Recovery and Resiliency

Society of American Military Engineers
Joint Training and Education Day

February 28, 2018
Tampa Electric Service Area

- 752,000 Customers
- 2,000 Square Miles
- 11,400 Distribution Miles
- 1,300 Transmission Miles
- 5,000 MW Generating Capacity
Preparation

• Training
• Mock storm drills
• Federal, state & local coordination
• Technology to improve response
• Extending our reach
• Hardening
Restoration Response

- Modeling and Planning
- Resource acquisition & staging
- Logistics support
- Damage assessment
- Resource management
- Work management
- Customer Experience
- Communications
Preparation and Restoration

• Initial planning for Irma began on Sept. 3
• As close as 72 hours away from Florida, the forecasted track was middle to east coast
• From then, the forecast continually shifted west, and we planned for a more significant event
• Resource acquisition and lodging were challenging, due to competition from other utilities and roughly 5 million Florida residents evacuating
• Final foreign resources acquired through S.E.E., regional mutual aid groups, contractor networks, and sister companies:
  • 2,521 distribution line resources
  • 621 tree workers
  • 266 damage assessors
Preparation and Restoration

• Outages began on Sunday, Sept. 10, peaking after midnight. Sustained winds were 70 to 90 mph with gusts to 115 mph.
• Outages peaked at 335K, with roughly 425K of 752K affected over the event.
• 6 incident bases were fully established on Monday and Tuesday.
• Restoration began after 8 a.m. Monday, when wind conditions became safe.
• Estimated time of restoration (ETR) was established on Tuesday, based on damage assessment (Essentially all customers restored by end of day Sunday).

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<tr>
<th></th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
<th>Monday</th>
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</thead>
<tbody>
<tr>
<td>Customers Out</td>
<td>335,000</td>
<td>284,000</td>
<td>269,000</td>
<td>96,000</td>
<td>41,000</td>
<td>19,000</td>
<td>2,000</td>
<td>&lt;200</td>
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Preparation and Restoration

- 28 substations impacted
  - Two sub transformers damaged
  - Six 13kV circuit breakers damaged
- 516 out of 738 circuits operated during the storm
- 220 circuits locked out from the storm
- Replaced 207 poles
- 1,400 wire down reports
- Replaced 356 transformers
- 225,042 ft of cable/conductor
- 1,595 lightning arrestors
- 17,544 fuses
- 23,881 splices
Preparation and Restoration

Plant City Incident Base

Tampa Bay
Key Successes

• Safety – no serious incidents or motor vehicle accidents
• Implemented storm model to manage over 3,400 external resources – largest ever
• Critical facility work – hospitals, nursing homes, water treatment, MacDill – prioritization and triage process
• Developed global ETR after 24 hours based on damage assessment models, and Tampa Electric met that goal
• EOC (Emergency Operations Centers) coordination with state and multiple counties

Key Improvements

• Develop plan for larger event – Category 4 or 5 w/ 7,000 resources, etc.
• Train internal and external management teams to run up to 6 additional incident bases
• Streamline outage communication technologies
• Enhance logistics capability with training and IT
Resiliency at MacDill AFB

Mission – Deliver creative installation energy resiliency solutions to meet 21st century threats

• USAF and Tampa Electric have a shared mission to pursue energy projects that are resilient, cost-effective, and environmentally responsible

• Tampa Electric has taken steps toward resiliency
  – Secondary substation, construction underway
  – Provides energy transmission at two points at the fence
  – Substations are high priority during restoration
  – Tampa Electric recognizes importance of an operational air strip at MacDill in overall recovery, post disaster/emergency (cycle resources out of Base)
  – MacDill restoration – high-priority, critical facility during national or local emergency

• Islanding equipment at substations to provide micro-grid function being considered
  – Switch on secondary feed on substation transformer that opens in the event of an emergency
  – Allows for generators, solar, storage, etc. to operate independently from the grid

• Distributed energy resources such as natural gas aero-derivatives, solar, and battery energy storage systems have been the focus of Tampa Electric’s investigation into fast, reliable, and flexible power resources