Abstract of the Incident Analysis of PEC response to the February 2021 winter storm event

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1. ABSTRACT

Between February 10 – 20, 2021, three severe winter storms swept across the United States. The storms, hereinafter collectively referred to as the Winter Storm Event, resulted in over 170 million Americans being placed under various winter weather alerts being issued by the National Weather Service in the United States across the country and caused blackouts for over 9.9 million people in the U.S. and Mexico, most notably in Texas, where massive electricity generation failures occurred and emergency operations mandated load curtailment across the ERCOT Region.

The Electric Reliability Council of Texas (ERCOT) declared a Level 3 Energy Emergency Alert (EEA3), and initiated rotating outages at 1:25 a.m. on February 15, 2021. Pedernales Electric Cooperative (PEC) and utilities across the state participated in mandatory load shedding. Rotating outages were mandated on a continuous basis until 11:55 p.m. on February 17, 2021, and ERCOT moved from EEA3 to EEA2, at 9:17 a.m. on February 19. Prior to the Winter Storm Event, ERCOT had initiated system-wide rotating outages three times in its history (Dec. 22, 1989; Apr. 17, 2006; and Feb. 2, 2011).

While some outages on PEC's system were due to a state-wide mandate by ERCOT to manage power load, others were a result of extreme temperatures that led to infrastructure damage across PEC's 8,100 square mile service territory. Hazardous roads made it difficult for PEC crews to restore power loss caused by infrastructure damage.

PEC retained Utilicast to conduct an incident analysis through an after-action review of PEC's responses to the Winter Storm Event. The scope of the Incident Analysis is reflected in Figure 1, illustrating an emphasis on the Operations functions within PEC.

As a result of the Incident Analysis, Utilicast concluded that the Winter Storm Event allowed opportunities to strengthen PEC's ability to maintain resiliency. Resiliency occurs when systems, standards, and procedures have been built and tested to withstand extreme conditions. Resiliency was tested across the people, processes, and technology of the organization.

- Communication to members and employees was reactive in nature, driven by a lack of preparation for the subevents that when culminated together, made the Winter Storm Event an unprecedented event. Recommendations related to *people* include strategies to bolster staff, improve emergency communications, and proactively connect with members.
- Reliance on manual processes and operations experience stretched personnel to their limits and exposed gaps in documented procedures and communication protocols. *Process* recommendations address methods to automate manual operations or formalize manual procedures into standard and emergency operations procedures.
- During emergency operations, the flow of information was compromised when several system issues deterred personnel from normal communication and collaboration.

Technology recommendations require assessing, upgrading, re-configuring, testing, tuning and potentially replacing core modules of operational systems.
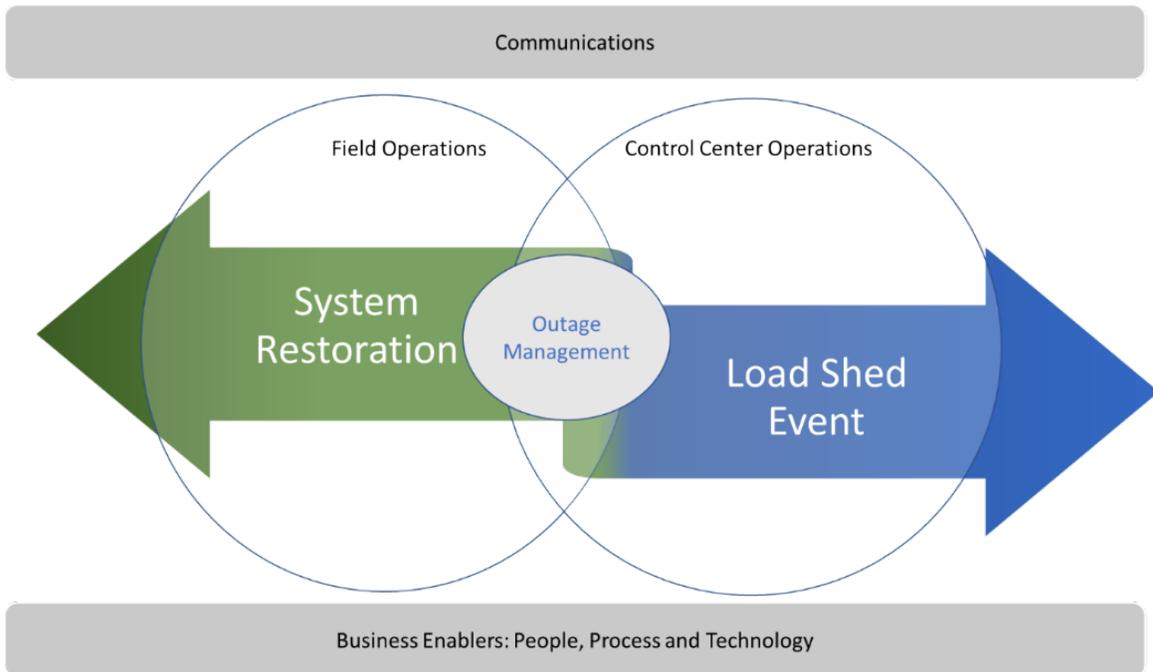

Figure 1: Scope of Incident Analysis

Detailed findings and tactical steps to implement the recommendations are contained in the full report. This abstract highlights key recommendations without exposing commercially or operationally sensitive information.

Despite key issues discussed in the detailed report, PEC personnel and leadership continue to serve the PEC membership with a focus on constant improvement. During the Winter Storm Event, support staff and restoration crews worked tirelessly to meet the demands of the membership and to restore the PEC service territory to a steady state of operations, many times at the expense of their own personal comforts. Tremendous innovation and commitment to troubleshooting during the event have shaped the recommendations contained in this report. Recommendations in the full report address key issues, and as they are implemented, will ultimately build resiliency in the people, processes, and technology of PEC.

The full Incident Analysis report includes 22 total recommendations. In summary:

- 11 recommendations directly modify PEC Operations, across the field and control center.
- 9 recommendations address technology improvements to assess and establish a baseline of technology architecture and improve the performance of operational technology.
- 2 recommendations extend communications procedures.

If all are recommendations were implemented in sequence, PEC would need approximately 165-months to complete. Thus, many recommendations must be implemented in parallel to achieve benefits in a timely fashion. Without having an in-depth understanding of the existing workload, the ability to predict regulatory or legislative mandates, or the insight into recommendations put forth from other internal analysis, PEC should leverage the descriptive steps in the full report to implement the recommendations by either distributing assignments to internal resources or leveraging the recommendations as a framework to solicit third parties to implement.

2. OPERATIONS EXCERPTS

During the Winter Storm Event, Operations was responsible for two critical tasks: meeting load shed obligations and restoring system power. These two core responsibilities, by definition, have competing interests. The Incident Analysis uncovered system and process challenges at PEC that hamstrung power restoration efforts and complicated the load management process. The Incident Analysis groups recommendations into tactical and sequential projects to (1) improve system restoration by streamlining field and control center operations, and (2) improve the load management process.

System restoration spans across Field Operations and the Control Center Operations. Thus, the overall recommendation is to streamline and improve the communication and coordination between these two vital departments.
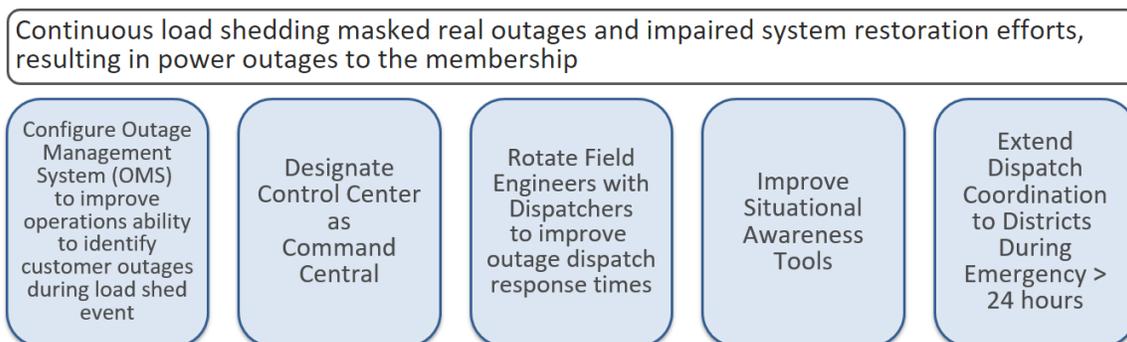
Continuous load shedding masked real outages and impaired system restoration efforts, resulting in power outages to the membership

| Configure Outage Management System (OMS) to improve operations ability to identify customer outages during load shed event | Designate Control Center as Command Central | Rotate Field Engineers with Dispatchers to improve outage dispatch response times | Improve Situational Awareness Tools | Extend Dispatch Coordination to Districts During Emergency > 24 hours |

Figure 2: Streamline Operations Recommendations

The load management applications and processes typically designed for peak shaving under short-term daily peaks, or used intermittently over multiple days of storm recovery, were receiving continuously changing, and substantially large, load shed obligations for 70.5 hours. Load Management recommendations suggest a combination of process and technology changes to mitigate the combined challenges encountered to PEC's approach to Load Management.

Load Shed algorithm sheds load at the feeder level, causing allocation of rolling outages to only feeders without critical load
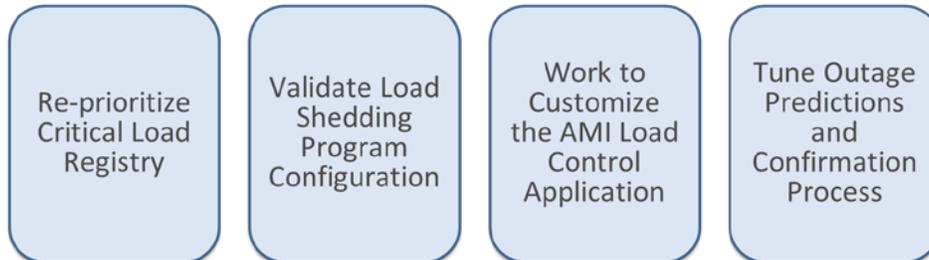
| Re-prioritize Critical Load Registry | Validate Load Shedding Program Configuration | Work to Customize the AMI Load Control Application | Tune Outage Predictions and Confirmation Process |

Figure 3: Recommendations to Improve Load Management

3. TECHNOLOGY EXCERPTS

Information Technology includes both Operational Technology (OT)[1] and Corporate applications. The applications and infrastructure included in the Incident Analysis focused on Operations Technology. Technology Recommendations are captured in three core areas: (1) Assessment of Public Outage Map modules, (2) improving Service Level Agreements and personnel responsibilities, and (3) reviewing the enterprise architecture.

Infrastructure, resources, and applications supporting Operations Technology compete with corporate and enterprise solutions, masking weaknesses within the systems

| Complete Assessment of system supporting Outage Map | Augment IT Personnel & Service Agreements | Review Enterprise Architecture |

Figure 4: Technology Recommendations

4. COMMUNICATIONS EXCERPTS

Directors, Executives, Member-facing, and IT staff all expressed varying level of frustrations of being reactive to the circumstances reported to them, or unable to represent the restoration effort or

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[1] Operational Technology is hardware and software that detects or causes a change, through the direct monitoring and/or control of industrial equipment, assets, processes, and events, according to https://www.gartner.com/it-glossary/operational-technology-ot "Gartner IT Glossary > Operational Technology". The term has become established to demonstrate the technological and functional differences between traditional IT systems.

magnitude of the outages with confidence. The common thread that mends these frustrations together is improving internal communications.

This Incident Analysis does not include any assessment of mass external communications, social media, or member-wide communications. However, two recommendations surrounding communication are included in the Incident Analysis as they could strengthen the efficiency of operations and ultimately improve resiliency across the PEC service area.
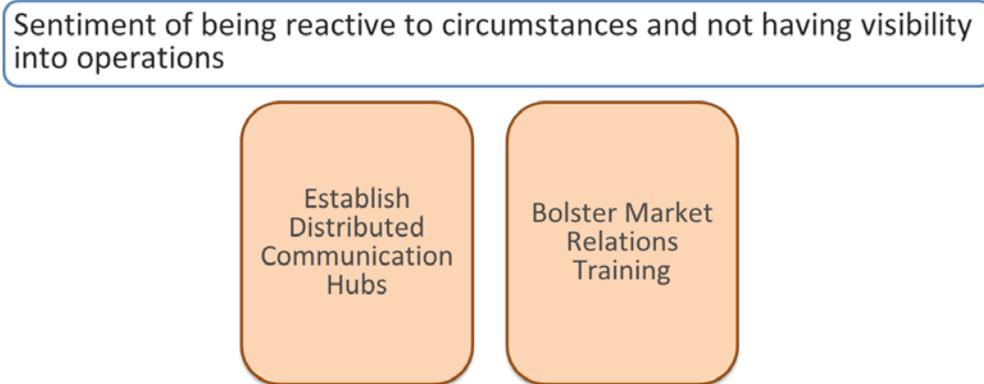

Figure 5: Communication Recommendations