Agenda

1. Safety Moment
2. Storm Events
3. Identification of Reliability Concerns
4. Critical Infrastructure Facilities
5. Engineering for Resilience and Storm Events
A safety moment

Employee safety during a storm event.

- Family safety
- Wait until all clear
- Communication
- Traffic
- The public
- Energized lines and debris
Storm and Other Events

- Wind
- Snow & Ice
- Water
- Material Failure
- Poor Design
- Other (vandalism & terrorism)
Recent Events

- Hurricane Katrina (2004)
- Florida hurricanes (2008)
- Hurricane Sandy (2012)
- Midwest tornados (2016)
- Northeast blizzards
Existing Reliability Concerns

Known outages
- Ground Faults
- Flash Overs
- Lightning
- Voltage Overload
- Equipment Failures (End of Lifetime)
- Wildlife
Overhead vs. Underground Facilities

- Cost effective
- Longer history operating high voltage
- Visibility of Reliability Issues
- Reduced restoration time
- Susceptible to above ground hazards

- Increased Cost
- Difficult to Identify Issues
- Increased restoration time
- Resistant to above ground conditions
- Aesthetics
Critical Infrastructure Facilities

Critical to Utility
- Power Plants
- Substations
- Transmission Lines
- Main Distribution Feeders

Critical to Community
- Hospitals
- Police and Fire Stations
- Evacuation Centers and Schools
Engineering for Resiliency

Transmission Lines

- Structure Material and Availability
- Engineering Criteria (NESC)
- Redundancy Loops
- Vegetation Management
Engineering for Resiliency

Substations
- Breaker Design
- Protection Schemes
- Flood Monitoring and Elevation
Engineering for Resiliency

Distribution Lines
- Structure Material and Availability
- Voluntary Structure Loading
- Feeder Loops
- Automatic Feeder Switches, Fuses and Reclosers

[Image of overhead power lines]
Resiliency Prior to an Event

Restoration Preparation

• Storm Team
  – Safety
  – Training
  – Damage Assessment Teams
  – Engineering
• Surplus Material
• Construction Support
• Partnerships/Alliances
Resiliency During an Event

Prioritization
- Generation
- Transmission Lines
- Substations
- Distribution Feeders
- CIFs
Resiliency During an Event

Logistics
• Storm Team Logistics
Outage Management System
• Prioritization
• Tracking of Outages
  – Storm Team Notification
  – Customer Notification and Responsibilities
• Advances in Technology

Lessons Learned
Questions?