Today’s Panel

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Public Works Practice Leader

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GIS Director

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MEP Engineering

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Agenda

The winter storm’s impact on operations was unprecedented.

Learn about steps you can take to improve resilience.

Use condition assessments to your advantage.

Achieve and maintain reliable backup power generation.
WINTER STORM BY THE NUMBERS

139: Consecutive hours the DFW area was at or below 32 degrees (nearly 6 days)

4.5 MILLION: Reported power outages in Texas at its peak

16 MILLION: People under boil-water advisories

2,000: Public water systems in Texas that reported disrupted operations

$130 billion: Estimated cost of total damage and economic loss in Texas (would be greater than Hurricane Harvey)

$18 billion: Estimated cost of the insured damage from the storm

Compiled from wire reports
IMPACT ON OPERATIONS
Impact on Operations

TWO PRIMARY CULPRITS

• Extremely cold temperatures for a long period of time
• Power outages
FOUR PRIMARY PUBLIC/MUNICIPAL INFRASTRUCTURE SYSTEMS AFFECTED

- Stormwater pumping (interchange/intersection sumps)
- Traffic control systems (intersections and tolling)
- Municipal electrical utilities
- Water and wastewater utilities (by far the most affected)
Impact on Operations

DIFFERENT WAYS CITIES OR AGENCIES OPERATED DURING THE STORM EVENT

• Most affected systems were water/wastewater systems

• Winter season minimized the impacts to wastewater systems

• Treatment and distribution of potable water was impacted most.
Impact on Operations

Because of the widespread nature of the event and the variability from city to city and utility to utility, responses were different. However, there was one constant: It was an all-hands-on-deck attack!
Impact on Operations

WHAT HAVE WE HEARD?

- Backup generators were needed at key pump stations
- Loss of power impacted various systems
- Most reported large increases in calls of service
- There was a shortage of diesel fuel
- Human resources was impacted heavily
Impact on Operations

MOVING FORWARD

- Conduct an after-action review
- It’s critical to be prepared
- Have a plan to get support from other departments
- Address temporary housing for employees
- Ensure adequate backup power at your service centers
- Keep adequate materials on hand
- Think about emergency water wells
- Consider having snowplow attachments
Resilience

FEATURES TO CONSIDER IN RECOVERY PLANNING AND FUTURE MITIGATION

Power Supply
- Grid
- Generators
- Fuel source

Electronic Equipment
- Tank level monitoring
- Pressure and treatment inputs

Water Supply
- Alternate sources
- Distribution and service lines

People
- Field staff
- Plant and SCADA operators
- Emergency personnel
Resilience

RISK AND RESILIENCE ASSESSMENTS (RRA)

- Floods and hurricanes
- Tornados
- Cyberattacks
- Winter storms
- Droughts
- Terrorism
Resilience

RESILIENCY PLANNING IN PRACTICE: CHECK YOUR GENERATOR

• High-capacity generator
• Tested occasionally
• Unsure about whether it would meet need
• Activated generator
• Ran off generator power for five days
Resilience

RESILIENCY PLANNING IN PRACTICE:
PREPARE YOUR PEOPLE

• Electronic systems may not work
• Have 24-hour monitoring
• Stay in contact with your water supplier
• Conduct manual checks
• Be prepared for repairs
Resilience

RESILIENCY PLANNING IN PRACTICE:
BUILD IN REDUNDANCY

- City supplies its own water through wells
- Formerly obtained large share of water from neighboring City and maintained interconnection
- Continued to draw water when demand exceeded supply and maintained ties with neighboring City's water department
- During the storm, fire control system in private facility burst, affecting capacity of City to supply water (made up the difference by increasing the supply of water from former provider)
What’s Up with SB3?

Emergency Preparedness Plan (EPP)

TCEQ has developed a form that the water system will submit for review. The plan contains information about the affected system and how it operates under emergency conditions.

Purpose: Develop an EPP to maintain 20 psi during an extended power outage (> 24 hours)

Submit EPP no later than March 1, 2022
Implement EPP no later than July 1, 2022
pipe deformed
Condition Assessment

DEFINITION

“Collection of data and information … followed by analysis of the data and information, to make a determination of the current and/or future status.” (U.S. EPA)

BUSINESS CASE FOR CONDITION ASSESSMENT

• Serious impacts to infrastructure
• Effective asset management
• Reactive vs. proactive management
Condition Assessment

GIS AND WORK ORDER SYSTEM INTEGRATION

• Effective use of spatial and historical information
• Sync information collected in the field with GIS data
• Asset-based maintenance history
Condition Assessment

PRIORITIZATION AND ROLE OF CONDITION ASSESSMENT

• Condition assessment is a key element of an effective prioritization program
• GIS and work order data enable risk-based prioritization
• Business risk exposure (BRE) applies risk criteria to score and rank assets
• Advanced prioritization leverages artificial intelligence (AI)
NEAR-TERM INSPECTION AND MAINTENANCE TARGETS

- Annual schedule of inspection and maintenance (key action item)
- Annual costs, budget, KPIs and LOS
- Opportunity to reassess & revise targets
Condition Assessment

TOOLS TO VISUALIZE PRIORITY AND ALIGN WITH BUDGET

- GIS-based prioritization tools
- Prioritization applications
- Program-tracking applications
Condition Assessment

TOOLS: GIS-BASED & WEB-BASED PRIORITIZATION APPLICATIONS
Condition Assessment

TOOLS: PROGRAM-TRACKING APPLICATIONS
BACKUP POWER GENERATION
On Feb. 16, at least 4.5 million customers in Texas were without power. Here is where Texans were most impacted during the worst of the outages between 10 and 11 a.m. on Feb. 16. (Texastribune.com)
Backup Power Generation

MISSION-CRITICAL FACILITIES

- Police stations
- Fire stations
- Emergency command centers
- Hospitals
- Vaccination facilities
- Water and wastewater treatment facilities
- Data centers
- Research facilities
- Financial facilities
Backup Power Generation

HOW THE STORM AFFECTED BACKUP POWER

- Undersized generators for assumed connected load
- Lack of diesel additive in the fuel system
- Diesel fueling stations on empty for lack of supply
- Battery failures
- Natural gas regulators freezing up
- Natural gas utility providers stopped supply of fuel
- Failure (or lack) of block heaters on generators
- Automatic transfer switches not switching over
- Wind turbines without deicing tools, such as built-in heating
- PV systems covered by ice/snow and overcast days
Backup Power Generation

IMPORTANT CONSIDERATIONS

- Know what you have
- Conduct a risk assessment
- Have a contingency plan
- Identify hazards
- Conduct witness testing
- Test periodically
- Have an active preventive maintenance program
- Keep written records
Backup Power Generation

IMPORTANT CONSIDERATIONS

- Conduct testing under load
- Have a plan and execute it!

Typical diesel-fueled generator maintenance schedule
Backup Power Generation

TYPES OF BACKUP POWER AND EMERGING TECHNOLOGY

• Engine-driven generator (diesel)
• Engine-driven generator (natural gas)
• Engine-driven generator bi-fuel (natural gas and diesel)
• Photovoltaic systems
• Wind turbine systems
• Microgrids
# Backup Power Generation

## TYPES OF BACKUP POWER AND EMERGING TECHNOLOGY

<table>
<thead>
<tr>
<th>Backup Power System</th>
<th>Initial Cost</th>
<th>Area Required</th>
<th>Fuel Availability</th>
<th>Maintenance Required</th>
<th>Life Expectancy</th>
<th>Reliability</th>
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- **Initial Cost:**
  - Good
  - Better
  - Best

- **Reliability:**
  - Good
  - Better
  - Best
Backup Power Generation

MOVING FORWARD

• Know what you have
• Determine if you can afford to do some load shedding
• Understand how your facility’s electrical distribution system is connected
• Know your real estate limitations for additional backup systems
• Find out the remaining life expectancy of your existing backup systems
• Identify who will be (or is) providing preventive maintenance
• Search for available incentives
• Think regionally
• A power resiliency study is recommended
QUESTIONS?