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TRAINING FOR DISRUPTION – THE PG&E AND CON EDISON STORIES
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TODAY’S WEBCAST TOPIC:
training for disruptions
Tracy Cox

Director, Applied Strategies
Raytheon Professional Services
Training for High Consequence Environments

• Raytheon
  • Over 90 years of innovation
  • 70,000 employees worldwide
  • Defense, Homeland Security, Aerospace

• Raytheon Intelligence and Information Services
  • High consequence skills and competencies
  • Trains more than 2 million people a year
  • U.S. Army soldier, NASA astronaut, Air Traffic Controller

• Raytheon Professional Services
  • 1,100 learning professionals
  • Over 100 countries and 28 languages
  • Learning solutions designed to meet critical business challenges
Framing the Conversation

• **Minimizing Disruption in High Consequence Environments:**
  • People – only as good as their processes
  • Processes – only as good as their people

• **Preparedness requires Training:**
  • Anticipating the unexpected
  • Simulation – face-to-face and desktop required
  • Immersive, Realistic, Repetitive
The Panel

Barry Anderson
Vice President, Emergency Preparedness and Response
Pacific Gas and Electric Company

Carlos D. Torres
Vice President, Emergency Management
Consolidated Edison of New York, Inc.
Emergency Preparedness and Response
Training for Disruption
December 10, 2014
Emergency Management Vision Statement

PG&E responds to all emergency incidents safely, transparently and with a strong sense of urgency. Our planning and response are aligned with the needs of the communities we serve.

Our approach to a catastrophic event is predicated on two principals: our ability to scale, and our ability to do so quickly.
Emergency Response Critical Success Factors

EMAP: Emergency Management Advancement Program

- Near real-time estimate on damage order of magnitude
- Open and transparent lines of communications with key stakeholders
- Rapid activation of command sites and key initial assessment teams
- Capability to handle influx of customer requests from various sources
- Comprehensive logistics support for incoming resources and base camps
- Resilient IT systems
- Effective field execution of securing and restoring the system
Collapsing lead times for Emergency Response

EMAP also is looking to collapse current lead times for Emergency Response

**T + 24 Hrs. Critical Success Factors**

- Extent of damage understood
- Affected area response teams mobilized
- Unaffected area response teams mobilized
- Base Camps up and running
- Mission critical applications, voice, data, restored
- Mutual Aid mobilized
- Communicate with internal and external stakeholders

**Legend**
- Initial State
- Mature State

**Event Timeline**
- Event
- 24 hrs.
- 48 hrs.
- 72 hrs.
- 96 hrs.
- 120 hrs.
- 144 hrs.
EMAP is improving rapid scalability for Emergency Response

Predictive damage models to forecast restoration hours & workforce requirements

Areas of command scaled down to ensure more manageable and efficient restoration

Immediate mobilization of resources to affected areas

Pre-assigned incident leadership teams

Pre-identified and immediately executable base camp locations

Available materials to support restoration
South Napa Earthquake
South Napa Earthquake

Facts and Figures

Largest earthquake since 1989 Loma Prieta
- 6.0 magnitude earthquake – August 24, 2014 at 3:20 AM PDT – West Napa Fault
- 30-40 seconds total duration with 10-15 seconds strong ground shaking centered in Napa

60 aftershocks occurred in the first 24 hours
- Largest aftershock on August 26 – 3.9 magnitude within 48 hours of event

Community Impact - Napa County
- ~120 water main leaks
- ~150 red-tagged buildings
- Initial estimate of $360 million in damage to privately owned buildings
Emergency Readiness – Principles

The Napa earthquake demonstrated that a successful response is based upon 3 significant principles:
Asset Resiliency

Asset resiliency played a major role in minimizing damage from the Napa earthquake

Electric Infrastructure

Approximately $1BN capital over past 10 years

- Replaced and anchored about 100 substation transformers since 1989 to higher seismic specifications
- Substation breakers have also been replaced to meet higher seismic specifications
- Substation control buildings retrofitted
- SCADA penetration approaching 80%
- New design standards set at M7.0+
- Distribution circuits installed with FLISR (Fault Location, Isolation, and Service Restoration) to self-heal distribution outages

Gas Infrastructure

Approximately $2.5BN capital on distribution pipeline replacement

- 2,422 miles cast iron and pre-1940 steel distribution pipeline replaced with new modern plastic by 2014 end
- 39,500 copper services replaced
- 27 transmission fault crossing projects completed
- Pipeline Safety Enhancement Plan (PSEP) has installed 151 automated valves
Technology

Technology plays a critical role in expediting and scaling a response effort

SmartMeter

- Embedded into our Outage Management Tools to help identify upstream device outages and nested outages
- Can verify single customer outages via pinging
- High accuracy in outage identification as evidenced by very few carry-over outages in the next operating period

Gas Technologies

- Picarro and the SuperCrew processes – allowed for 2,000-2,500 services surveyed per day
- PG&E utilized helicopter-based technology (i.e. LASEN) for rapid transmission leak detection
- New TAMI system overlays shake areas with Gas Transmission SCADA, GIS, and distribution level maps for immediate visibility

Damage Modeling

- Electric damage model (ShakeCast) developed resource requirements within 15 minutes after the event
- DASH damage model prioritized gas leak survey and facility inspections within 15 minutes after the event
- A prioritized list of substations is also identified for inspection

Rapid Assessment

- Revised electric rapid assessment processes have shown significant improvement over historic performance
Gas Operations Impact

Safety / Customer Impacts

Public or employee injuries 0
Customer outages due to damage on PG&E distribution / transmission lines 0
Customer outages due to customer facility structural damage / red-tagged buildings 160
Customer service tags 5,810

Assessments Performed

Transmission 151 miles aerial patrols daily (8/24 – 9/5)
231 miles leak surveyed
Distribution Over 11,100 services leak surveyed via Picarro and foot surveys
Continuous SCADA operation allowing clear view of system

Asset Performance

Distribution leaks
  Hazardous distribution 26
  Non-hazardous distribution 425
  Non-hazardous meter set 886
Transmission leaks 2 – non-hazardous
Regulator stations 0 findings / 76 stations

Leak Survey Modeling

Areas initially identified by Dynamic Automated Seismic Hazard (DASH) model for leak survey
Areas identified by Distribution Integrity Management Program (DIMP) for additional leak survey based on analysis and leak / odor reports
Electric Operations Impact

**Safety Impacts**
- Public or employee injuries: 0
- 911 standby performance: 93.9% (31/33)
- Wires down: 28

**Reliability Impacts due to Earthquake**
- Unique Customers Experienced: 76,040
- Sustained Outage (CESO)
- System Average Interruption Duration Index (SAIDI): 5.5 min./cust. served
- Customer Average Interruption Duration Index (CAIDI): 315.2 minutes

**Asset Damage Causing Outages**
- Substation/Transmission: None
- Distribution:
  - Conductor: 63 spans
  - Transformers: 16
  - Cross arms: 15
  - Other equipment: 43
Emergency Preparedness: Preparing for Disruption

Carlos D. Torres
Vice President
Emergency Management

December 10, 2014
Agenda

• Superstorm Sandy

• Other Disruptions

• The Emergency Management Cycle

• Challenges
Superstorm Sandy
Impact on Con Edison System
October 29, 2012
Sandy – Overview

• Largest tropical cyclone observed in the Atlantic Ocean
• Storm diameter covered 820 miles
• 8.5 million customers lost power across 21 states
Sandy – Comparison to Other Storms

Integrated Kinetic Energy and Intensity at Landfall

by Brian McNoldy
Senior Researcher University of Miami’s Rosenstiel School of Marine and Atmospheric Science

2011 IRENE
2012 SANDY
2005 KATRINA
1989 HUGO
1992 ANDREW
Sandy – Tide Level

14.06’ Superstorm Sandy 2012 (9.41’ surge)

11.2’ Hurricane 1821 (unofficial)

10.5’ Hurricane 1815

10.02’ Hurricane Donna 1960

9.7’ Nor’easter 1992

9.51’ Hurricane Irene 2011 (4.23’ surge)

9.51’ Nor’easter 1953
Sandy – Tide Level
Impact – Top 10 Outage Comparison

Electric Customers Interrupted

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
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<tbody>
<tr>
<td>Superstorm Sandy*</td>
<td>Oct. 29, 2012</td>
</tr>
<tr>
<td>Nor’easter</td>
<td>Oct. 29, 2011</td>
</tr>
<tr>
<td>Hurricane Irene</td>
<td>Aug. 28, 2011</td>
</tr>
<tr>
<td>Nor’easter</td>
<td>Mar. 13, 2010</td>
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<tr>
<td>Snow</td>
<td>Feb. 25, 2010</td>
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<tr>
<td>Tropical Storm Ernesto</td>
<td>Sept. 2, 2006</td>
</tr>
<tr>
<td>Wind / Rain</td>
<td>Jan. 18, 2006</td>
</tr>
<tr>
<td>Nor’easter</td>
<td>Mar. 31, 1997</td>
</tr>
<tr>
<td>Nor’easter</td>
<td>Oct. 19, 1996</td>
</tr>
<tr>
<td>Hurricane Gloria</td>
<td>Sept. 9, 1985</td>
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* Includes outages caused by Nor’easter on Nov. 7, 2012
Impact – Top 10 Outage Comparison

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Other Disruptions
Winter Salt Storms
Heat Waves
July 21-24, 2011

• New load peaks
  – Weekday 13,189 MW
  – Weekend 11,535 MW

• 45 feeder failures (open autos)

• Customers impacted - 85,300
Coastal Storms
Irene – August 2011
Early Snow Storms
October 2011
Substation Transformer Fires

October 2009
Special Events
Super Bowl Boulevard 2014
And Many More . . .
Disruptions

- blizzard
- environmental
- flooding
- earthquake
- hail storm
- explosion
derecho
blackout
- drought
- system failure
- cyber-attack
- sabotage
- fire
- lightning
- labor strike
- terrorist attack

MAN MADE EVENTS
- ice storm
- tropical storm
- heat wave
- tsunami
- polar vortex

NATURAL EVENTS
- snow storm
- hurricane
- bomb

MEDICAL EVENTS
- flu epidemic
- Ebola
tornado
The Emergency Management Cycle

Prevention / Mitigation

Preparedness

Recovery

Response

Communication
Leadership Engagement
Risk Assessments
Performance Assessment
Continuous Improvement
Safety/Environmental
Prevention/Mitigation

- Risk Assessments
- Weather Analysis
- Benchmarking
- System Hardening
- Business Continuity
Preparedness

- Plans & Procedures
- Training
- Drills & Exercises
- Driving for proficiency
Response

- Liaisons
- Incident Management Assist Teams (IMAT)
- Emergency Assignments
- Proactive Communication
Recovery

- Agency Reports
- Customer Feedback
- Stakeholder Inquiries
- After-Action Reviews
- Document and Track
Challenges

- Infinite Risks
- Finite Resources
- Creating Sustainable Programs
- Staying Focused Between Disruptions
Questions & Answers

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