center was already challenged by the volume of switching and tagging requirements, causing delays in restoration. The Lighthipe and Mira Loma switching centers were not activated, however, until approximately 6:30 a.m. on December 2. On December 3, Mesa’s switching center was subdivided so that El Nido personnel were able to issue switching and tagging instructions on behalf of Mesa. The activation of these personnel and additional centers should have been completed on December 1.

During the event, SCE’s resource utilization was less than optimal in that it prioritized orders by circuit but dispatched crews by order from the Mesa service center. Indeed, crews were dispatched out of the Mesa service center on a single order, repaired the order, and then returned to the Mesa service center for the next order. Inherent in this strategy is a significant amount of lost travel time and inefficiency. Arguably, this was an event that should have been decentralized down to a circuit-based restoration. The factors that should have been considered include: the significant number of locked-out
breakers in a focused geographic area; the number of wire down locations in the same area; and the desire to focus on responding to wires down reports. In fact, if the response had been decentralized to a substation level, the issue of responding to downed wires could have been addressed quickly because an analysis at a substation breaker level would have identified the population of downed wires that actually posed a potential threat. This is true because wire down locations supplied by circuits where the breaker was locked out did not pose a safety threat from the standpoint of conductors being energized from the supply side. Furthermore, if there were a significant number of wires down locations where there was a possibility of the wire being energized because of a closed breaker, the breaker could be opened until the feeders were patrolled for safety.

Most importantly, during an event like this, a decentralized model provides a discrete mechanism to maximize the efficiency of resources, especially those prioritizing and planning the work, because responsible personnel have a reasonable amount of trouble orders under their control which they can reasonably prioritize and manage. In addition, it is relatively easy, without any analysis or damage assessment, to begin restoration efforts at the circuit breaker/riser and repair damage along the mainline for each circuit emanating from a station and effectuate restoration along the way. As long as crew staffing is properly allocated to the prioritized substations (based upon pre-established priorities that weights critical customers and therefore circuits and substations), undertaking this approach also ensures that the use of resources is optimized because they are working on the most important work in a focused area.

The new “wire down” procedure was ineffective and delayed restoration.

As noted previously, in response to safety concerns, SCE adopted a new wire down policy shortly before the windstorm. During the November 30 event, and as a result of this new procedure, overhead resources were assigned to repair de-energized wires that had no energized source instead of focusing on the restoration of mainline distribution, including mainline customers closest to the substation. Because the source was de-energized, the repair work did not result in any restorations to customers, which frustrated crews and customers and ultimately delayed other work that would have restored customers. Mid-day on December 1, SCE modified the wire down policy and dual efforts were undertaken to patrol for safety and re-energize the system according to a prioritized list of circuits. It should be recognized that SCE’s system experienced a very significant number of wire down locations.

SCE’s wire down reporting processes, which permits faxed reports, do not ensure that SCE receives the wire down information and do not ensure that the sender obtains confirmation of receipt by SCE.

Wires down and other 911 situations are reported to SCE in one of three ways:
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- A call by a customer to the Contact Center, where a Customer Service Specialist takes the report and enters the information into the CWS system, which generates an order that a troubleman (during blue sky or smaller outages) or field service representative (FSR) (during larger events) investigates;
- A call from a local fire/police dispatch center to SCE’s Dispatch Center. Dispatchers in those centers will take the report from the fire or police department and will generate an order for SCE field personnel to investigate; or
- Local emergency response agency personnel fax wires down reports to SCE.

Many 911 emergency responders interviewed expressed concern over SCE’s wire down reporting process during the windstorm response. The 911 staff wanted confirmation that the orders they had provided to SCE had been received and that SCE staff had been dispatched to address the wire down report, since police and fire personnel were “standing by” on location. According to interviewees, in the vast majority of cases, they were not getting confirmation of any type and one first responder agency indicated that early in the event, SCE refused to take additional calls from 911 dispatchers.

*SCE’s execution of its “tree crew” policy caused inefficiencies in restoration because the efforts of line and tree crews were not coordinated.*

During the response, SCE’s failure to effectively communicate and execute its tree crew operating policy caused non-productive time for tree crews and line resources. The policy requires that all wires down that are in contact with fallen trees or limbs be isolated and grounded before tree crews begin tree clearing efforts. Because tree crews were assigned jobs where wires were in contact with the tree/limbs without necessary line crews to isolate and ground the wire, tree crews were forced to remain on site waiting for line crews or were assigned other work. As a result, tree and line crews were required to make multiple trips to the same location because the efforts of each were not coordinated.

5.6.2. Recommendations

**RE-1: Develop and implement a restoration strategy for different size events including a fully decentralized strategy**

SCE should develop detailed restoration strategies that contemplate ranges of events, including the types and volume of damage realized, and identify the necessary resources and functions necessary to execute these strategies. In addition, the criteria (especially weather predictions) used to initiate these strategies should be defined with appropriate guidance as to when and why events should be initiated or escalated, despite the pre-defined criteria not being met. Each strategy should be independently defined in the plans, along with the process for transitioning between strategies.

It should be noted that significant effort will be required to establish a fully decentralized strategy and prepare for its execution. This type of strategy, which is fundamentally different than the way utilities operate on a day-to-day basis, requires
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pre-establishing numerous “new” incident response roles (along with the appropriate training and exercises) that enable multiple areas and/or substations to be fully staffed to restore the system.

All restoration strategies should include a “situational awareness” guideline to ensure that those executing the strategy have full visibility of the actual system conditions; including, the volume and type of damage and impact of the event on the community at large. Additionally, appropriate communication plans that consider the needs of employees and the community should be developed that correspond to the significance of the event. Plans should also include policies (like the tree crew operating policy) that need to be communicated within the company to execute response efforts. Finally, each strategy should include triggers to temporarily suspend other non-priority work within the company.

**RE-2: Develop and implement a prioritized weighting mechanism that accounts for priority customers and critical infrastructure that is incorporated into OMS and readily provides guidance for dispatching resources.**

In order to optimize the utilization of resources during a significant and high outage volume event, it is important to understand the effect of an outage on the system and customers. While each customer is important, the restoration of certain types of customers and critical infrastructure is important to establish normalcy in an area. This normalcy helps ensure that emergency response personnel within these local areas are capable of maintaining public safety. Additionally, the restoration of critical infrastructure is important to enable subsequent restoration efforts by SCE. Critical infrastructure may include certain breakers that supply priority customers.

The LPA managers should work with their assigned communities and their respective emergency service personnel to identify restoration priorities for critical facilities during storms. Due to the large number of municipalities/communities, it may be useful for the LPA Managers to establish regionally based Municipal Task Forces and work within existing emergency management structures, to gather necessary information to adequately understand the needs and priorities of the communities and define mechanisms for on-going collaboration.

**RE-3: Develop a process to quickly ramp up switching and tagging capabilities within the company for significant work volume events and/or consider changing the procedures to expedite field work while not ignoring safety requirements.**

Switching and tagging procedures are critical to maintain the safety of work that is happening during major restorations. However, the procedures and processes that are in place for day-to-day operation of the system are not readily adaptable to the restoration requirements necessary during major events. Accordingly, these processes and procedures need to be evaluated and enhanced to be able to better contribute to the success of a restoration effort. In some cases, it may be safe and useful to delegate
the switching authority to decentralized resources. Some utilities, especially during full decentralization responses, allow field control of circuits from the first switch point onto the circuit while retaining control of the breakers.

**RE-4: Conduct a thorough review of the wires down process.**

A review of the wires down policy needs to be initiated. This review should include, at a minimum, how the data regarding wire down locations is captured, how the information is communicated to storm emergency response personnel, how the locations are incorporated into the restoration priorities established for a given event, and when it may be necessary to de-energize portions of the system to address potential safety hazards.

**RE-5: Adopt a standard restoration shift for long-term (greater than two days) restorations.**

The company should adopt the industry standard 16 hours of work with a mandatory 8 hours of rest within each 24 hour period. SCE should enforce this shift schedule for all restoration resources, including those performing incident response roles.

**RE-6: Set limits on aerial and outdoor operations during windstorms.**

SCE should establish a policy around safe operations limits for aerial operations and outdoor operations. The limits for aerial work are typically set at a wind speed of 35 mph or greater, meaning that, if wind speeds reach or exceed that number, field operations will not perform any “bucket” work. Increasingly, limits for outdoor operations are also being set. In hurricane states, when wind speeds exceed a given speed, outdoor activities are suspended.

### 5.6.3. Prioritized Matrix

**Table 12: Restoration Execution Recommendations Matrix**

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
<th>Value</th>
<th>Ease of Implementation</th>
<th>Implementation Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>RE-1</td>
<td>Develop and implement a restoration strategy for different size events</td>
<td>High</td>
<td>Hard</td>
<td>Immediate</td>
</tr>
<tr>
<td>RE-2</td>
<td>Develop and implement a prioritized weighting mechanism</td>
<td>High</td>
<td>Easy</td>
<td>Mid-term</td>
</tr>
<tr>
<td>RE-3</td>
<td>Develop a process to quickly ramp up the switching and tagging capabilities within the company</td>
<td>High</td>
<td>Moderate</td>
<td>Mid-term</td>
</tr>
<tr>
<td>RE-4</td>
<td>Conduct a thorough review of the wires down process</td>
<td>High</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
<tr>
<td>RE-5</td>
<td>Standardize shifts during events</td>
<td>High</td>
<td>Hard</td>
<td>Mid-term</td>
</tr>
<tr>
<td>Number</td>
<td>Recommendation</td>
<td>Value</td>
<td>Ease of Implementation</td>
<td>Implementation Timeframe</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------</td>
<td>-------</td>
<td>------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>RE-6</td>
<td>Set limits to aerial and outdoor operations</td>
<td>High</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
</tbody>
</table>
5.7. Information Systems and Technologies

Best practice utilities rely on information systems and technologies (OMS, supervisory control and data acquisition (SCADA), geographic information systems (GIS), Mobile Data Terminals (MDTs), radio communications, and other software designed to facilitate restoration and provide customers with information) to support their emergency restoration operations. Combined, these technologies provide incident managers with the ability to identify, process, and comprehend critical restoration information (customers out, location of outages, devices that have operated, location of crews, etc.). Through this information, these systems provide incident managers with “situational awareness” during storm restorations. Without these systems and tools and their integration into command and control decision making processes at the strategic, operational and tactical level, extended restorations may be caused by flawed decisions.

When a customer calls a CSR or the IVR and indicates that their power is out, a trouble ticket is produced in OMS that represents the specific customer’s outage. When additional notifications are received from the IVR or CSRs indicating additional customer outages in the same area as the first call, OMS will utilize algorithms to determine what upstream device operated to interrupt service to the entire group of customers. OMS will then create an outage ticket for that upstream device. In companies with MDTs, the trouble tickets are sent, via dispatchers, to trouble or line crews via the MDT. In utilities without MDTs, a dispatcher will typically radio the ticket information to the crew and the crew will then initiate a paper ticket process to provide the required information to clear the ticket from OMS. A robust OMS is critical to effective restoration – since it enhances the incident management team’s ability to identify hard hit areas and number of customers out.

MDTs are a best practice technology that has aided utilities in having situational awareness and supporting operational decision making during restoration events. MDTs are devices that are installed in line crew vehicles (or can be portable) that provide GPS and trouble spot information, and provide restoration crews with the ability to interface directly with a work management system and dispatchers to streamline execution of operational decisions. Restoration personnel using MDTs can capture damage assessments, providing damage data that can support restoration decision-making, or as a tool to better communicate ERTs from crews in the field to customers. The MDTs also provide location information of the crews, which is valuable for communicating where crews are conducting work to customers, including through posting the information on the company’s outage map or website. The drawback is that while each device may be reasonably priced, the cost of outfitting an entire vehicle fleet can be costly.

SCADA systems at the breaker level provide a comprehensive understanding of the scope and breadth of outages. This information can quickly provide an overview of how broadly the system has been affected by a particular event. Also, SCADA systems can help to restore the system because dispatchers can use them to remotely open and
close devices in the field. This works well to improve reliability on a day-to-day basis but makes the system more complex to restore in a major outage event and may delay energizing circuits once the physical restoration is completed. Although SCADA systems can help restoration, they can, and often do, become a “choke point” for restoration efforts because of the protocols used to ensure control of operational equipment and safety. GIS is used to enhance a utility’s ability to track assets, develop circuit maps, and, in some cases, view tree canopy in relation to the system’s equipment and assets.

5.7.1. Findings

SCE’s existing technologies did not provide the incident management team with adequate information to improve situational awareness and support better decision making. As a result, the information on the status of outages, estimated restoration times, and crew locations that SCE provided to outside stakeholders could have been more accurate if these systems had been fully integrated. Additional opportunities for improvement include: the need for more structure policies and training around the use of SCE’s 900MHz radios; the lack of MDTs for various response personnel; and the lack of IT support for key response roles.

**SCE’s IT systems were not fully leveraged to provide necessary information on the scope of the event early in restoration.**

Notwithstanding that SCE has deployed technologies to assist in establishing situational awareness, many critical decisions during the storm response were made with limited or inaccurate information. The technologies SCE has deployed are, however, designed for normal day-to-day operations and are not expandable to support operations during a complex emergency such as the one experienced by SCE on November 30. As a result, the lack of situational awareness during this event detrimentally affected the efficiency of restoration efforts. This is illustrated by SCE’s limited use of SCADA/OMS during the event to determine the overall status of the system and the breadth of the damage caused by the wind storm. Although SCE’s SCADA system captures breaker status information and the information is also available in OMS, neither tools were relied upon appropriately to support the decision making process. This appears to be the result of ineffective communication between SCADA users and decision makers, an OMS user interface that does not readily display breaker status, and users not trained to query and relay this critical information to decision makers.

**SCE did not adequately consider IT and workflow demands necessary to respond to an event the size of the November 30 windstorm when designing or testing certain software and hardware systems.**

SCE’s existing emergency planning assumptions, as described in Section 5.3, did not anticipate a storm of this complexity and magnitude. Normally, emergency plans, and as a result, the underlying tools necessary to execute the plans, are designed for the types and volume of work that may reasonably be necessary during a worst case
scenario as a result of a significant outage event. Because SCE’s emergency plans do not contemplate a storm of significant complexity, the underlying tools that would facilitate an effective restoration are not designed to support a response on this scale. Whether it is the allotment of IP addresses in a given service center, the number of printers available in an operations center, or the hardware that supports OMS, these systems were not designed to handle the amount of workflow experienced during the November 30 response.

As a result, the tools that are designed to run the system day-to-day and are appropriate for moderate system emergencies are strained to operate effectively during significant events. Ironically, because utilities typically provide high service reliability on an overall per hour served basis, the processes and tools that are utilized day-to-day are not designed to effectively manage a significant volume of trouble tickets. Additionally, operators are not adequately trained to utilize the day-to-day system during significant restoration efforts.

**SCE’s OMS does not enable effective management of widespread and complex events.**

OMS is a software tool that enables a utility to manage outage and other abnormal conditions on its energy delivery systems. One of the key functions of OMS is the use of logical algorithms to predict the cause and extent of abnormal conditions on the system. As noted previously, OMS algorithms group customer calls to discrete interrupting devices. An example of the logic employed by OMS is: after 3 distinct customers who are supplied from 3 different transformers all supplied by the same lateral fuse report an outage, OMS will predict that the fuse is out of service and therefore predict that all customers supplied by that fuse are out of service. Thus, any future calls that came in from the load side of the “blown fuse” would be rolled up into this outage and not create a separate outage for the customer’s outage report. Although this logic works very well for day-to-day events, it may be challenged to accurately depict the underlying damage and overall impact during a significant widespread event. This is because during a widespread significant event there can be many outages below an interrupting device that are, in fact, not actually caused by the operation of the device. For instance, during a significant event as described above (three reports from three customers supplied by three separate transformers supplied by the same fused lateral), there may be three separate events that are causing the customers supplied by three separate transformers to be without power that is not caused by the operation of the fuse. Thus, if during the event, OMS predicts that the fuse is out of service, the system will over predict the number of customers out (because the system will assume the fuse operated and subsequently “roll” all the customers into a lead job) and will under predict the amount of underlying system damage (because it will not highlight that there are three distinct events). These types of miscalculations are often referred to as nested outages because there are a number of underlying events that are “nested” in the listed outage. This level of complexity often complicates the appropriate acquisition of and subsequent allocation of resources to restore the system.
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There are several tactics that utilities can take to overcome the shortcomings in this logic:

- Establish a mechanism where the OMS logic is modified during an event to under predict the customers out of service and over predict the damage. This can be done by increasing the underlying damage necessary to allow OMS to predict an “upstream” interrupting device has operated;
- Establish querying capabilities and logical flags (for instance, wires down or trees down associated with any customer call) within OMS that enable a more thorough understanding for each trouble ticket to better understand the underlying damage that predicted the operation of an interrupting device;
- Conduct a prompt, thorough damage assessment driven by pre-established priorities that is electronically captured in the field and fed into OMS in real-time;
- Develop a mechanism to disaggregate nested outages in OMS to ensure that when a trouble location is repaired that the OMS logic will recognize the outages downstream still need to be repaired; and
- Enhance mechanisms such as customer call backs or smart meter polling to obtain more accurate information on actual restored load.

While smart meters will eventually provide SCE with additional information during restorations, there is still the need for accurate, reliable and prompt damage assessment early in the incident. That and a review of OMS logic in complex incidents is necessary.

**OMS is not configured to automatically prioritize pre-identified critical infrastructure or circuits.**

SCE’s OMS does not automatically prioritize circuits or critical infrastructure as reports of trouble are captured. Rather, SCE manually prioritizes services into four categories (major, critical, essential, and key), which, coupled with data input to a descriptor field, provides the prioritization mechanism for critical infrastructure/circuits throughout the restoration of an event. SCE manually sorts the information and coordinates its response by utilizing GIS maps. During an emergency of this magnitude, this manual process is a significant impediment to restoring critical infrastructure in an efficient manner.

**Hardware limitations in OMS slowed workflow in key areas and delayed the restoration.**

OMS (and its underlying operating system) is necessary for switching and tagging, crew dispatching, order prioritization, order closeout, and ERT development. During this event, OMS was not as responsive as it should have been due to the number of users and volume of data within the system. There are over 1,200 OMS users who have varying levels of access to the system. While it is highly unlikely that all users access the
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software system simultaneously, it is possible for OMS’s functionality to be severely limited during a large scale event if most of its users simultaneously logon.

Key personnel that were interviewed indicated that the servers and other hardware that support the OMS software system had not been adequately upgraded in the recent past. These hardware issues resulted in significant processing slowdowns for all users. The result of which were OMS actions taking 30-45 seconds to process where they should be instantaneous. Also, OMS froze for several heavy users and their computers had to be rebooted. The OMS vendor was on site during the storm and worked with SCE to troubleshoot and resolve some of the issues. In a lower level storm, these workflow issues would have been frustrating but would not have had a major effect on the restoration; however, since the issues with OMS were widespread, the ability of SCE’s staff to switch and tag, create, modify or close orders or update customer’s ERTs was hampered.

Both hardware and software limitations affected the efficient dispatching of crews and timely updating of information in OMS, which resulted in delays in restoration and inaccurate ERTs.

During the November 30 windstorm response, there were software and hardware limitations that affected SCE’s ability to efficiently restore its system and communicate to customers. MDTs are in the process of being deployed at SCE. While the hardware was partially deployed before the storm, the software programs that would support a more efficient operation had not yet been deployed or had been recently deployed and had not been tested for an incident the scope of the November 30 windstorm.

Because of the volume of work that was being assigned, SCE needed to have the ability to automatically dispatch crews and close orders via MDTs. Because these were not yet deployed across the system, the resources in the DOC, the service centers, and the Mobile Command Center were overtaxed. As a result, SCE manually dispatched crews, which required that crews drive back to the service center each time they were being dispatched to a trouble location, and crews manually provided data. This manual process reduced the understanding of the breadth and extent of system damage. In order to support efficient operations during a response such as this, the MDTs must support mobile dispatching, damage assessment, and repair order processing.

In addition, throughout the storm, staff identified significant issues with the processing speed of SCE’s IT systems and the availability of IT resources, such as printers and IP addresses. Eventually, the hardware issues were resolved during the storm but the lack of a dedicated IT staff position slowed the restoration effort early in the storm.

E1P1 slowed field resources’ ability to conduct damage assessment.

E1P1 is a software program designed to allow troublemen to link repair orders created in “eWork” and SAP with MDTs in the field. In concept, the program is designed to increase work efficiencies in the field and reduce workflow in the damage assessment
process. Unfortunately, the design of E1P1 requires an approximate 15-minute delay in the uploading, validation, and downloading of data between the MDT and the central offices. This delay does not appear to have a major effect in normal operations, but during an incident such as the windstorm, the delay in order processing had a major effect on the efficiency of the troublemen. An efficient patrol relies upon efficient, accurate, and consistent collection of damage data. E1P1, as currently configured, does not support efficient entry of damage assessment information.

**SCE crews were overly reliant on cell phone communication and did not fully utilize SCE’s 900MHz radio system capabilities.**

SCE has a radio communication system that services its entire, 50,000 square mile service territory. This radio system has the capability of breaking out operational groups into myriad talk groups, with the fleetmap supporting over 300 talk groups. While there are limitations on the number of talk groups that can transmit simultaneously in each region, the radio system was not used efficiently during the windstorm. This is because SCE lacks a uniform method for communication between crews, the DOC, the substation, and the service centers during a large outage event. While the TDBU ERRP outlines the use of the 900MHz radios to communicate, many crews relied on cell phones to communicate with the DOC, substation, and service centers. Dispatching, switching, and tagging were all done either via cell phone or via radio. It should be noted that by using cell phones to provide switching and tagging, the instructions cannot be audited or available for review in the event there is a switching error. Finally, by utilizing two or more communication channels, there is an increased risk of errors or miscommunication.

**The Mobile Command Center was not capable of supporting independent decentralized operations.**

The MCC was built to support mobile command functions but is not capable of operating as a decentralized service center. The vehicle relied on satellite communication whose latency did not support the bandwidth requirements of the software programs necessary to independently control crews in its area of operations.

**The smart meter system was recently deployed in the area hit by the storm and was not fully configured to automatically supply critical information to decision makers.**

The penetration of SCE’s smart meter system, Smart Connect, was high in the area affected by this storm. Although it was deployed in large parts of the affected area, the overall Smart Connect program was not complete. More specifically, Smart Connect was not fully integrated into OMS and still had some functional limitations that prevented it from providing automatic, useful intelligence during the restoration.

When properly configured, the smart meters are designed to be able to provide useful intelligence during an outage. This information can be routed into OMS and provide decision makers with comprehensive information on the extent of damage and the pace
of restoration. Indeed, the use of actual meter information will help overcome the shortcomings in the existing OMS algorithms. Although Smart Connect was not linked to OMS, SCE did make use of the meters during the restoration by querying the status of the meters, which was used to update OMS and decision makers on the restoration.

5.7.2. Recommendations

**IT-1: Identify IT needs for worst case scenarios outlined in revised ERRPs, including required hardware, software, and support.**

The revised ERRPs (see Section 5.3) should identify the IT processes that are required to appropriately respond to a significant event and delineate which are mission critical. The plans should also anticipate the number and types of personnel that will be required to operate IT systems during an event and the volume of information that will need to be managed and utilized. Once this has been identified, IT personnel should develop and execute strategies that will support the worst case scenarios, including, contingency plans that are designed for mission critical portions of the IT system.

**IT-2: Established/integrate a customer/critical infrastructure prioritization that is automatically included within OMS to assist in incident management decision-making.**

SCE should identify priority customers and critical infrastructure and mark their accounts accordingly, so this information can be utilized when their service is interrupted. OMS should be modified to highlight when service to priority customers and critical infrastructure are adversely impacted. Additionally, as smart meters are integrated into OMS, these priority and critical infrastructure customers should be given priority over other customers for reporting purposes. Finally, the restoration plans should be modified to focus on the restoration of priority customers and critical infrastructure. Usually the information regarding criticality of customers and infrastructure is already available at utilities because this information is used to determine circuit priorities for load shedding.

**IT-3: Strengthen OMS training to include modules focused on “situational awareness,” prioritization of customers and critical infrastructure, and basic understanding of available data.**

The effective use of OMS information is critical to optimizing the use of resources and therefore is a critical component to effectively managing an outage. On a day-to-day basis, OMS is easy to manage because the crewing resources dwarf the needs of the system. However, during a significant event, the needs of the system significantly outpace the available resources necessary to restore the system, and the optimization and prioritization of available resources become absolutely critical. In addition, understanding how to evaluate the available data to determine the extent and type of damage in order to develop and execute a restoration strategy is critical to a successful outage response.
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**IT-4: Establish an IT role in the command structure to support increased IT needs.**

As SCE deploys ICS throughout its corporation, it should ensure that a dedicated role be assigned to work centers to assist in identifying and troubleshooting IT needs during a large scale event. This IT position will allow SCE to identify issues early in an incident and enable operational resources to work at peak efficiency.

**IT-5: Ensure that OMS can be automatically updated by smart meter information and that the smart meter platform is sufficiently resilient to support extended outages.**

The practices to ensure effective use of smart meters during significant events are still being developed within the industry. Although it is anticipated that the investment in smart meters and their effective utilization will enable SCE to quickly gain a better understanding of the impact of an event, the effective use of the vast amount of information that will be generated during system events with large numbers of affected customers will need to be managed. SCE should ensure that the Smart Connect system is properly configured to automatically supply outage information to OMS and that the underlying communications infrastructure meets SCE’s needs and planning assumptions going forward. Accordingly, SCE should evaluate whether the necessary infrastructure is sufficient to support reliance on key data being available during significant, prolonged events.

**IT-6: Ensure that software and hardware necessary to properly operate OMS during peak usage are sufficient.**

SCE should evaluate, using peak demands consistent with those identified in its updated ERRPs, its computer hardware and software needs. In addition, or alternatively (depending on the needs analysis), SCE should consider taking steps to either limit access to users during a significant storm or switch some users to a web interface version of OMS. Without these upgrades and/or limitations, SCE will run the risk of limiting the usefulness of OMS and thereby limit the processing of information during a major incident.

**IT-7: Create an IT solution to graphically display the status of substation circuit breakers to key decision makers.**

In order to minimize the risk of critical information not being available to key decision makers during a storm, SCE should highlight this data to decision makers across the organization in an easily useable graphical display. Alternatively, the information may be displayed using OMS.

**IT-8: Ensure that the Damage Assessment Teams (DAT) are able to enter damage information directly into E1P1.**

Since timely and accurate entry of damage information into OMS is the cornerstone of an efficient restoration, the DATs should have mobile access to E1P1 to enter damage information. Currently, DATs only have access to paper-based records, which do not
allow for timely and efficient entry of information into OMS and increases the possibility of transcription errors. Since damage assessment information will drive ERTs and restoration, it is important to accurately and quickly enter this information into OMS from the field. SCE has three options it may consider:

1. Increase data entry positions during a storm to transcribe information from the field;
2. Provide DATs with MDTs that are capable of entering the data via existing graphical user interface; or
3. Create a web-based portal to allow DATs to enter the information directly from a variety of mobile devices.

**IT-9: Determine whether the MCC should be utilized as a decentralized service center or should be used to support command level functions.**

The bandwidth requirements of a decentralized service center were not adequately considered before deciding to use the MCC as a decentralized work location. SCE should consider whether it should use the mobile command post as a decentralized service center or a mobile command post before re-outfitting the vehicle with cellular-based data capabilities.

**IT-10: Ensure that the radio fleetmap is designed to support a complex emergency and that a communication officer allocates talk groups during a response.**

As SCE further deploys ICS throughout the organization and re-evaluates its planning assumptions, it should ensure that its radio fleetmap is structured to support a complex restoration such as this windstorm. During a restoration, a communication officer should be assigned to manage the distribution of radio talk groups. This distribution of talk groups will support more efficient command and control of staff and improved safety for crews working on the same circuit.

**IT-11: Fully deploy MDTs and ensure that software capabilities are aligned with process needs and provide appropriate training.**

The use of these devices will provide efficiencies in restoration efforts undertaken by SCE. Although MDTs are in the process of being deployed at SCE, it is important that all end-users are properly trained and that the process is appropriately integrated into the overall storm restoration approach. Metrics to evaluate the value provided by these devices should be established. Finally, a lessons-learned process should be incorporated into after-action reports so that improvements in the process and software can be incorporated into future deployments.

**IT-12: Evaluate the process of using cell phones to provide switching and tagging instructions.**

There is nothing more important in our business than the preservation of life, our workers, and the public. From a safety perspective, switching and tagging is a process that is critically important due to the potential consequences of miscommunication and
therefore should be as formalized as possible. The use of two processes, especially one that is not auditable and tends to be very informal because of its utilitarian use, should be reviewed.

### 5.7.3. Prioritized Matrix

**Table 13: Information Systems and Technologies Recommendations Matrix**

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
<th>Value</th>
<th>Ease of Implementation</th>
<th>Implementation Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT-1</td>
<td>Identify IT needs for worst case scenarios</td>
<td>Low</td>
<td>Hard</td>
<td>Long-term</td>
</tr>
<tr>
<td>IT-2</td>
<td>Established/integrate a customer/critical infrastructure prioritization</td>
<td>High</td>
<td>Hard</td>
<td>Mid-term</td>
</tr>
<tr>
<td>IT-3</td>
<td>Strengthen OMS training</td>
<td>High</td>
<td>Hard</td>
<td>Immediate</td>
</tr>
<tr>
<td>IT-4</td>
<td>Establish an IT role in the command structure</td>
<td>Moderate</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
<tr>
<td>IT-5</td>
<td>Ensure that OMS can be automatically updated by smart meter information</td>
<td>Moderate</td>
<td>Hard</td>
<td>Long-term</td>
</tr>
<tr>
<td>IT-6</td>
<td>Ensure that software &amp; hardware to operate OMS during peak usage are sufficient</td>
<td>High</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
<tr>
<td>IT-7</td>
<td>Create an IT solution to graphically display the status of substation circuit breakers</td>
<td>High</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
<tr>
<td>IT-8</td>
<td>Ensure that DATs are able to enter damage information directly into E1P1</td>
<td>High</td>
<td>Moderate</td>
<td>Mid-term</td>
</tr>
<tr>
<td>IT-9</td>
<td>Determine whether MCC should be utilized as decentralized service center or command support</td>
<td>Low</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
<tr>
<td>IT-10</td>
<td>Ensure that the radio fleetmap is designed to support a complex emergency</td>
<td>Moderate</td>
<td>Hard</td>
<td>Mid-term</td>
</tr>
<tr>
<td>IT-11</td>
<td>Fully deploy MDTs and provide appropriate training</td>
<td>High</td>
<td>Hard</td>
<td>Long-term</td>
</tr>
<tr>
<td>IT-12</td>
<td>Evaluate the process of using cell phones to provide switching and tagging instructions</td>
<td>Moderate</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
</tbody>
</table>
5.8. Logistics

Best practices in logistics during emergency management and storm restorations are highlighted by:

- Clearly defined and established processes and procedures for logistics requirement identification, acquisition and dissemination;
- Logistics command structure that defines who executes what logistics responsibility and who makes what decisions concerning logistics support;
- Inventory management procedures to increase rapidly stores of supplies prior to storm or emergency;
- Pre-established master support agreements with suppliers or vendors; and
- Automated tracking capabilities for logistics supplies and centralized information management systems.

Logistics sections typically perform well during emergency restorations as the logistics emergency operations are similar to day-to-day only accelerated in quantity of supplies and compressed timelines for acquisition. That being said, the stress and accelerated timelines associated with all elements of logistics support in emergencies present a number of opportunities for failure.

A utility should create a centralized logistics management at the highest command structure to ensure that operational aspects of the response are adequately supported. That is, damage assessment, resource allocation, stores requirements, food and lodging, etc. all must be orchestrated at a command level that understands the limitations, risks, and strategies that must be executed to successfully restore power to customers as efficiently and timely as possible. Fragmented and disjointed logistics decisions will fail to meet that end.

Once a restoration plan is activated, typically before a major event occurs, the logistics lead must estimate the long lead items the utility will likely need and begin a buildup of its stores inventory as rapidly as possible. Entering into a pre-established master service agreement reduces the risk of obtaining these long lead items. Suppliers often serve multiple utility companies and the demand from neighboring utilities may place a utility’s requirements in jeopardy of not being met in a timely manner. By entering into an agreement with supplier(s) on, at least, an annual basis, utilities can reduce the risk of not meeting the logistics needs for storm restoration.

5.8.1. Findings

Within SCE, logistics responsibility rests with the T&D Logistical Support Manager (TDLSM), who is part of the BUSS. This centrally controlled T&D role is responsible for Manpower Coordination, Materials and Equipment Supply, Storm Travel Services, Human Resource Liaison, Technical Support, and Mutual Assistance Management. It should be noted that Information Technology and Mutual Aid are addressed in earlier
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sections of this report. In addition to the BUSS resources, T&D Field and T&D Substation materials and equipment support is provided through the T&D Field Support Manager and the Substation C&M Manager, respectively.

In the November 30 windstorm, logistics functions (from food and stores perspective) generally performed well. SCE was able to establish a staging site at the Santa Anita Racetrack’s south parking lot that accommodated approximately 50 crews and support. In addition to rapidly establishing the staging site at Santa Anita, the logistics team used experience garnered from other major restoration efforts (e.g. Entergy – Katrina) to establish policies and practices that resulted in no material shortages or substitutions. Finally, on their own initiative, the T&D Material Services team activated their team prior to the event being declared. Notwithstanding these successes, SCE can improve its logistics processes and practice.

**Responsibilities, expectations, and timelines for mobilizing logistics support were not detailed.**

As noted above, members of the logistics team, on their own initiative, began preparing for the November 30 event. This mobilization was accomplished without having been activated by a central SCE function or incident management team. Had the logistics team not proactively mobilized, there would have been delays in establishing key logistics support functions.

**SCE’s on-boarding process for off-system crews may not be sufficiently scalable for large events.**

In responding to the November 30 windstorm, SCE did not request mutual assistance from neighboring utilities but relied on additional resources through non-local SCE and contractor resources. Although SCE was able to manage the on-boarding of these additional resources, if there had been hundreds or thousands of additional resources required to support restoration, the on-boarding practice would have been inadequate. More specifically, SCE’s processes do not currently provide administration operating procedures, safety briefing and requirements, logistics procedures, and a general introduction to SCE practices.

**Pre-established master agreements are not available for all staging sites.**

For the November 30 windstorm response, SCE was able to collaborate with officials from the Santa Anita Racetrack to establish a staging site for crews and other support personnel. The use of the site was negotiated, however, as SCE was trying to respond to damage. SCE does not appear to have any pre-established master agreements with third parties (racetracks, shopping malls, fairgrounds, vacant land, etc.) to use their properties for staging sites. During a major event, SCE should be prepared to have other entities (FEMA, local/state governments, etc.) competing to establish staging sites at large properties. As a result, SCE should execute master service agreements to protect
its ability to establish these sites without risk of not having access to them during a catastrophic event.

Current plan does not provide a formal process for vendor notification in advance of a major event

SCE’s logistics personnel notified vendors of the event as the company was beginning its restoration effort. Although the notification was effective, it was not part of a formalized pre-event notification process included in the TDBU ERRP or any logistics plans governing mobilization of a large event. Standard practice within the utility industry is to have formalized pre-event notification to allow vendors to provide materials and supplies to the utility in a timely manner. This practice reduces the likelihood of crew down time occurring because of material shortages.

There did not appear to be a clear point of oversight for charging out and tracking materials at the staging site.

Although there were no shortages of materials at the Santa Anita site, no one had responsibility for ensuring that materials and supplies were charged out properly. While there is no indication that there was inappropriate charging of materials and supplies, having a logistics or material clerk assigned to any location where equipment is being distributed is key to monitoring stores and ensuring that no equipment is accidentally removed.

Although the Santa Anita staging site assisted SCE in its restoration efforts, it did not have adequate health and sanitation facilities.

On December 1, SCE storm management personnel secured the Santa Anita Racetrack, which was located in close proximity to the hardest hit parts of SCE’s territory, to be used as a storm restoration resource facility. The site was operational by nightfall and was used to check-in and assign crews, park vehicles and trailers, pre-stage material and equipment, and serve meals. The site was operational quickly and assisted the company in managing resources and conducting restoration work.

Although the Santa Anita staging site worked well and positively facilitated SCE’s restoration efforts, one area of concern raised during interviews was the adequacy of sanitary facilities at the staging site. Ensuring clean and sanitary facilities is critical for maintaining the health and safety of the workforce, since a lack of facilities could have a catastrophic effect should a viral or bacterial illness spread in the site and affect crews or support personnel.

Local resources who worked extended hours were not provided lodging.

During the November 30 windstorm response, SCE decided not to offer local staff the opportunity to stay in hotels that were close to their assigned work areas. Standard practice for utilities is to offer staff supporting the restoration effort and working significant hours (16/8 hour days) the opportunity to stay in hotels close to their work areas.
Utilities that have adopted this practice believe it contributes to a safer work environment.

5.8.2. Recommendations

**L-1: Revise the Logistics Support Emergency Plan to create clearer processes, practices responsibility, expectations, and timelines for activating and executing the logistics support.**

The Corporate and TDBU ERRPs should be revised to formalize the responsibilities, expectations and timelines for activating all components of the logistics support. The revisions need to concurrently address other findings noted above including:

- Strengthen the on-boarding process for non-local resources;
- Strengthen the processes of informing vendors about pending events; and
- Establish roles and processes for charging out materials at the sites.

The processes and procedures should address large scale incidents, such as the November 30 windstorm, where crews are using satellite and staging areas (mall parking lots, etc.) for overnight parking with provisions that facilitate re-fueling and re-stocking at the locations. This will reduce delays in getting crews in the field and to the restoration sites.

**L-2: Formalize agreements with key staging and satellite sites and suppliers.**

As noted previously, while the use of the Santa Anita Racetrack provided substantial logistical support to SCE, the lack of pre-existing agreements with potential satellite sites and logistics suppliers may have complicated logistics efforts. SCE should work with local organizations/entities with land/facilities that could be used for staging sites (malls, schools, bus lots, sports facilities, etc.) to establish agreements in advance of an outage event. Similar agreements should be executed with other vendors, including caterers, lodging, restaurants, fleet/truck rental, etc. These agreements should be reviewed annually and updated as necessary.

**L-3: Ensure staging sites have adequate health and sanitation facilities.**

Although there was no known resource downtime caused by the less than adequate health and sanitation facilities at the Santa Anita staging site, those responsible for SCE’s health and safety have to ensure that there are adequate facilities prior to authorizing a staging site to open. They should also be performing on-going checks of conditions at the staging sites.

**L-4: Allow local resources working extended hours to stay in local hotels.**

As SCE knows, resources working long days supporting restoration efforts tend to get tired. Critical to an efficient, effective, and safe effort is providing staff with adequate rest time. SCE should follow standard industry practice and offer local resources the opportunity to stay in lodgings close to the work sites.
## 5.8.3. Prioritized Matrix

Table 14: Logistics Recommendations Matrix

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
<th>Value</th>
<th>Ease of Implementation</th>
<th>Implementation Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-1</td>
<td>Revise the Logistics Support Emergency Plan</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Long-term</td>
</tr>
<tr>
<td>L-2</td>
<td>Formalize agreements with key staging and satellite sites</td>
<td>Moderate</td>
<td>Easy</td>
<td>Mid-term</td>
</tr>
<tr>
<td>L-3</td>
<td>Ensure adequate health and sanitation facilities at staging sites</td>
<td>High</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
<tr>
<td>L-4</td>
<td>Offer lodgings to local resources</td>
<td>Low</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
</tbody>
</table>
5.9. **Call Center Performance**

The call center’s ability to meet customer expectations during a major storm is key to meeting communications objectives. As noted in Section 2.3, the high-level questions to be evaluated related to call center performance include:

- Is there a proactive plan for addressing the increased volume of calls from customers?
- Are there pre-event Interactive Voice Response (IVR) messages scripted and were outbound calls performed?
- Were the plans successfully implemented?

It is imperative that a utility have a plan to address the high call volumes associated with major storms or other events causing large percentages of the utility’s customer base to be out of power. During major storms, the number of incoming calls during the initial day or two of a storm can be 350 times (or more) the expected call volume for a typical day. It is therefore critical that the company have a plan to handle this tremendous increase in customer calls.

Successful plans might include contracts with vendors providing interactive voice response solutions, contracts with vendors supplying trained customer service representatives, in-house resources from outside the call center who are trained and have system access allowing them to take outage calls, and mutual aid arrangements with other utility call centers. Plans alone are not enough — those plans must be quickly executed to avoid large numbers of frustrated callers.

It is also important that a utility have multiple channels by which a customer can contact them to communicate about the outage. Having a robust IVR system used by customers to conduct business during non-outage conditions will reduce the number of customers desiring to speak with a representative. Website, e-mail, live-chat, mobile phone, and texting applications allow customers to report outages and track outage status and communicate without contacting the call center. Social media avenues, when available, provide an alternative method for customers to obtain information in lieu of calling.

Call centers rely on many different technologies to effectively handle their day-to-day business with customers, and those technologies must be scaled to handle the increased volumes associated with major storms and other such events. Customer information systems, telephony capacity, and other systems must be sized to adequately handle the volumes significant storms can bring.

Most call centers have outbound calling technology that can be employed to provide messaging to customers during storms. This technology can push telephone calls to customers with or without a representative attending the call. Proper use of this technology during outages can enhance the company’s effectiveness in meeting the communications objectives stated above.
In recent years, First Contact Resolution (FCR) has become an important measure of call center success. Many call centers strive to measure and reduce the number of customers who call their company more than once in order to have an inquiry or request satisfactorily resolved. The fewer the number of repeat calls to a company, the greater the customer satisfaction, at a lower cost. During extended outages, customers often become frustrated and insist on talking with a supervisor or manager. Reducing escalated calls during storms helps in meeting the customer satisfaction and cost reduction goals of FCR.

5.9.1. Findings

All calls into the five toll-free numbers designated for handling outage and general service are answered by SCE’s touch-tone IVR. The first option in the IVR is for electrical hazards, power outages, and repair. While electrical hazard calls are sent immediately to the queue to be answered by a Customer Service Specialist, customers reporting an outage can do so in the IVR or have the option of speaking to a Customer Service Specialist. Over the eight days of the storm, CCO handled 194,387 storm calls or 16% of the average number of calls received each month. Of the total storm calls, 24% were handled by SCE Customer Service Specialists, 7% were handled by Specialists at their contract contact center provider, 59% were handled in the SCE IVR, and the remaining 10% calls were handled by a contractor providing IVR overflow services when all telephone trunks for the main customer service toll-free numbers are busy.

*Although the Customer Communication Organization (CCO) answered customer calls relating to the storm in a reasonable amount of time, the quality of outage status information provided to customers was less than satisfactory.*

Average Speed of Answer (ASA) is a call center measure that provides the average number of seconds from the time a customer requests to be transferred to a customer service representative (Customer Service Specialists at SCE) to the time the representative answers the call. The overall average ASA for customers calling about the windstorm was 55 seconds, which is reasonable. While there is no standard goal in the call center industry, ASA goals are frequently set at or about 40 seconds. Despite this reasonable overall average ASA, some customers did experience long wait times during various periods over the eight-day restoration. Those long wait periods also caused a high number of abandoned calls. Wait times, abandoned calls, and ASA are all described in further detail later in this section.

As noted in Section 5.3, however, the Customer Service organization, including CCO, were not engaged before or during the storm in communications-focused discussions and the organization’s engagement on operational conference calls was less than optimal. Although CCO was represented on all storm conference calls once the Storm Center was opened, due to the format of, and number of participants on those calls, it is not an appropriate forum for brainstorming strategies and tactics for communications.
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The CCO duty manager did, on more than one occasion, emphasize the importance of getting damage assessment and ERT information from the field into OMS to provide better information to customers and even offered to provide CCO staff to the DOC to conduct the data entry. The DOC refused the offer for additional resources. SCE’s operations-focused response handicapped the CCO and demonstrates that SCE’s windstorm response was seen as an operational event rather than a community event. Since automatically generated OMS information, including ERTs, were inaccurate and being communicated via press releases and the CCO, the CCO’s performance in the eyes of the customer could never transcend that inaccurate information and be seen as effective.

**CCO leadership was not engaged in pre-storm calls and did not participate in the initial development of the communications strategy.**

The failure of SCE staff to engage CCO leadership in either the T&D pre-storm conference call or the development of a communications strategy detrimentally affected CCO’s ability to effectively plan for and provide accurate information to SCE’s customers. More specifically, the failure to include CCO on the T&D pre-storm call contributed to CCO’s failure to increase staffing for Wednesday night and Thursday morning and may have contributed to some high call wait time periods. Furthermore, and as noted in Section 5.4, the failure to include CCO leadership in discussions regarding the company’s communications strategy, created several issues, including: CCO staff were not engaged in messaging development; CCO staff had concerns about IVR and website messaging; there was a lack of coordination between the various communications entities; and brainstorming on how to improve the customer experience was not conducted (including how the IVR could have been segmented to use disaster mode messaging for the most affected areas).

The statistics discussed in this section in regards to ASA, abandoned calls, and longest wait times in any given hour are available on a real-time basis for use in managing staffing levels. Considering that the majority of calls to CCO were for non-storm calls and that ASA, abandoned call rate, and longest wait times for non-storm calls were exceeding levels normally within target ranges, CCO leadership should have discussed how call-wait times for non-storm calls could affect customer impressions of SCE during an already difficult period for the company.

**Taken together, SCE’s robust call center structure, available technology, and other agreements prepare the company well for outage events.**

There are two call centers in the SCE service territory, one in Rancho Cucamonga and one in Long Beach, which are staffed with approximately 415 active Customer Support Specialists to take incoming calls, as well as CCO Specialists in support roles not normally scheduled to handle incoming calls. CCO also contracts with a call center in Texas, to provide representatives to handle certain business calls, including outage calls. The contract provider has approximately 180 specialists trained to handle SCE customer
calls. These three locations operate as a virtual call center, using IVR technology to route the calls to available specialists. For major storms or other catastrophic events, the company’s mutual aid agreements with PG&E and SDG&E also provide for call center assistance when requested. These agreements have never been activated, but exercises are conducted to ensure proper functioning of the 800 numbers to transfer calls between the utilities.

The IVR prioritizes the routing of different types of calls to specialists. Outage and emergency calls are assigned the highest priority, being routed to the next available specialist before other types of calls. SCE utilizes its IVR technology beyond call routing. Their IVR includes functionality that allows customers to complete a long menu of business transactions in self-service mode without the need to talk with a Customer Service Specialist. During non-storm periods, just fewer than 40% of all calls to SCE’s five main toll-free numbers are contained in the IVR. This is an excellent containment rate, which speaks to the ease of performing everyday business transactions within the IVR. Since 1994, SCE customers have had the ability to report power outages in the IVR and get outage updates and ERT information in the IVR. In the same manner, customers can report outages and receive outage updates and ERTs when their calls overflow to the contract IVR provider.

The following graph compares SCE’s percentage of storm calls contained in the IVR during the windstorm with other North American utilities experiencing major outages over seven different storm experiences.

Figure 16: Percentage of Calls Answered by Channel

As noted previously, customers did not have the ability to report outages via the internet following the November 30 windstorm. The ability to report outages on the
website and receive e-mail or text messages with outage updates was, however, implemented a few weeks after the storm. During the event, customers could obtain information about the number and location of outages and ERTs. The ability to report an outage and receive outage updates by IVR, website, or mobile phones not only provides customers with options they like, but helps to eliminate incoming call volume from the contact center.

**During the event, SCE continued to accept non-outage calls.**

As in other areas of the company, CCO’s regular workloads (or portions of it) were being accomplished while also redirecting SCE staff to handle storm functions. Although at peak more than 220,000 customers were without power as a result of the storm, the majority of SCE customers did not experience an outage or experienced only a brief one and many areas of the company were taking care of day-to-day business for those customers.

It is important to note that when looking at storm-related call statistics only, SCE performed in line with its cohorts. However, the benchmark database only includes storm-related calls, since most utilities, during significant events, temporarily suspend acceptance of non-outage calls. This is due to the fact that during the events, other normal business was not being conducted. Therefore, comparing SCE’s performance to benchmarked companies is difficult, since SCE continued to accept both non-outage and outage related calls for the duration of the event. Comparing SCE’s statistics for outage calls against SCE’s statistics for non-outage calls indicates that customers experienced a marked difference in responsiveness, depending on whether the call was outage related or not. Due to IVR call routing and call center management reporting software, CCO is able to report statistics for storm calls alone, as well as for other types of business calls. Figure 17, below, provides the total number of storm calls that SCE received.
Figure 18, below, compares the number of calls answered by SCE Specialists with those answered by representatives at three other utility companies during three major storms. This graph provides the information using only storm calls for SCE during the November 30 windstorm response.
It is important to note that the windstorm occurred during night-time hours on the last day of the month and a majority of customers affected were awakening to the damage and outages on the first day of the month. The beginning of the month is normally the period of highest call volumes for utility call centers, requiring peak staffing to handle the peak business call volumes. Because Mondays are almost always the busiest day of the week, the first Monday of the month is typically the busiest day of the month for utility call centers.
Overall, SCE’s call statistics were in line with industry standard when evaluating storm calls only. SCE may have better met customer expectations, however, if it had either increased staffing to improve its non-storm call statistics or suspended non-outage calls. In the end, however, the call center’s performance was not criticized simply because of call statistics but because of the inaccurate information that Customer Service Specialists were receiving for release to customers.

*During the windstorm response, SCE utilized supplemental staffing to support the Customer Contact Organization in responding to customer calls.*

During the response to the windstorm and as a result of the high call volumes discussed previously, additional Customer Service Specialists were engaged to assist regularly scheduled staff in handling the calls. More specifically, on December 1 and December 2, fourteen Customer Service Specialists from Customer Billing who had recently worked in CCO and five employees from the credit group were activated to provide support. Approximately 100 Customer Support Specialists who work in support roles in CCO, but are not normally scheduled to take incoming calls, also assisted with calls at various intervals during the storm. On December 1 and December 3, when call wait times were extremely high, callouts were made to bring in off-shift specialists. From the time that
the storm affected the SCE service territory until the end of SCE’s response, staffing was also supplemented through the use of overtime, which was, at times, made mandatory.

**During the windstorm response, the CCO met CPUC GO 166 requirements.**

CPUC GO 166, which sets forth standards to ensure that electric utilities are prepared for emergencies and disasters, provides a benchmark for the California Public Utilities Commission (CPUC) to use in reviewing call center performance during storms and other emergencies. The benchmark relates to the number of busy signals received by customers when calling the utility during storms and states that the call center’s performance shall be presumed reasonable if the percent busies is lower than 30% of the call attempts to the utility over each day of the outage. It further states that the call center’s performance shall be presumed unreasonable if the percent busies is greater than 50% of the call attempts over each day of the outage and there are at least 50% busies in each of six one-hour increments during that day.

During the windstorm response, SCE customers received 840 busy signals on December 1 and three busies on December 2 for the five toll-free numbers designated for handling outage and general service in English and Spanish. That represented 0.5% and 0.003% of calls on each of those days, respectively. To eliminate the possibility of busy signals, those five toll-free numbers are supposed to roll over to the contract IVR provider when all trunks are busy. When CCO staff realized there had been busy signals on those lines, they discovered a technical problem with their telephone service provider where one trunk group was not overflowing properly. That problem was corrected. There were also 5,311 busy signals on December 1 for other toll-free numbers that SCE does not use for outage reporting or emergency services. The percent of busies on those lines was 13.8% of the calls or 2.7% of all toll-free calls.

**During the November 30 windstorm response, SCE received a smaller volume of calls than events of approximately the same duration but had a longer Average Speed of Answer.**

As noted previously, SCE’s external stakeholders did not view the call center as having performed well in response to the November 30 windstorm. Evaluating the contact center’s performance, however, requires not only a review of the statistical measures of success, but also a review of the quality of information that specialists were able to provide to customers. Indeed, the biggest complaint by customers and external stakeholders interviewed was the perceived lack of transparency vis-à-vis inaccurate information and ERTs throughout the storm event.

During two separate major storms at another North American utility, customer outages peaked at 671,000 and 807,000 for each the two storms. During those storms and the associated restoration periods, which lasted 10 and 12 days, the company received 1.03 million calls and 1.12 million calls. Those calls were all storm calls and represented 23% and 26% of the call volume they would normally take in a year. In comparison, during
the response to the November 30 windstorm, SCE received 194,387 calls, representing only 16% of the average monthly or 1.3% of annual call volumes. During the period of the windstorm response, the total number of incoming calls at SCE, including storm and other business calls, was 576,081, representing 48% of SCE’s average monthly or 4% of the annual call volume. Clearly, even including the non-outage calls that SCE received during the event, the call volumes at SCE were significantly below the benchmarked utility.

Hourly ASA figures were weighted according to the number of calls handled each hour. The average ASA was then calculated for the SCE restoration period (for both non-outage and outage calls) and each of the restoration periods at the comparison utility noted above. For the two storms at the best practice call center, the ASA averages were 37 seconds for the ten day storm and 41 seconds for the twelve day storm. The average ASA for storm calls throughout the windstorm was 62 seconds, which although reasonable, does not place SCE’s performance in the best practice category, especially considering the volume of storm calls handled at SCE versus those handled at the best practice utility. The average ASA for SCE’s non-storm calls was 132 seconds or 2 minutes and 12 seconds, which is over three times the frequently used ASA goal of 40 seconds mentioned earlier.

Figure 20, below, depicts hourly ASA values for SCE during the windstorm compared with hourly ASA values for the best practices.

*Figure 20: Hourly ASA SCE Versus Best Practice*
For the sake of making the graph more readable, it does not display the peak ASA values for storm calls from the four-hour period on December 1 between the hours of 4:00 and 7:00 a.m., where the ASA ranged between 1,097 seconds (18 minutes, 17 seconds) and 1,488 seconds (24 minutes, 48 seconds). Notwithstanding that the CCO Duty Supervisor reported to the Contact Center at 2:30 a.m. and began a call-out to bring in off-duty Customer Support Specialists, the number of staff available was inadequate to handle the volume of calls during those hours. During the hour from 7:00 to 8:00 a.m. on December 1, as regularly scheduled staff began to arrive at the Contact Center, the ASA for the storm call queue dropped to 515 seconds (8 minutes, 35 seconds) and it remained in the single digits for the rest of the day.

Had a “one voice” communications process been implemented, had SCE approached the this as a community event, and had there been a formalized structure that accounted for corporate-wide decision making, it is more likely that CCO leadership would have been engaged in conference calls and would have anticipated staffing needs on December 1. This would have likely yielded better CCO statistics and visibility.

Although SCE’s percent of abandoned calls spiked on December 1, the rates for outage calls were acceptable considering typical call center performance metrics.

The percentage of abandoned calls (calls wherein the caller hangs up prior to the call being answered by a representative) is another measure of call center performance. Although abandoned call goals vary from company to company, a range of up to 5% or 6% is usually considered acceptable, with tolerance of sometimes up to 8% or even 10%. SCE’s percent of abandoned storm calls, by day, are as follows:

- November 30 – 6%
- December 1 – 17%
- December 2 through December 4 – between 7% and 8%

During the last three days of the event (from December 5 through December 7), the percent of abandoned calls dropped to between 2% and 4%, which are considered acceptable levels, even during non-storm times. These figures indicate that once the initial surge in calls on December 1 had waned, SCE’s staffing levels were adequate to handle storm calls.
Abandoned calls for all other business inquiries and transactions were the following:

- November 30 – 10%;
- December 1 – 19%;
- December 2 – 18%;
- December 3 (weekend) – 20%; and
- December 4 (weekend) – 30%.

During the last three days of the event, non-storm abandoned calls were 10%, 8% and 4%. Although the first few days of each month are normally periods of peak call volume, 20% and 30% abandonment rates are considered high. Overall, CCO Abandon Call performance was within industry standard but it should not be considered a best practice. There are certain tactics, described in the recommendation section, which may assist CCO improve performance in the future.

Due to long wait times, particularly for non-outage calls, customers calling SCE during the event may have had a negative impression of the company.

The next graph shows the percentage of abandoned calls for non-storm calls at SCE during the period of the windstorm compared with abandoned calls for storm calls ONLY at other companies for which benchmarking statistics exist. This graphic is provided to illustrate that SCE, including all calls that it was receiving, had a substantial
higher percentage of abandoned calls than those companies that suspended receipt of non-outage calls.

Figure 22: Benchmark Percent Abandoned Calls (SCE Non-Storm)

Wait times that are longer than customer expectations and tolerances are the primary reason for abandoned calls. Although benchmarking information on longest wait calls during major events is not available, SCE’s longest wait time in each hour of the eight-day restoration effort following the November 30 event was analyzed. The longest waits in any hour before a specialist answered an outage call on each of the eight days of the windstorm were:

- November 30 – 2 minutes, 58 seconds;
- December 1 – 29 minutes, 11 seconds;
- December 2 – 11 minutes, 10 seconds;
- December 3 – 11 minutes, 12 seconds;
- December 4 – 10 minutes, 10 seconds;
- December 5 – 50 minutes, 15 seconds;
- December 6 – 31 minutes, 26 seconds; and
- December 7 – 4 minutes, 10 seconds.
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Figure 23, below, displays the distribution of the 192 (24 hours X 7 days) longest wait times per hour by the length of wait time for storm calls.

Figure 23: Longest Hourly Wait Times

Because the call path within the IVR prioritizes outage calls ahead of all other business calls, longest wait times for non-outage calls were considerably higher than outage calls during the storm. For all other business calls the longest waits per hour for each day were:

- November 30 – 41 minutes, 16 seconds;
- December 1 – 3 hours, 11 minutes, 7 seconds;
- December 2 – 3 hours, 46 seconds;
- December 3 – 2 hours, 2 minutes, 43 seconds;
- December 4 – 2 hours, 5 minutes, 17 seconds;
- December 5 – 55 minutes, 20 seconds;
- December 6 – 30 minutes, 48 seconds; and
- December 7 – 18 minutes, 28 seconds

Figure 24, below, displays the distribution of the 192 (24 hours X 7 days) longest wait times per hour by the length of wait time, for all non-storm calls.
During the event, CCO staff released a broadcast message on the IVR informing customers that there was a possibility of extended wait times and that if the call was regarding routine business, the customer should consider calling later in the week. Although that message was probably helpful in setting longer wait time expectations for some customers, customers waiting for the longer periods above probably had a negative impression of their experience with SCE.

**CCO’s supervisory and management organizational structure was adequate to handle escalated calls in a timely fashion.**

In large-scale storms where hundreds of thousands of customers are without power for an extended period of time, it is not uncommon for customers to become so frustrated that, especially later in the restoration period, they demand to speak to higher authorities. During major events, call centers sometimes have to pull training personnel, very experienced representatives, and others with special skills into a group to handle escalated calls. Callbacks can even become necessary at times due to the high volume of escalated calls. Research has shown that customer satisfaction drops by 15% when a second call is required to handle a customer’s inquiry. Whether or not that research specifically applies to callbacks during extended outages is unknown. In any event, not being able to talk to a higher authority at the time of the original call normally further frustrates the customer. SCE’s leadership structure was sufficiently robust to handle escalated calls during the storm. In the majority of escalated calls, supervisors were able to handle the calls live, rather than requiring a callback.
SCE’s IVR functionality should have been used differently during the windstorm.

As mentioned above, of the 194,387 calls into the Contact Center during the windstorm response, 31% were handled by representatives and 69% were handled by IVR technology. Because the majority of ERTs in OMS were inaccurate and because OMS information is automatically updated into the IVR, the majority of customers using the IVR for storm updates received incorrect information.

When a customer calls to report an outage or to inquire about outage status, he or she has the option of being called back, using outbound call technology, with updates on the outage. Customers reporting outages or getting outage updates in the IVR are provided the applicable information from OMS. A search is done within OMS to provide the most specific information available, whether it is an Outage Alert Note (OAN) tied to the customer’s own outage report, alerts on the customer’s circuit, or alerts in the customer’s zip code. In the windstorm, 34% of reported outages were in four zip codes. Because there were so many different instances of damage in relatively small geographic areas, customers were getting a long menu of ERTs in their zip code. When key personnel within CCO received feedback from specialists who began getting calls from customers confused by these long lists of ERTs, the issue was investigated. Because storms are not normally so concentrated in one particular area of the service territory, this had not come up in prior storms. As a result of this investigation, changes were made in IVR programming and implemented on December 5 to limit the number of OANs a customer would hear to nine.

The IVR also has a feature for disaster response service, which has never been utilized, but has been tested and is available. Rather than providing OAN information, messages can be entered by zip code area to provide higher level damage and restoration information. It appears that this feature of the IVR would have been valuable during the windstorm response. Because it is possible to use this feature for some zip codes and leave the other more granular IVR messaging implemented for other zip codes, it would work well in storms like the windstorm, where damage was highly concentrated in certain areas. When asked why this feature was not implemented during the November 30 event response, staff reported that it was not considered because CCO was not in disaster mode, as evidenced by the fact that a Category 3 storm was not declared and they were still taking regular business calls. In addition, due to the lack of centralized communications, there was not enough geographic granular information to be provided through revised IVR menus and messaging.

SCE’s Automated Outage Communications (AOC) system is a best practice in outage communications for special needs customers.

The cross-functional team described in Section 5.4 also undertook implementation of communications improvements for medical baseline customers. SCE’s medical baseline program is a CPUC-mandated program for single-family and multi-unit residential customers who must certify their medical dependence on electricity. Critical care
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customers are a subset of the medical baseline group who are dependent on a medically necessary device that they can only operate for two hours without electrical supply. SCE’s customer information system currently includes approximately 60,000 medical baseline customers, of which about 6,000 are critical care customers.

Under SCE’s program, all medical baseline customers receive an annual letter, which includes safety tips during outages and the customers must recertify with the company every two years. In April 2011, SCE’s Consumer Affairs Division, which is responsible for the program, requested that special needs customers identify an alternative communications preference (text, email, TTY) for the purpose of contacting these customers in case of planned or rotating outages. With a 67% response rate, SCE was able to ensure that it has an effective means of communicating with its special needs customers.

SCE’s Automated Outage Communications (AOC) system was designed to provide special needs customers with automated communications regarding planned or unplanned (including emergency) outages. The system is designed so that 15 minutes after an emergency outage, special needs customers receive the automated communication, which is a one-way communication with scripted messages. One issue that was raised during the November 30 windstorm response is that the AOC system is integrated with OMS, the Customer Support System, and Outage Alert Notes. In an event where OMS is generating inaccurate ERTs, medical baseline customers will also receive inaccurate ERTs. Nevertheless, Consumer Affairs did not receive a single call from a medical baseline customer that required escalation during the windstorm response. In any event, in asking medical customers for a second method of communications during outages and giving them various communications options noted above, SCE has implemented a best practice.

SCE’s outage website received 178,121 visits during the windstorm, but the ERT information provided was frequently inaccurate.

The outage map (located at http://www.sce.com/AOC_Outagemap/OutageMap.html) refreshes every 15 minutes with the latest information from OMS. The map displays the approximate locations of outages, the number of customer accounts affected, the ERT, the cause of the outage, and the status of the crews. It also displays lists of outages by counties, cities, and zip codes. Again, because the majority of ERTs in OMS were inaccurate and because OMS information automatically updates the website, the majority of customers using sce.com for storm updates received incorrect information.

In May 2011, SCE began development of web pages to allow customers to report an outage on sce.com and provide the option to receive ERT updates and power restoration messages via email and text. This functionality was implemented on December 10, 2011. The ability to report an outage on the website should help improve Contact Center performance by reducing calls during the initial stages of future outages.
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In addition, adding email and text messaging options for receipt of restoration information is a positive improvement for many customers.

The storm center web page was not the default web page for SCE once the storm was declared. When utility companies make website changes to allow their storm page to be the default page for their website during major storms, it helps demonstrate to customers that the company is aware of the scope of the outages and places restoration as a high priority.

Due to inaccurate ERTs populating OMS, the IVRs, sce.com, and the CCO system, the majority of customer experiences were less than satisfactory.

As noted previously, the overall quality of information provided to customers after the windstorm was poor. During any outage, and particularly during extended outages, customers have decisions to make regarding their living arrangements and businesses. Customers, therefore, depend on the information SCE provides regarding restoration times. As discussed in Section 5.4, the majority of customers inquiring about restoration times during the windstorm response received inaccurate ERTs. On average, ERTs populated into the OMS system and reflected in the IVR systems, the information system used by the CCO Customer Service Specialists, and the data on the website overpromised restoration by 21 hours. Underachieving on the Sunday 8:00 p.m. 99% restoration commitment also negatively impacted many customers’ planning efforts.

SCE’s call centers and a majority of its back-up call centers are in geographic proximity.

In the event of a large scale earthquake or some other major disaster, it is conceivable that both of SCE’s Southern California call center locations could be affected. It is further possible, that both PG&E and SDG&E might not be in a position to aid SCE in taking customer calls as planned in mutual aid agreements. Best practice utilities typically plan for such continuity of operations through agreements with “crisis call centers,” which can be activated if SCE requests assistance.

5.9.2. Recommendations

CC-1: Identify additional “second role” specialists, provide them system access and refresher training, and conduct exercises.

During interviews, CCO management indicated that there are approximately 200 specialists who have worked in CCO within the past five years but are now in different positions. SCE should identify these individuals and work with their day-to-day managers to assign them as “second role” Specialists. This assignment should also be conducted in coordination with the effort (described in Section 5.2.2) to establish a robust incident response role program that defines the process for assigning, training, evaluating, and tracking roles and is tied to HR systems. By identifying specialists in other areas of SCE and keeping a callout roster, these “second role” personnel could be
activated during large events or when the Contact Center requires support to ensure that it meets reasonable customer performance expectations.

Although the specialists identified above were previously trained in handling outage calls, they should be provided refresher training, at least annually. In order to respond quickly in emergency situations, plans for the use of these second role specialists should consider all logistical issues, such as workstations, system accesses, headphones, etc. Exercises should be performed occasionally to test the ability of second role specialist to sign into CWS, the system specialists use in helping customers with outage reporting and inquiries.

**CC-2: Include a protocol in storm/disaster response plans for management discussions and decisions regarding continuing to take, or suspending, non-storm calls.**

Because customer experience during major storms is so critical to the company’s overall reputation with its stakeholders, it is important that executive management become involved in setting performance goals for the major customer-facing organizations. SCE’s response plans should be revised to include discussion agendas and checklists of discussion items to be addressed during pre-storm conference calls, communications calls, and other key incident management briefings. For CCO, key agenda items would include:

- Risks and benefits of continuing to take or suspending non-outage calls;
- Performance target(s) around key call center measures;
- General service level targets for the event period; and
- Estimated staffing levels required to meet those targets.

Procedures should be included in the SCE response plans to ensure that the analyses above are undertaken during any event. During future events, when the media and public officials are making critical statements about the company, management should consider an “all hands on deck” approach to answering calls, an approach which would ensure that resources are brought in from parts of SCE which are not traditionally involved in the response.

**CC-3: Develop a communication strategy based on the level of the storm or event, including how the IVR and website messages will work for each of the different event categories.**

In larger scale outage events, the communication strategy should start with an explanation of the restoration strategy, followed by an explanation of how long the damage assessment will take and an idea of how long the restoration is expected to take. Once the damage assessment is complete, ERTs can be provided on a global scale. This should be within one to two days at a minimum for moderate storms or less granular for catastrophic events. Then as the damage assessment and the restoration progresses, the company will be able to refine these ERTs by city/neighborhood, by circuit, or by address. Once the company has developed how the strategy will work for
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different levels of storms, the procedures for how the IVR and website will receive outage update information and will provide information to customers should be designed for event category.

**CC-4: Review the disaster mode of the IVR to ensure that its functionality is sufficient for various scales of storms/events and, if necessary, redesign and implement changes to handle all storm/event scenarios.**

A detailed review should be performed to determine how the communications strategy and messaging for all scales of events, as discussed above, will work within the SCE and contracted IVR systems. Where needed to meet the requirements of storm/event communication strategies, the IVRs should be redesigned and changes implemented. When system requirements are being developed for each of the various scenarios, consideration should be given to including the ability to operate in disaster mode (wherein only outage calls are answered) or to continue to take non-outage calls.

**CC-5: Review website programming logic to analyze its scalability and ensure its functionality is sufficient for various scales of storms.**

A detailed review should be performed to determine how the communications strategy and messaging for all scales of events, as discussed above, can be displayed on sce.com. As needed, the website should be redesigned to meet the requirements of the various storm scenarios and programming changes should be implemented.

**CC-6: Consider using focus groups, or another customer feedback mechanism, in designing and testing changes to IVR and website storm communications functionality.**

Hearing customer needs and preferences first-hand regarding technology tools such as the IVR and website is always valuable. If changes to the IVR and/or website are necessary to meet the requirements of the outage communications strategy, the company should consider using focus groups or other customer feedback mechanisms to decide on alternative approaches to making the changes.

**CC-7: Develop a protocol for changing the default page of sce.com to the storm page once a certain level of storm is reached.**

During the windstorm, the storm center web page was not the default web page for SCE. Finally, SCE should create a storm webpage that replaces the company’s regular home page during a significant event and provides customers with easy access to outage-related information, including safety messaging, press releases, other key messaging, ERTs, etc.

**CC-8: Account for a loss of local call centers and local mutual aid call centers in planning assumptions.**

While SCE should not be expected to create a permanent capability, mutual aid or contract call centers should be identified in Texas, for example, to accommodate a loss
of local call centers and absorb the normal level of call center service. SCE should adapt its planning assumptions and alter stakeholder expectations for this eventuality. While SCE should not be expected to create a permanent capability out of state to accommodate normal levels of call center service, it should consider other alternatives, such as mutual aid agreements with utility call centers in other parts of the United States or pre-planned communications to alter stakeholder expectations.

5.9.3. Prioritized Matrix

Table 15: Call Center Recommendations Matrix

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
<th>Value</th>
<th>Ease of Implementation</th>
<th>Implementation Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC-1</td>
<td>Identify additional “second role” Specialists</td>
<td>High</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
<tr>
<td>CC-2</td>
<td>Include a protocol in plans for decisions regarding continuing to take, or suspending, non-storm calls</td>
<td>High</td>
<td>Easy</td>
<td>Long-term</td>
</tr>
<tr>
<td>CC-3</td>
<td>Develop a communication strategy based on level of event which includes procedures for how the IVR and website will work</td>
<td>High</td>
<td>Moderate</td>
<td>Immediate</td>
</tr>
<tr>
<td>CC-4</td>
<td>Review the disaster mode of the IVR and reprogram if necessary</td>
<td>High</td>
<td>Moderate</td>
<td>Immediate</td>
</tr>
<tr>
<td>CC-5</td>
<td>Review website programming logic to analyze its scalability</td>
<td>High</td>
<td>Moderate</td>
<td>Mid-term</td>
</tr>
<tr>
<td>CC-6</td>
<td>Consider using focus groups in designing changes to communications functionality</td>
<td>Moderate</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
<tr>
<td>CC-7</td>
<td>Develop a protocol for changing the default page of sce.com to the storm page</td>
<td>Moderate</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
<tr>
<td>CC-8</td>
<td>Account for a loss of local call centers</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Mid-term</td>
</tr>
</tbody>
</table>
5.10. Maintenance and Vegetation Management

Utilities throughout the United States own and operate tens of millions of assets necessary for delivering energy to customers. In order to manage these assets effectively and to provide safe and reliable service, most utilities utilize some form of an Inspection and Maintenance (I&M) program. Generally, an I&M program is a comprehensive inspection plan that defines an appropriate maintenance schedule for overhead and underground distribution, sub-transmission and transmission assets. Usually, the inspection portion of the program establishes a priority system that will identify and provide for the timely condition-based replacement of any visibly damaged or deteriorated assets prior to the next inspection cycle. The inspection process is typically linked to a work management system for streamlined work order creation, execution, field completion, closeout, and tracking. On an annual basis, the inspection criteria and the performance of repaired equipment are reviewed for effectiveness. Additionally, a Quality Assurance/Quality Control program is often implemented to ensure the efficiency and effectiveness of the inspection and maintenance program.

The following is a brief description of a typical inspection program utilized by many utilities. SCE’s I&M program substantively includes the majority of the following cyclical inspections:

- **Overhead Distribution Inspection** – visual inspection of overhead assets, which usually includes: poles; crossarms; insulators; primaries; transformers; capacitors; regulators; switches; reclosers; ground rods; guys; anchors; secondaries; services; spacer cable; cutouts; risers; switch gears; padmounted transformers; enclosures; and right of way (ROW). In addition, many programs include cyclical or prioritized infrared inspections and visual inspections;

- **Underground Distribution Inspection** – visual inspection of underground assets, which usually includes: metallic handholes; padmounted transformers; switchgear; manholes; vaults; splice boxes; junction boxes; and submersible equipment. In addition, many programs include internal inspections of padmounted transformers and switch gears and an infrared inspection of all separable components; and

- **Sub-transmission and Transmission Line Inspection (Overhead)** – visual inspection of overhead assets, which usually includes: towers; poles; crossarms; insulators; switches; reclosers; sectionalizers; conductors; guys; anchors; risers; ROW; and foundations. Many programs also include annual aerial helicopter patrols for visual examinations and an aerial helicopter infrared patrol.

Generally, any work identified as a result of the I&M program will be logged and prioritized based on the severity of the issues found. Priority codes vary among utilities but generally are determined by their potential impact on reliability and safety. Some I&M programs also focus on more discrete components of the operating system or are developed to mitigate the risks associated with certain circumstances prevalent in the service territory, which may include:
Findings and Recommendations

- Elevated voltage testing on facilities that are capable of conducting electricity and are publicly accessible;
- Street light inspections, focused on: luminaries, standards and foundations;
- Inspection and operational testing of regulators and capacitors;
- Inspection and operational testing of reclosers and sectionalizers; and
- Visual inspections of the entire distribution mainline and transmission system annually.

Various considerations motivate decisions about the value proposition associated with I&M programs, including: safety and environmental concerns (asset replacement prior to failure provides incremental employee and public safety benefits and avoidance of potential environmental problems) and reliability improvements (condition-based repair/replacement result in improved reliability and support the creation of a sustainable system). Consistent throughout the industry, deteriorated equipment related interruptions are a notable driver of poor reliability. Best practice utilities use either timed-based or reliability-based maintenance approach depending on the type of equipment. In addition, these utilities have a strong process to ensure that the maintenance is carried out and that the replacements are completed on a timely basis.

In order to ensure safety of electric utility construction, NESC has established guidelines for pole loading based on historic weather patterns by geographic area. The guidelines are expressed in terms of the minimum wind speeds and ice loading that the structures are expected to withstand. Utilities are expected to follow this guideline and ensure that their construction standards and structures, including wood poles, meet the NESC loading guidelines at the time of installation. During major storms, distribution system failures are typically caused by falling trees, tree limbs or debris on electric facilities, or broken poles due to extensive wind or ice loading. Since the strength of wood poles may deteriorate over time due to environmental factors, utilities have pole inspection and replacement programs that are based on a pre-defined cycle, which depend on environmental factors and type of wood poles that are used. In most major weather events, however, the poles that fail and cause interruptions are typically brought down by vegetation or other debris or extensive wind and ice loading that are beyond NESC structure loading guidelines.

Vegetation is typically the single largest culprit of outages during major events. Trees and limbs tend to fall into distribution lines and take down wire and equipment, including poles, creating interruptions to customer service. While most utilities manage vegetation line clearance on a pre-defined cycle, the trees and limbs that cause outages in major events tend to fall in from outside the typical clearances or rights-of-way (ROWS). Some companies have expanded their vegetation management (VM) programs to increase clearance specifications, remove overhangs, and remove hazard trees from outside the ROW. Aggressive VM programs can reduce damage during major events, but are difficult to execute since they require access and approval by property owners.
5.10.1. Findings

SCE’s I&M program is consistent not only with the expectations set forth in the General Orders, but also with standard industry practice. SCE utilizes a five-year Distribution Inspection and Maintenance Program (DIMP) that includes a Quality Assurance/Quality Control (QA/QC) process to evaluate the inspections that are done. SCE conducts intrusive inspections of poles in compliance with General Order 165, which requires that each pole is inspected before it reaches 25 years old and then once thereafter every 20 years. The program is not, however, coordinated with the previously mentioned inspection cycles and is executed based upon a pole’s age. Finally, the company’s vegetation management program appears to be well-funded and meets CPUC requirements.

**SCE’s Inspection and Maintenance (I&M) program is consistent with the expectations set forth in the General Orders and standard industry practice.**

As noted above, SCE utilizes a five-year DIMP that includes a QA/QC process to evaluate the inspections that are done. SCE utilizes craft personnel for underground inspections and trained and qualified inspectors for overhead inspections. The work that is identified as part of this process is classified into one of three priorities which establish how quickly the work will be completed. As part of the QA/QC process, feedback evaluations are provided to the inspectors and formalized training is provided using the DIMP training manual. SCE’s transmission and sub-transmission system is inspected under the Transmission Maintenance Program (TMP), which includes an annual foot patrol to visually inspect each pole and helicopter, thermography and tower footer inspections. As part of this program, SCE has an industry leading practice of conducting three-year “climb down” inspections for all towers on each of the 217 transmission circuits. Other inspection practices conducted by SCE include:

- **An Annual Grid Patrol (AGP),** which is a visual inspection of the entire transmission, sub-transmission (foot patrol) and distribution system annually (80% (driving) of the distribution is inspected under the AGP and 20% (see above) is done under the DIMP). SCE is only required to inspect rural areas once every two years but have chosen to inspect every year for reliability and safety;
- **Analysis of operational information,** specifically, unexplainable relay operations (lockouts and multiple trip and recloser operations) at transmission substations to drive patrols of its transmission lines outside of normal inspection cycles.

Since 1998, SCE has issued and filed an availability outage report for each of its 217 ISO circuits. The ISO, in conjunction with SCE, conducts audits on approximately 18-20 circuits using both a record review and field inspection. SCE also issues a Western Electric Coordinating Council (WECC) report for annual certification.

As a result, while SCE focuses on compliance with General Orders, it should also examine the intrinsic value of the mandated I&M programs.
SCE’s pole inspection program appears to be consistent with the expectations set forth in the General Orders and industry practice.

SCE conducts intrusive inspections of poles in compliance with General Order 165, which requires that each pole is inspected before it reaches 25 years old and then once thereafter every 20 years. The program is not, however, coordinated with the previously mentioned inspection cycles and is executed based upon a pole’s age. Notably, SCE presently utilizes a 15-year intrusive inspection cycle in an effort to manage compliance with General Order 165 and intends to transition to a 10-year cycle utilizing a grid/circuit approach to better coordinate its efforts. SCE also utilizes an overhead loading evaluation process to evaluate the integrity of poles as related to the safety factor. The overhead pole loading is not part of the intrusive inspection cycle or the inspection and maintenance process. As noted previously, the Transmission and Sub-Transmission system is inspected under the Transmission Maintenance Program (TMP), which includes an annual foot patrol to visually inspect each pole. Finally, SCE evaluates poles that fail during storms and where there are safety issues.

SCE’s process to comply with appropriate safety factors for pole loading is a leading industry practice but, there are opportunities for improvement.

SCE is required to ensure that poles installed during reconstruction and new construction meet certain safety factors related to loading. SCE has a process in place to comply with this requirement, which includes training incumbent design engineers through the use of a formal manual and computer program. Notwithstanding this training program, the Facilities Inventory Map (FIM) used by design engineering personnel does not include 3rd party attachment data, suggesting that design engineers may not have full visibility of the actual loading on each pole. In addition, SCE does not currently have a process in place to evaluate compliance with this directive or its impact on reliability and safety.

During emergency conditions (e.g. localized storms and natural disasters) the requirements of General Order 95 may be deferred. However, General Order 95 also requires that emergency installations shall be removed, replaced or relocated as soon as practical so that the new installations comport with the requirements set forth therein. There is no quality control process in place to presently determine if poles and other assets that were installed during storm restoration meet the safety factor requirements set forth in General Order 95.

Rate of pole failures during the November 30 windstorm was lower than in other similar events.

During the November 30 windstorm, SCE had approximately 350,000 poles in the area exposed to significant winds, the Mesa sector. In total, approximately 250 poles failed during this event representing only 0.07% of poles exposed to the sustained winds. Davies Consulting compared this rate to the failure rate of other similar events using
available benchmark data. Since the November 30 windstorm is a unique event, it was compared to tropical storms or category 1 hurricane. Based on this comparison, it appears that the failure rate was significantly less than that of the category 1 hurricane and slightly lower than the failure rate for tropical storms. We acknowledge that there are significant wind pattern differences between tropical storms or hurricanes and the windstorm experienced on November 30. Regardless, the area exposed to the high sustained winds and the peak, intense gusts, did not suffer a significant percentage of damaged poles as compared to other wind events.

**SCE’s Vegetation Management program appears to be well funded and meets strict CPUC requirements.**

The state of California has the most strict electric line clearance requirements in the United States. There are three key rules and regulations that have been enacted that govern utility practices in the area of vegetation management:

- **Public Resource Code 4292: Firebreak Clearing** – Utilities have to maintain around and adjacent to any pole or tower that supports a switch, fuse, transformer, lightning arrester, line junction, or dead end or corner pole, a firebreak which consists of a clearing of not less than 10 feet in each direction from the outer circumference of such pole or tower.

- **Public Resource Code 4293: State Responsibility** – Utilities are required to maintain clearance between vegetation and high voltage power lines during fire season in wild land areas to prevent wild fires. Following are the required distances by voltage:
  - For any line which is operating at 2,400 or more volts, but less than 72,000 volts, four feet;
  - For any line which is operating at 72,000 or more volts, but less than 110,000 volts, six feet; and
  - For any line which is operating at 110,000 or more volts, 10 feet.

- **General Order 95: Utility Vegetation Management Requirements** – Utilities are required to maintain a minimum clearance of 18” between vegetation and high voltage power lines (750V to 105kV) at all times in all areas for public safety and electric system reliability.

In order to ensure compliance with these regulations, SCE has established a long-term alliance contract with one of the leading utility vegetation contractors, Asplundh Tree Expert (ATE). As a part of the agreement, ATE is paid a pre-defined annual amount and is accountable for maintaining SCE facilities in full compliance with the regulations. SCE foresters and vegetation management staff administer the contract, work with ATE to ensure implementation, and provide quality control.

The vegetation management budget has steadily increased over the past 10 years and is currently at around $60 million annually (see Table 16, below).
Findings and Recommendations

Table 16: VM Program Funding 2002-2011

<table>
<thead>
<tr>
<th>Activity</th>
<th>Vegetation Trims/ Clearing</th>
<th>Vegetation Trims/ Clearing - High Fire</th>
<th>DCM Line Clearing</th>
<th>TOTAL</th>
</tr>
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<tbody>
<tr>
<td>2002 $30,152,158</td>
<td>$348,987</td>
<td>$30,501,145</td>
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<tr>
<td>2003 $30,318,122</td>
<td>$644,339</td>
<td>$30,962,461</td>
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<tr>
<td>2004 $28,517,250</td>
<td>$1,085,878</td>
<td>$29,603,128</td>
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<td>2005 $28,889,115</td>
<td>$956,874</td>
<td>$29,845,988</td>
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<tr>
<td>2006 $38,895,524</td>
<td>$1,581,038</td>
<td>$40,476,562</td>
<td></td>
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</tr>
<tr>
<td>2007 $39,664,874</td>
<td>$1,653,869</td>
<td>$41,318,743</td>
<td></td>
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<tr>
<td>2008 $42,565,999</td>
<td>$1,967,578</td>
<td>$44,533,577</td>
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<td></td>
</tr>
<tr>
<td>2009 $43,866,758</td>
<td>$991,980</td>
<td>$2,330,831</td>
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</tr>
<tr>
<td>2010 $48,266,001</td>
<td>$11,837,426</td>
<td>$2,272,272</td>
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</tr>
<tr>
<td>2011 $43,980,336</td>
<td>$11,769,035</td>
<td>$2,596,430</td>
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<td></td>
</tr>
</tbody>
</table>

The goal for SCE’s trimming is to establish a four-year clearance depending on the species of trees and their respective growth. However, depending on the growth cycle and access, some of the lines have to be maintained on a much shorter maintenance cycle. For example, eucalyptus trees are a fast growing species that require aggressive removal to ensure compliance four years after the trim. Since in some areas, it is impossible to establish such a large clearance, SCE uses a mid-cycle program, which in some cases results in trimming trees every four to eight months to maintain compliance. As a part of the program, the contractor annually inspects all overhead miles.

Based on the review of the vegetation program, it is clear that SCE’s program is well funded, meets CPUC requirements, and did not adversely contribute to the amount of damage during the windstorm.

5.10.2. Recommendations

*M-VM-1: Evaluate the cost/benefit of the I&M program and establish metrics to determine the value of the investments in order to establish future priorities, capital, and O&M budgets.*

SCE focuses on compliance with various General Orders but also has an opportunity to look at the intrinsic value of the Inspection and Maintenance programs it employs. Programs are not prioritized or evaluated by their contribution to providing reliable service. While compliance with regulations is important, SCE should determine whether these investments are cost-effective and necessary. Where investments are not cost-justified, SCE should work with its regulators to establish investments that yield positive and cost-effective results that meet their obligation to provide safe and reliable service at reasonable costs.
M-VM-2: Enhance pole inspection program focus and execution.

SCE has numerous inspection programs that can be better integrated and enhanced to improve the utilization of resources (personnel and investment funds) and identify target poles. Target poles could be identified by location due to certain types of weather events, including wind and lightning, or by criticality and safety exposure to workers and the public. The inspection of the pole plant should be driven by condition assessments and analysis rather than by age, notwithstanding that this is a regulatory compliance issue. Although age is often used as a proxy for potential poor pole plant reliability performance, there is little evidence in the industry to support that assertion and SCE does not evaluate its program on that basis. Furthermore, SCE should execute its program on a per circuit/substation basis, prioritized by potential impact to critical infrastructure and safety to the public and utility workers. Finally, SCE should work with CPSD to modify the requirements set forth in the General Orders accordingly.

M-VM-3: Establish a quality assurance/quality control process to evaluate whether the safety factor requirements set forth in General Order 95 are being appropriately applied during new construction, re-construction, and for poles that are installed during storm restoration.

SCE should consider establishing a standing process or perhaps a field forensic analysis team that validates that the safety factor is appropriately applied (perhaps, also investigating other reliability drivers beyond those that impact pole plant) and executed during blue sky operations as well as during storm restoration and recovery. This analysis is necessary to determine if there are systemic process issues that need to be improved and will also establish correlation data that can be analyzed to determine causal links that drive performance.

M-VM-4: Incorporate, as SCE progresses with the development of its GIS system, the integration of Facility Inventory Maps (FIM) and 3rd party attachments.

SCE is focused on expanding its utilization of GIS technology to drive better performance and improve its overall capabilities to plan and respond to system events. As SCE expands the amount and type of data being utilized by GIS, the company has an opportunity to create various layers that can support departments by ensuring that the most comprehensive information is available. Presently, the FIMs and the 3rd party pole attachment data reside in separate databases, which hinder optimal utilization within the company. By integrating both of these databases into the GIS platform (along with other relevant information databases) more comprehensive data will be available for designers, operators and storm response personnel which will improve their situational awareness.
### Prioritized Matrix

**Table 17: Maintenance and VM Recommendations Matrix**

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
<th>Value</th>
<th>Ease of Implementation</th>
<th>Implementation Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-VM-1</td>
<td>Evaluate the cost/benefit of the I&amp;M program and establish metrics to determine the value of the investments</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Mid-term</td>
</tr>
<tr>
<td>M-VM-2</td>
<td>Enhance pole inspection program focus and execution</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Mid-term</td>
</tr>
<tr>
<td>M-VM-3</td>
<td>Establish a quality assurance / quality control process to evaluate if the safety factor requirements are being appropriately applied</td>
<td>Moderate</td>
<td>Low</td>
<td>Immediate</td>
</tr>
<tr>
<td>M-VM-4</td>
<td>Integration of Facility Inventory Maps (FIM) and 3rd party attachments into GIS</td>
<td>Moderate</td>
<td>Hard</td>
<td>Long-term</td>
</tr>
</tbody>
</table>
5.11. Transmission

The SCE transmission system is connected to the Regional Transmission System and is a critical electrical infrastructure asset supplying uninterrupted power to SCE’s distribution system customers. This transmission system is heavily regulated by the Federal Energy Regulatory Committee (FERC) and the North American Electric Reliability Council (NERC). There are approximately 100 mandatory reliability standards that govern the Bulk Electric System (BES) and the Bulk Power System (BPS), which for purposes of this report are those transmission facilities 100kV and above. Compliance with these mandatory standards is performed through NERC audits and strict requirements for voluntarily reporting non-compliance events. In addition, SCE has regulatory compliance goals defined by agreements with the Western Electricity Coordinating Council (WECC), California Independent System Operator (CAISO), and California Public Utilities Commission.

Transmission emergency response plans often, as in this case, incorporate both transmission and sub-transmission facilities. This is usually because the majority of sub-transmission infrastructure is designed and constructed similar to transmission facilities and usually resides on similar, if not the same, ROW. In addition, transmission and sub-transmission restoration requires differently skilled resources than does the distribution system.

Due to system design and operations, transmission and sub-transmission restoration efforts are prioritized ahead of distribution restoration but are usually undertaken in parallel because of the natural independence of each. As it relates to the overall restoration, it should be noted, however, that in some cases where redundancy is not available, the failure to restore transmission and sub-transmission facilities may adversely affect the underlying distribution system and delay restoration.

5.11.1. Findings

SCE’s Transmission Business Line (TBL) is responsible for the safe and reliable delivery of power in its seven grids. The SCE transmission system consists of 626 miles of 1000kV lines, 1,031 miles of 500kV lines, 3,381 miles of 220 kV lines, and 52 miles of 161 kV lines. The sub-transmission system consists of 1,891 miles of 115 kV lines, 5,135 miles of 66kV lines, 144 miles of 55 kV lines, and 52 miles of 33kV lines. The TBL is responsible for the design, construction, inspection, and maintenance of all transmission assets, which are dispersed over a 55,000 square mile service territory.

The workforce that conducts normal operations on TBL’s seven grids consists of 13 heavy crews, typically comprised of eight men. There are also 34 senior patrol crews, which are primarily responsible for all inspection and maintenance activities within each crew’s assigned areas of operation. Patrol crews are typically made up of two or three man patrols. TBL Commercial Management right-of-way crews provide grading support for routine and emergency access to transmission facilities within environmental
restrictions. These crews are strategically located in the North Coast and Eastern Grids. TBL Field Forces are augmented by contract resources as needed to meet workload or emergency requirements.

*The windstorm was not a notable transmission or sub-transmission event but there were two isolated incidents on the sub-transmission system that were significant.*

There were no realized incidents on the transmission system and there were only two incidents of isolated damage on the sub-transmission system. Although there were seven locations where sub-transmission infrastructure was damaged, the vast majority of the damage was at two locations. The two notable events resulted in 38 poles having to be replaced and 42 spans of wire being re-hung. One of these events was precipitated by trees contacting the pole lines and resulted in the cascading failure of poles. It should be noted that these isolated incidents were off-ROW combination poles that supported sub-transmission and distribution circuits.

*The Transmission Business Line Emergency Response and Business Continuity Plan is comprehensive but was not fully activated and staffed prior to the windstorm.*

The TBL Emergency Response and Business Continuity Plan is comprehensive and generally comports with standard practices in the industry. For this storm event, TBL personnel were not activated at the Control Center or Emergency Response Center in anticipation of any significant events.

*Significant delays were incurred by Transmission restoration crews waiting for switching and safety clearances.*

As a result of the significant volume of trouble tickets requiring switching and tagging, transmission crews assigned to repair the sub-transmission system (which had distribution under-build) waited an extensive period of time to obtain switching clearance and thus, were significantly delayed in beginning their work. During this event, because of the isolated nature of the sub-transmission events, the delayed transmission restoration did not demonstrably affect the overall system restoration but, in future events, a delayed transmission restoration could be a very significant issue.

*There were opportunities to improve the BUSS’s effectiveness during this sub-transmission restoration event.*

The BUSS did not provide adequate logistical support for sub-transmission restoration efforts. Specifically, there were opportunities during the restoration of the two significant sub-transmission damage locations to utilize additional non-operations personnel for maintaining a safe and secure worksite. Instead, during the restoration of both the Peck Road and Primrose sub-transmission facilities, members of the press and general public needed to be constantly managed by operations personnel to stay outside the work zone perimeter.
5.11.2. Recommendations

T-1: Review the TBL Emergency Response and Business Continuity Plan to fully take advantage of and integrate into the corporate plan.

Although the TBL Emergency Response and Business Continuity Plan is generally comprehensive, there are enhancement opportunities that will be realized by integrating it more closely with the Corporate ERRP, especially as it relates to structural alignment with the ICS organizational structure. This review should include identifying the potential value added and future space requirements that would permit certain transmission IC staff to co-locate with corporate IC command staff.

T-2: SCE should develop and implement a detailed transmission prioritization tool.

The existing TBL Emergency Restoration and Business Continuity Plan does not adequately delineate the prioritization of transmission facilities for repair. While this was not a significant issue during this event, because of the isolated damage on the sub-transmission system, it will be an issue during a more significant event. Accordingly, SCE should develop and implement a detailed transmission prioritization tool and the necessary damage assessment process to be used to determine and assign resources to the most critical damaged facilities first and safely expedite restoration efforts.

T-3: Perform a lessons learned on the effectiveness of and the need for the BUSS during this transmission restoration event.

Upon undertaking a lessons learned of the BUSS process, as it relates to transmission support, revise the role of the BUSS to better facilitate the restoration of transmission facilities. Alternatively, because of the comprehensive responsibilities assigned to the BUSS, its role and perhaps existence in future emergency planning should be evaluated.

T-4: Review and improve the switching and clearance practices performed during significant storm events to safely and effectively support the crews performing restoration of Transmission equipment.

As noted above, the transmission system (including sub-transmission) is the backbone of the integrated electric system. During this event, a significant delay in obtaining clearance was experienced by transmission response personnel and as a result they were unable to execute their repairs in a timely manner. Accordingly, SCE should review existing safety tagging and clearance procedures and the number of resources that are trained and qualified to perform switching and provide clearances during different size emergency restoration events.

T-5: Work with distribution emergency preparedness to improve forecasting and risk assessment of weather events.

Work with the SCE distribution emergency preparedness team to improve the process for acquiring and analyzing weather forecasts and assessing the potential risk on the SCE transmission and sub-transmission infrastructure. Defined triggers should be
incorporated into the TBL Emergency Response and Business Continuity Plan based upon a robust transmission risk assessment for potential damage to infrastructure caused by weather events. These triggers, once defined, would initiate the activation and implementation of the plan.

_T-6 Provide dedicated resources to maintain a safe work perimeter for large transmission or sub-transmission emergency restoration efforts._

In addition to planning for traffic control, SCE should provide trained and qualified personnel to keep bystanders out of transmission worksites. Because of the high visibility of transmission restoration events and the complexity of the work, it is critical to maintain a safe and secure worksite.

### 5.11.3. Prioritized Matrix

<table>
<thead>
<tr>
<th>Number</th>
<th>Recommendation</th>
<th>Value</th>
<th>Ease of Implementation</th>
<th>Implementation Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-1</td>
<td>Review plan to fully take advantage of and integrate into the corporate plan based upon ICS</td>
<td>Moderate</td>
<td>Hard</td>
<td>Long-term</td>
</tr>
<tr>
<td>T-2</td>
<td>Develop and implement a detailed transmission prioritization tool</td>
<td>Moderate</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
<tr>
<td>T-3</td>
<td>Perform a lessons learned on the effectiveness of and need for the BUSS</td>
<td>Moderate</td>
<td>Hard</td>
<td>Long-term</td>
</tr>
<tr>
<td>T-4</td>
<td>Review and improve the switching and clearance practices during outage events</td>
<td>High</td>
<td>Moderate</td>
<td>Immediate</td>
</tr>
<tr>
<td>T-5</td>
<td>Work with distribution emergency preparedness to improve forecasting and risk assessment of weather events.</td>
<td>High</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
<tr>
<td>T-6</td>
<td>Provide for dedicated resources to maintain a safe work perimeter for large transmission or sub transmission emergency restoration efforts.</td>
<td>High</td>
<td>Easy</td>
<td>Immediate</td>
</tr>
</tbody>
</table>
Appendices
**Davies Consulting Background**

Davies Consulting was founded in 1991 as an international strategic management consulting firm. Focusing primarily on the energy industry, Davies Consulting provides its clients with a comprehensive range of services, experience, ideas, decision support tools, and strategies to ensure that they successfully meet challenges to their businesses and prepare for the future. Our current and former clients include top energy companies in North America and leading healthcare, pharmaceutical, international funding, chemical, technology, and manufacturing companies in the U.S., Canada, and Europe.

The Davies Consulting energy practice is committed to providing quality methods, tools, and experience to advance the effectiveness of our clients' energy businesses. Our clients consistently indicate that our consulting teams have the unique ability to build internal capability through collaboration at all organizational levels to provide customized, strategic, and analytic solutions. Relying on a mix of industry and management consulting expertise and analytic solutions, Davies Consulting provides energy companies with successful management consulting services in the following areas:

**Organizational and Operational Effectiveness**

Davies Consulting provides in-depth Organizational and Operational Effectiveness consulting services in support of energy companies trying to thrive in today’s complex environment. Davies Consulting’s energy team provides clients with a unique combination of hands-on industry expertise and proven management consulting expertise and approaches. Organizational and Operational Effectiveness services ensure that operational objectives are linked with customer expectations, regulatory requirements, financial objectives, and other stakeholder goals.

**Business Process Improvement**

Davies Consulting works with companies to enhance business efficiency, increase profit margins, and build stakeholder relationships through enhancement, development, and implementation of business process improvement plans. These plans typically require development or modification of budget and resource allocation processes and tools and organizational structures, roles, and responsibilities. Davies Consulting consultants use their extensive change management and strategic consulting experience to ensure that the recommended business processes are not only implemented, but also adopted by client stakeholders, resulting in sustainable business results.

**Regulatory Strategy**

With the resurgence of cost recovery proceedings, rate cases, and performance audits, regulators have directed their attention to energy delivery service performance. Some states have already implemented performance-based rates (PBRs), while others are
imposing severe penalties on those utilities within their jurisdictions that do not meet specific customer satisfaction or reliability targets. At the same time, the large numbers of severe storms that have affected large swaths of the country have led to increased regulatory scrutiny. Davies Consulting works with energy companies operating across multiple jurisdictions to help them develop regulatory strategies that best fit their business objectives and minimize their risk.

Strategy Planning

Davies Consulting’s strategic planning consulting services support clients seeking to develop a solid business foundation through strategic and business plan development. Our consulting team provides clients with a unique combination of hands-on industry expertise and management consulting experience. We work with our clients to ensure that their decisions on business, product prioritization, merger and acquisition strategy and implementation, and IP valuation are linked with regulatory requirements, financial objectives, and stakeholder objectives.

Reliability Performance

Success in today’s environment depends on an energy company’s ability to proactively address regulator and customer expectations, and provide reliable service at the lowest possible cost. Davies Consulting energy consultants work with clients to ensure the availability of accurate and easily accessible reliability data, establish clear accountability for all process participants, and link financial system information to reliability performance in order to enhance the decision-making process. Davies Consulting’s Integrated Reliability Strategy services include: strategy development, vegetation management, and implementation of several decision support tools.

Asset Management Strategy

Energy companies are under increasing pressure to better optimize the balance of risk, cost, and performance of their complex and distributed asset bases. Energy executives are challenged every day to make decisions to ensure better financial return, more efficient operations, better service reliability, and improved customer service. Davies Consulting’s Financial and Human Resource Allocation services enhance the effectiveness of management decision making. Our resource allocation services support decision making at multiple organizational levels, across and within different business units.

Market Development and Entry Strategy

Companies are constantly weighing the risks and benefits of expanding into new product and geographic markets. To support these decisions, Davies Consulting works with clients to conduct extensive market research studies and develop market entry and forecasting models. Our team then uses its extensive industry expertise to develop and successfully implement strategic marketing and product positioning strategies for our clients.
Emergency Planning and Response

Utilities have come under increasing scrutiny from regulatory agencies, local, state, and federal governments, customers, and the media as a result of concerns over extended outages due to natural disasters, events such as the August 2003 blackout, and man-made threats. Davies Consulting works with energy companies to assess their preparedness for major events, develop integrated restoration plans and strategies, and prepare for regulatory audits. To enhance our emergency response services, Davies Consulting consultants have extensive operational emergency experience and are certified by the Federal Emergency Management Agency on the Incident Command System, National Incident Management System, and National Response Plan. Over the past ten years, Davies Consulting has worked with more than twenty utilities throughout North America to improve their ability to restore customers after major events. The Davies Consulting team includes experts in utility operations, emergency management, regulatory, communications, and engineering. All of the consultants that participated in the SCE work have conducted multiple reviews of utility responses and several have managed different facets of major event restoration and have led improvement efforts subsequent to major events while employed by the utilities.