STRENGTHENING RELIABILITY AND SECURITY BY MODERNIZING THE ELECTRIC GRID

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PRESENTED BY:

CHRIS EDGE | VICE PRESIDENT   LARGE BUSINESS CUSTOMERS
Cyber Security Threat to Utility Grid is Real

- 1,000 Centrifuges destroyed by Stuxnet malware at Iranian nuclear facility in 2010
- 36,000 Workstations and servers wiped or destroyed by virus launched from a USB drive at Saudi Aramco in 2012
- 230,000 Outages in Ukraine as a result of Russian cyber attack in 2015
## Duke Energy Cyber Security Program*

<table>
<thead>
<tr>
<th>Identify</th>
<th>Protect</th>
<th>Detect</th>
<th>Respond</th>
<th>Recover</th>
</tr>
</thead>
</table>
| Identify key assets and related cyber security risks | • Critical assets identified  
  • Risk management framework  
  • Internal and third-party penetration testing | • Intrusion protection systems and monitoring  
  • Cybersecurity Risk Information Sharing Program (Department of Homeland Security ("DHS") program)  
  • Collaboration with Federal Bureau of Investigation, DHS, and Electricity Sector Information Sharing and Analysis Center ("ES-ISAC") | • Incident response process and communication plans  
  • Anti-distributed denial of service attack  
  • Cyber incident drills – internal and external | • Cyber incident response process and communication plan  
  • Backup and restore process  
  • Disaster recovery exercise |

* Based on NIST Cybersecurity Framework
Mother Nature’s Fury

Hurricane Matthew

Hurricane Irma

Hurricane Irma
Recent Major Storm Events

- Hurricane Irma (FL) - 2017
- Hurricane Matthew (Car) - 2016
- Ice - (Car) - 2016
- Hurricane Joaquin (Car) - 2015
- Ice #2 - (Car) - 2015
- Ice #1- (Car) - 2015
- Ice #2 (Car) - 2014
- Ice #1 (Car) - 2014
- Ice #2 (Car) - 2014
- Ice #1 (Car) - 2014
- Hurricane Irene (Car) - 2011
- Hurricane Frances (FL) 2004
- Hurricane Ivan (FL) 2004
- Hurricane Jeanne (FL) 2004
- Hurricane Charley (FL) 2004
- Ice Storm (Car) 2002

Number of Outages

Notables
Customer expectations have changed.

People rely on electricity more than ever to power their lives and businesses. Power is no longer a convenience, nor is it a luxury.

Severe weather events are increasing, and cyber and physical attacks on the grid are real.

Technology is available to enable a transition from a mechanical grid that is aging, to a more modern digitalized grid.
Modernizing the Grid  What? How?

$10 B
OF GRID INVESTMENTS OVER NEXT 5 YEARS

Targeted Underground
Reduced outages and momentary interruptions
Faster response to major storms
Improved customer satisfaction

Hardening & Resiliency
Reduced asset failures (hardening)
Rapid outage recovery (resiliency)
Updated system design & security

Self-Optimizing Grid
Automated fault isolation and power rerouting
Modern circuit segmentation standards

Advanced Metering Infrastructure
Enhanced billing options
Detailed usage data
Outage detection
Remote metering

Transmission Improvements
Upgrades to mechanical and end-of-life equipment
Flood mitigation
Physical and cyber security
System intelligence

Communication Network Upgrades
Secure high-speed, high-bandwidth comm pathways
Enablement of more smart grid devices

Advanced Enterprise Systems
Intelligent management of digital grid devices
System health monitoring
Self-optimizing technology enablement
MODERNIZE THE ENERGY GRID

$25 B INVESTMENTS IN GRID MODERNIZATION OVER 10 YEARS

GENERATE CLEANER ENERGY

$11 B INVESTMENTS IN CLEANER GENERATION OVER 10 YEARS\(^{(1)}\)

EXPAND NATURAL GAS INFRASTRUCTURE

15% PROPORTION OF OUR BUSINESS MIX FROM GAS IN 10 YEARS FROM 8% TODAY\(^{(2)}\)

\(^{(1)}\) Includes natural gas and renewables generation. Excludes nuclear relicensing and new nuclear projects

\(^{(2)}\) Based on adjusted diluted EPS
Continuing to invest in the grid, with an emerging focus on the Carolinas

MODERNIZE THE ENERGY GRID

$10 B OF GRID INVESTMENTS OVER NEXT 5 YEARS

60% OF TOTAL TO BE INVESTED IN THE CAROLINAS

2017 - 2021 SPEND BY CATEGORY

More Reliable System

$10 B

Smarter Grid

Targeted Undergrounding 24%
Advanced Metering 13%
Self Optimizing Grid 10%
Advanced Systems & Communications 9%
Storm Hardening & Resiliency 44%
**Protect Your Business:**
Help prevent costly disruptions in your operations. Duke Energy provides Backup Power Systems that we design, build, own, and maintain to help you keep your business operating smoothly.

<table>
<thead>
<tr>
<th>Description</th>
<th>Customer Sites</th>
<th>New Customer Sites (construction in progress)</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backup Power Systems</td>
<td>84</td>
<td>47</td>
<td>131</td>
</tr>
<tr>
<td>Megawatts</td>
<td>93</td>
<td>63</td>
<td>156</td>
</tr>
</tbody>
</table>

*Thanks to Duke’s team of experts managing our critical infrastructure needs, we can focus on what we do best.*

Successful Customer Site “SAVES”
- 2016 – 160
- 2017 – 85
- 2018 YTD - 11