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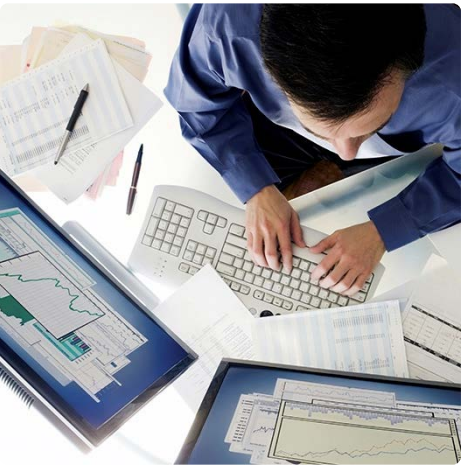
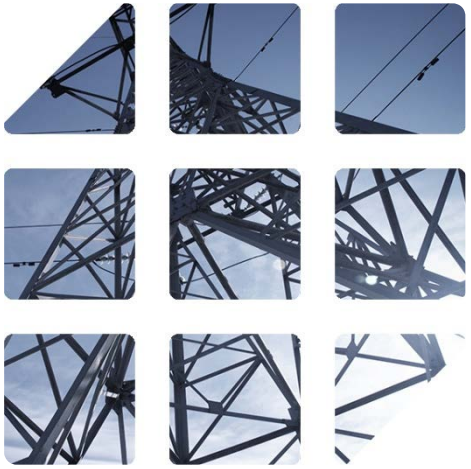
Superstorm Sandy Fuels Grid Innovation

Parag Parikh, Smart Grid Solution Executive

A National Summit on Smart Grid and Climate Change – December 2, 2014



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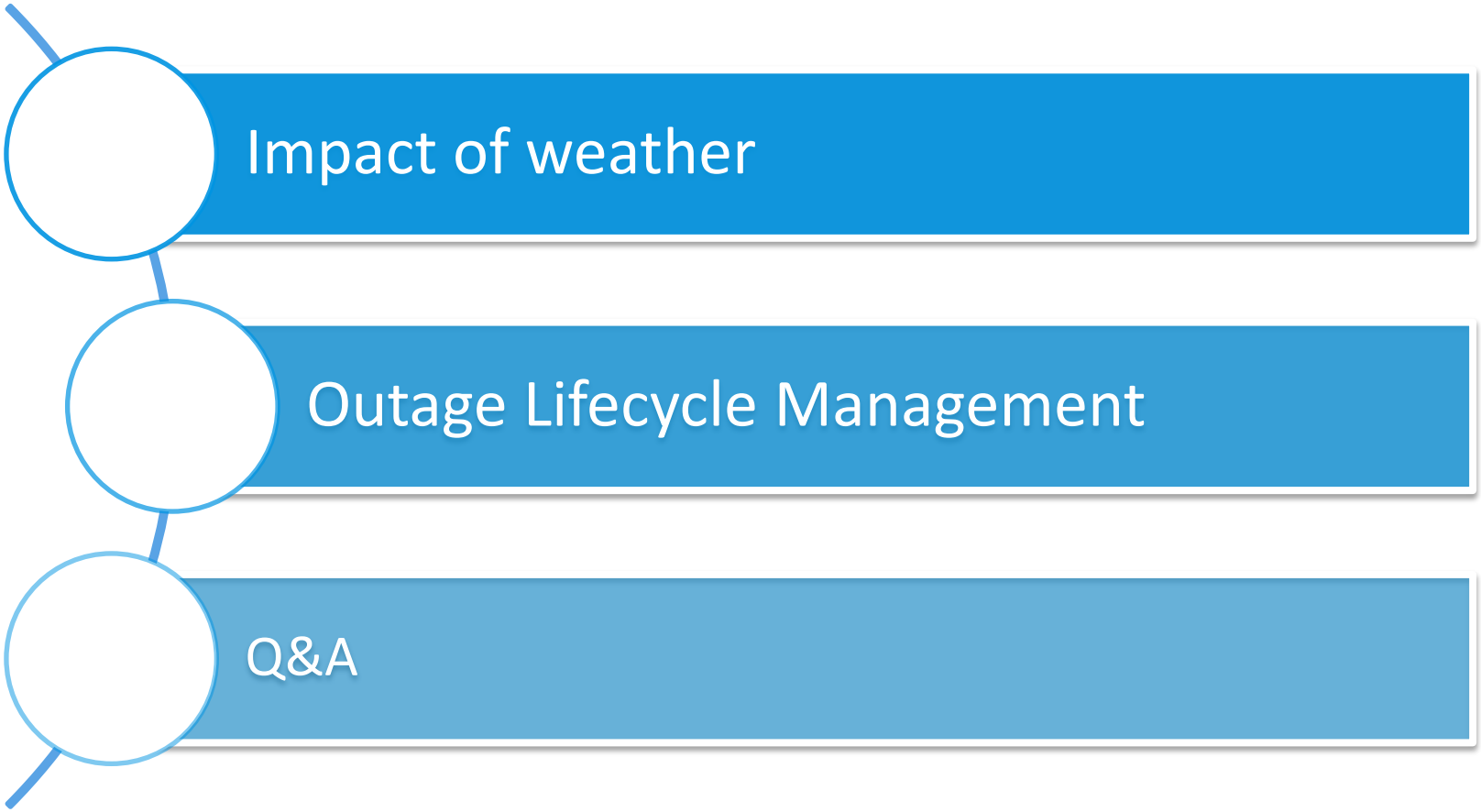
Today's Agenda



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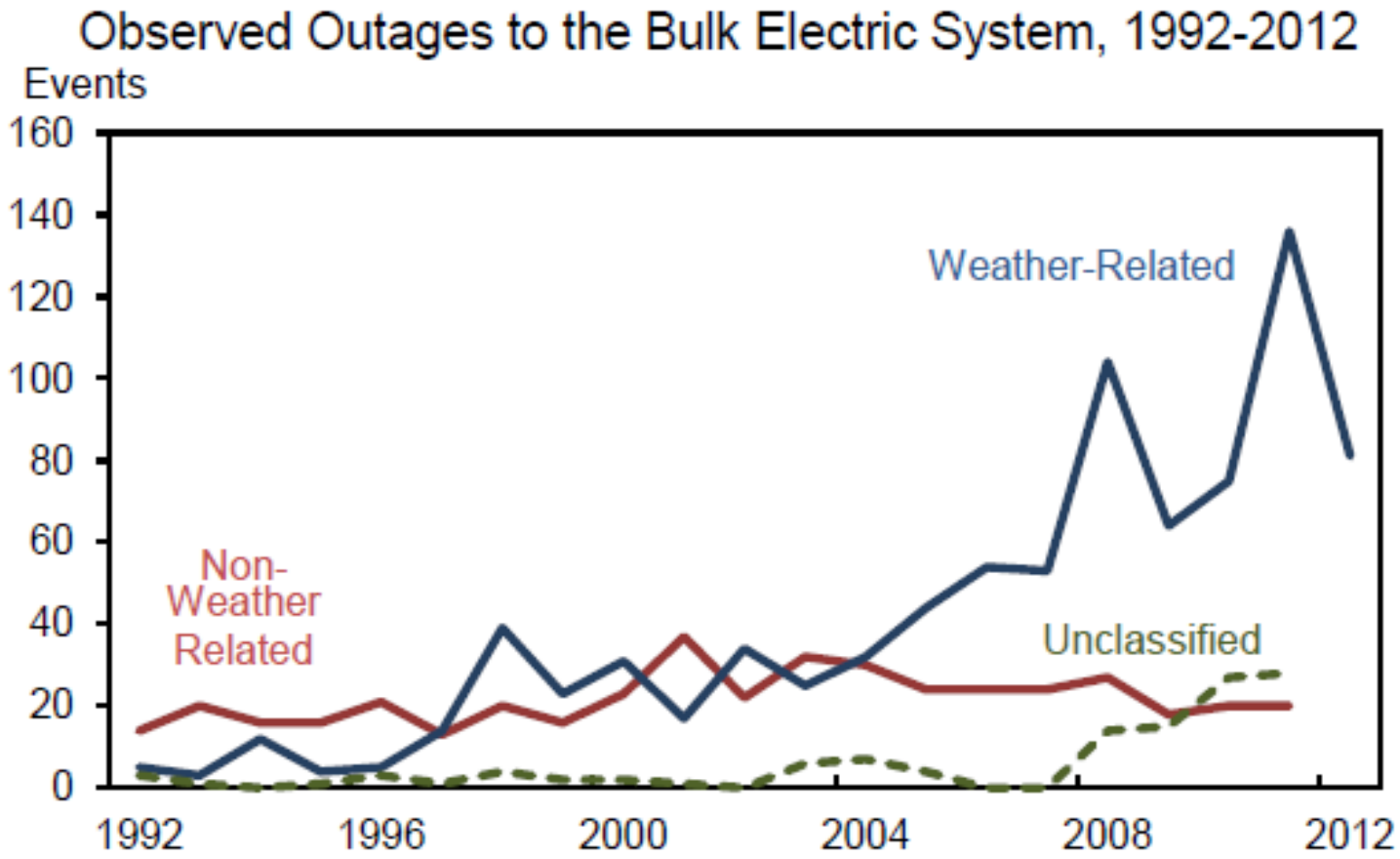
Billion-dollar Weather and Climate Disasters



Severe weather is the single leading cause of power outages and accounts for 87 percent of outages affecting 50,000 or more customers (U.S. DOE, Form OE-417).

Source: Economic Benefits Of Increasing Electric Grid Resilience to Weather Outages Executive Office of the President – August 2013

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The costs of the new era of outages

10x  INCREASE IN LARGE-SCALE OUTAGES

$20M  A MINUTE SOCIETAL COST

$25-70B  AVERAGE ANNUAL COST

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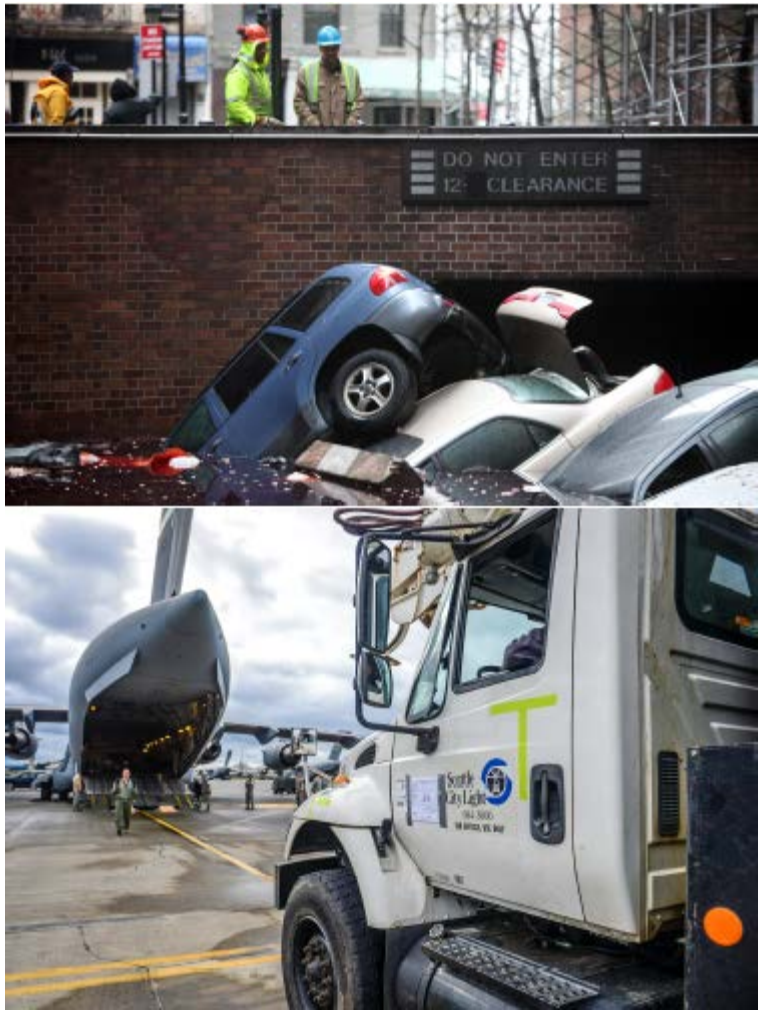
A Strategic Surprise for the Power Sector

"Super storm Sandy constituted a strategic surprise for me and much of the Department of Defense." – Paul Stockton

- Difficult logistics and poor communication between utilities, defense officials, state planners and first responders.
- Inadequate communication to customers, inadequate planning in vulnerable areas, poor visibility on the grid.
- Lack of attention on future "black sky" events worse than Sandy.



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Why the Grid is Different After Sandy

"Technological innovation…combined with aging infrastructure, extreme weather events, and system security and resiliency needs, are all leading to significant changes" – NY PUC

- Closer federal engagement in extreme weather events and better coordination among utilities.
- Distribution automation grows to $3B next year. Three IOUs in CA to spend $700M on voltage regulators, capacitor banks, etc. ADMS could hit $1B.

- 700 megawatts of commercial storage; 1.8 gigawatts of microgrids, many with renewables.
- Comprehensive planning that encompass extreme weather, smart grid, distributed energy and utility business models.

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Today’s industry challenges - Example

80%

21 min

36%

5 of 6

1.8%

$1.5M

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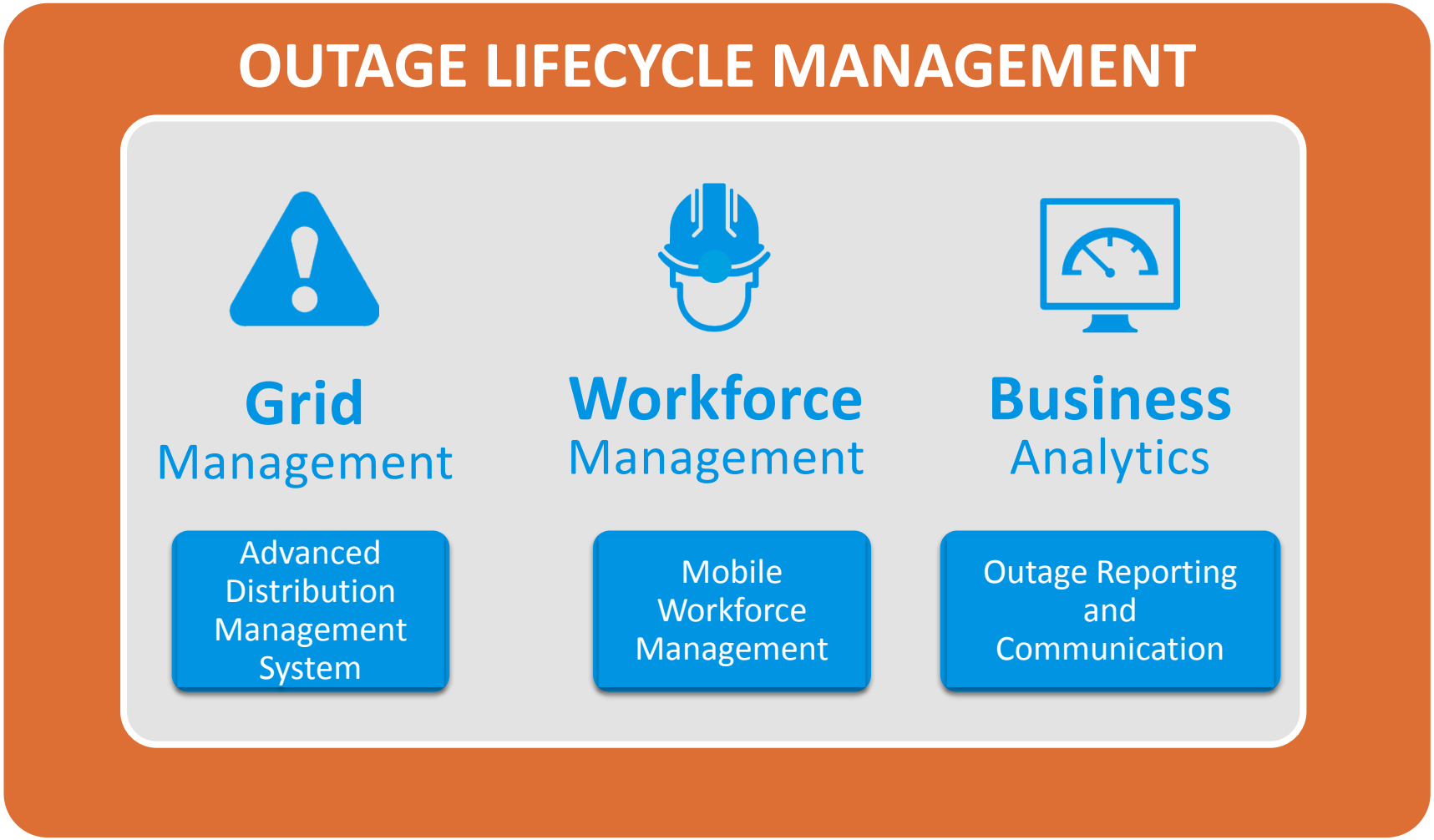
Outage Lifecycle Management



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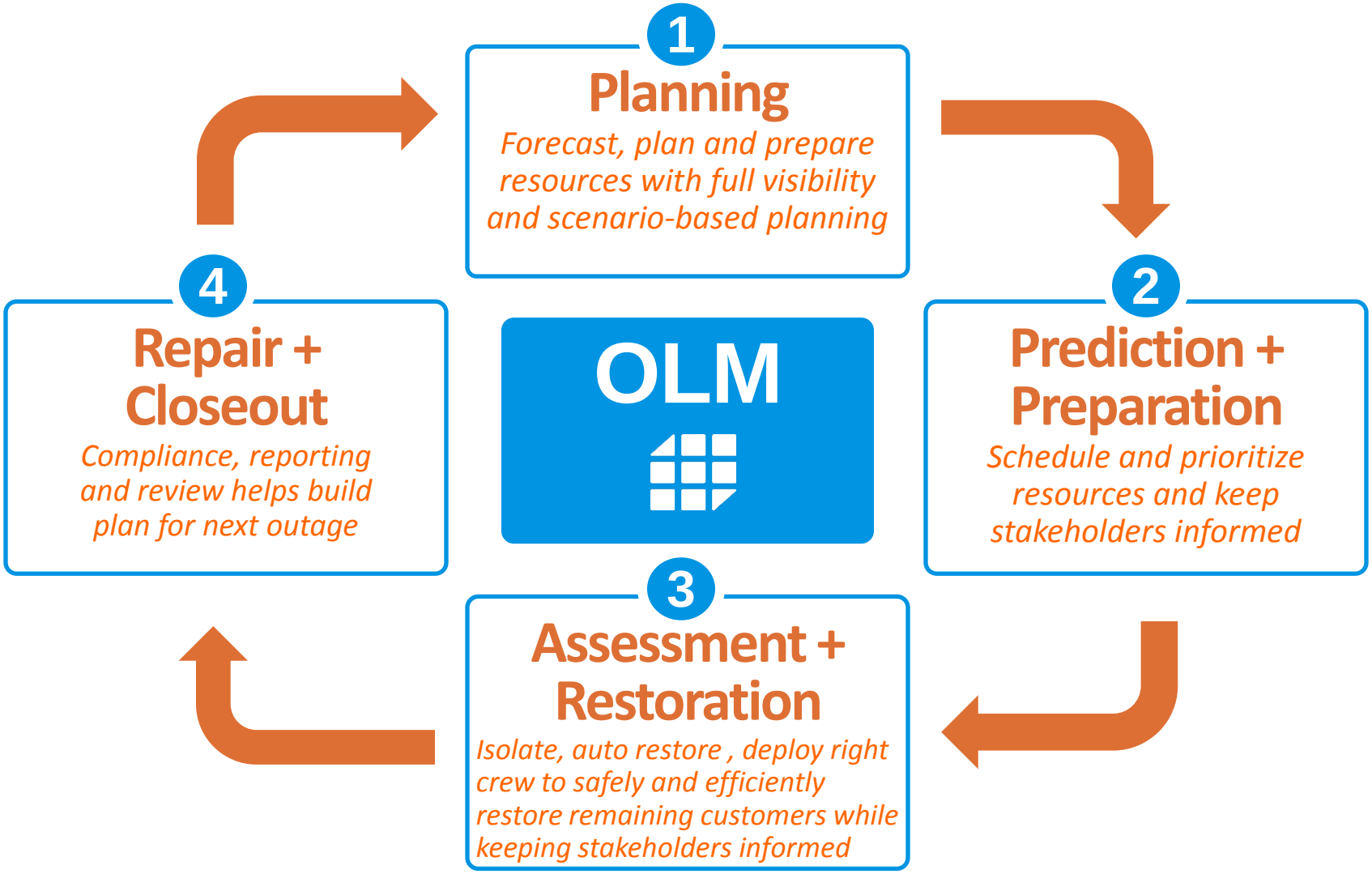
The lifecycle of an outage



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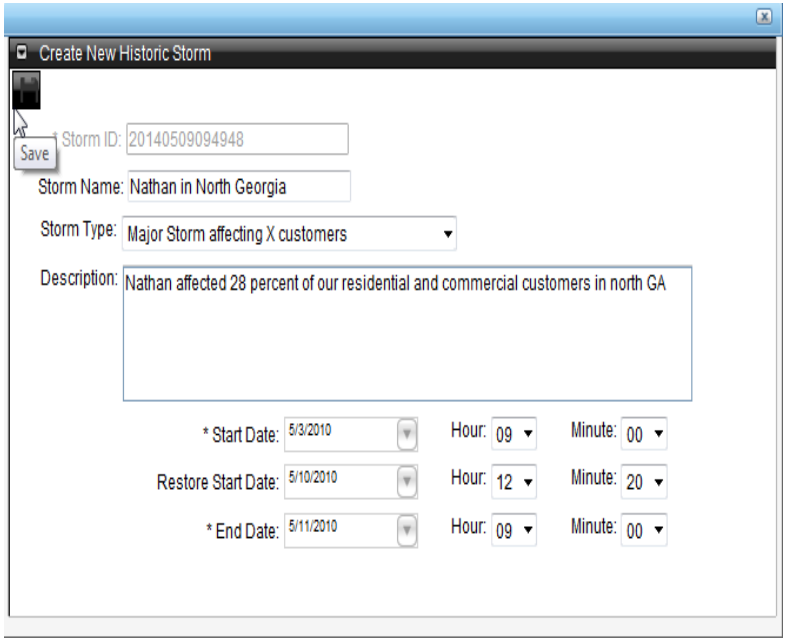
1 Planning

Plan and prepare systems throughout the year

Plan and Prepare

- Build and maintain library of Historical Storm Models
- Build statistic reports for historical or different storm types
- Allows customer to register for notifications with preferences



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2 Prepare

Prepare restoration activities based on historical models and projections and schedule resources accordingly

Project & Analyze	▪ Create projection models for restoration analysis ▪ Edit projections models with scenarios to understand impact of storm and resource planning
Resource Planning	▪ Plan resource needs and locations ▪ Mutual assistance call outs and on-boarding

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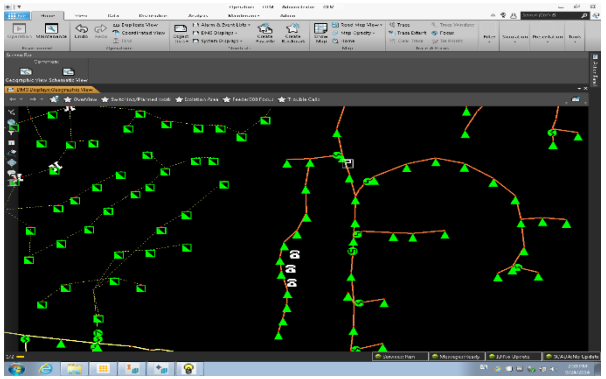
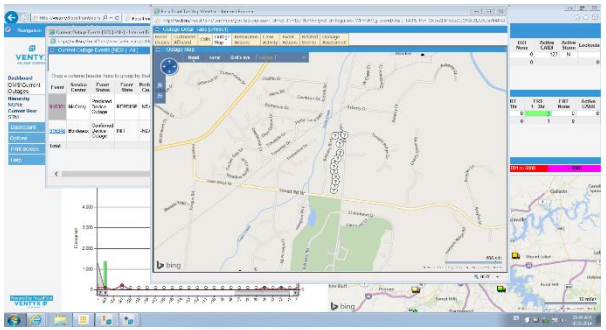
3 Assess + Restore

Isolate and restore automatically then deploy right crew to safely and efficiently restore remaining customers

Outage Analysis, work prioritization and dispatch	▪ OMS analyzes troubles calls form different sources, ▪ Identify faulted section through Fault location and Damage Assessment ▪ Self-healing can auto isolate and reconfigure grid ▪ Prioritize work and dispatch to crews for optimal restoration
Notification	▪ Notify stakeholders and keep affected customers up to date throughout the event





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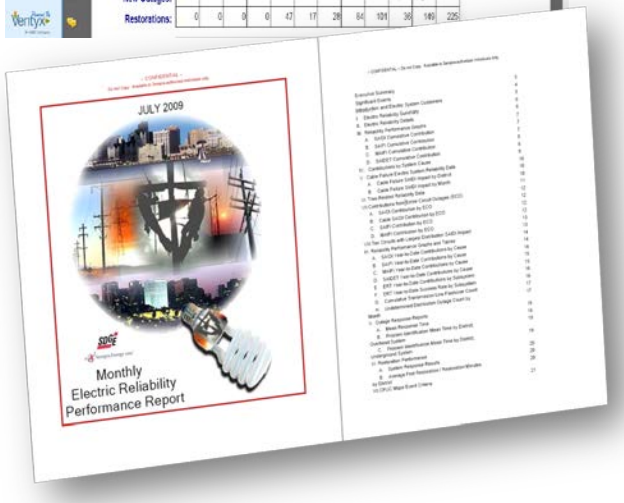
4 Closeout

Post event Analysis & Reporting, Compliance, and plan for next outage

Post Event Analysis and Reports	▪ Post analysis of crew work, outage areas and issues ▪ Addition of information for trend reporting ▪ Post Event Reports
Storm Classification	▪ Build data for future preparation, back in to Preparation phase



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OLM Benefits

- Provides a scalable platform that allows the same processes to be followed in blue sky days and major events
- Improves situational awareness, in the control room, out in the field and across the organization
- Improved resource planning that saves time and money
- Common data across platform ensures common & accurate data is communicated to stakeholder and customers
- Ensure compliance with regulatory requirements with full audit trail throughout he event.
- Reduced outage duration and improved reliability leading to improved customer satisfaction

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