ComEd Grid Renewal

Terence R. Donnelly

Executive Vice President and Chief Operating Officer

September 23, 2013

ComEd
An Exelon Company

COMED'S GRID MODERNIZATION VISION

ComEd will fulfill the promise of grid modernization for northern Illinois consumers by:

- Improving system reliability and deploying new smart grid technologies
- Providing greater value to customers through better service and creating a new level of accountability for ComEd
- Preparing our region for the new demands of the 21st century economy and supporting a greener future
- Providing energy consumers more savings, choice and control
- Redoubling efforts to care for communities and customers who depend on infrastructure and service

ENERGY INFRASTRUCTURE MODERNIZATION ACT (EIMA)

- Authorizes a 10-year, $2.6 billion ComEd investment in upgrading and modernizing Illinois' electric grid.
- Performance-based formula rate brings greater stability to the regulatory process for significant investments in grid modernization.
- Annual Work Plan required to be submitted to ICC
- Provides consumer benefits through grid modernization and installation of smart meters.
- Protects consumers throughout the 10-year investment period through performance metrics, strong oversight and an intervener process involving advocates for consumers and business.

ComEd
An Exelon Company

HALF OF THE $2.6B INVESTMENT IS FOR INFRASTRUCTURE IMPROVEMENTS & TRAINING FACILITIES

	Program Goal
Underground Residential Cable (URD)	Refurbish or replace OVER 4,100 miles
Mainline Underground Cable	Assess, refurbish or rebuild OVER 32,000 manholes Test or replace OVER 3,600 miles of mainline cable
Wood Poles	Inspect OVER 730,000 poles Replace or reinforce OVER 19,000 poles
Storm Hardening	$200M in improvements
Training Facilities	Construct two state-of-the-art training facilities

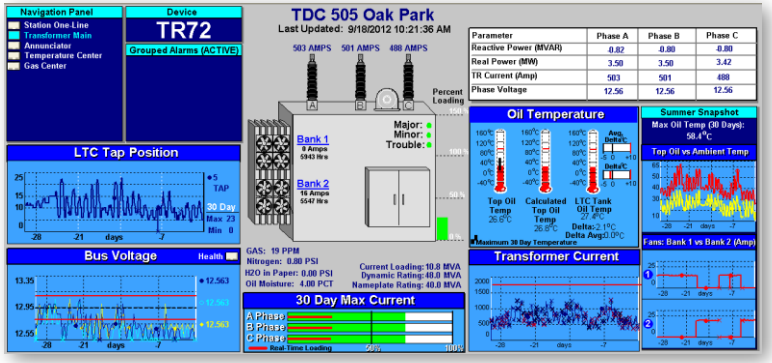
Before

After

ComEd
An Exelon Company

HALF OF THE $2.6B INVESTMENT IS FOR SMART GRID TECHNOLOGY

	Program Goal
Distribution Automation (DA)	Install 2,600 DA devices
Substation Upgrades	Upgrade 10 substations
Smart Meters	Install 4 million smart meters

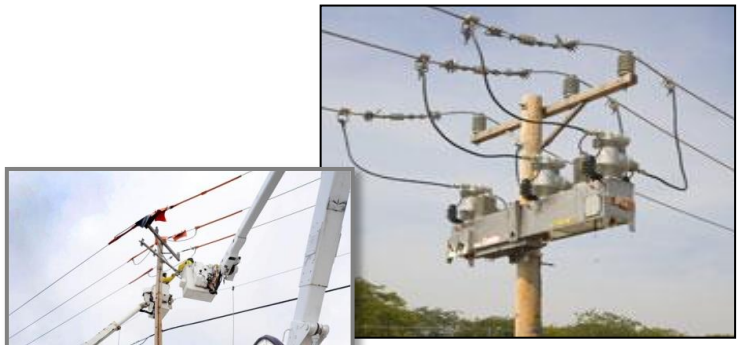


ComEd
An Exelon Company

EIMA RESULTS TO DATE

- Over 1.3 million customers are benefitting from work already completed
- Three substations completed, benefitting 54,500 customers, including O'Hare and Midway airports

- 421,000 avoided customer interruptions as a result of distribution automation devices installed through EIMA
- 2,450 avoided underground cable faults averting over 421,000 customer interruptions
- Storm hardening programs have avoided 927,000 customer interruption hours
- Over 1,100,000 automated meter readings for monthly billing



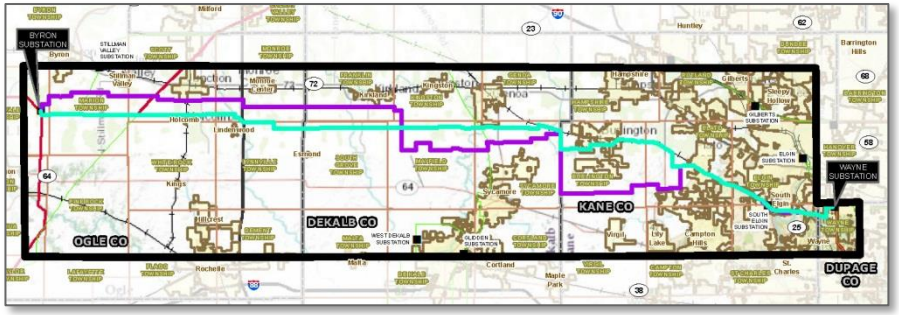
CONTINUING TO DELIVER ON OUR PROMISE

Grid Resiliency Investment Portfolio

- $1.7B T&D investments ***in addition to*** EIMA's $2.6B
  - Grid Resiliency
  - Transmission System Improvements
  - Regional Transmission Expansion

Grand Prairie Gateway

- First major transmission addition in 30 years
  - Mitigates impacts of system congestion
  - Provides diverse west-east pathway
  - Enhances future ability to support base load
  - Increases flexibility to perform maintenance



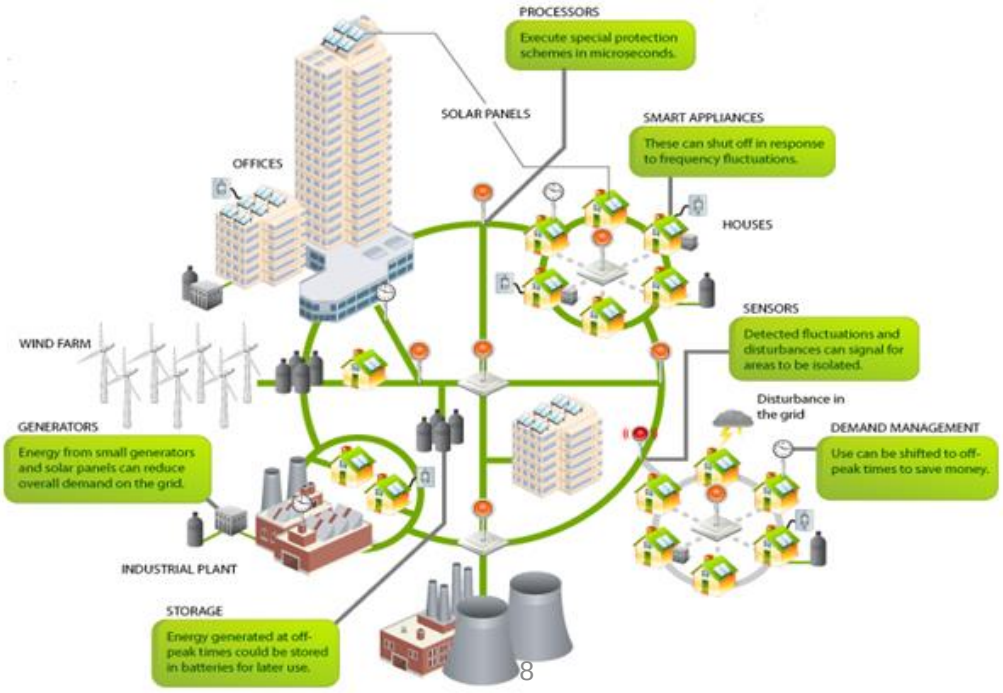
ComEd
An Exelon Company

GRID MODERNIZATION: AN ECONOMIC ENGINE FOR ILLINOIS

- Creating opportunities for Illinois companies
- Commitment to women and minority-owned businesses
- 2,800 FTE jobs created in 2013 alone
- Over 5,200 total job-years created to date
- New Chicago Training Center to begin construction

MICROGRIDS

- U.S. Department of Energy announced $8 million to improve grid resiliency
- DOE awarded approximately $1.2 million to ComEd and it's partners to develop and test a commercial-grade microgrid controller capable of managing two or more interconnected microgrids
- ComEd's concept includes a diverse mix of facilities and critical loads, including police and fire department headquarters, major transportation infrastructure, healthcare facilities, and private residences



ComEd
An Exelon Company

BRONZEVILLE RESILIENT COMMUNITY MODEL MICROGRID

ComEd is evaluating Chicago's Bronzeville neighborhood, adjacent to IIT, to demonstrate the clustered microgrid controller

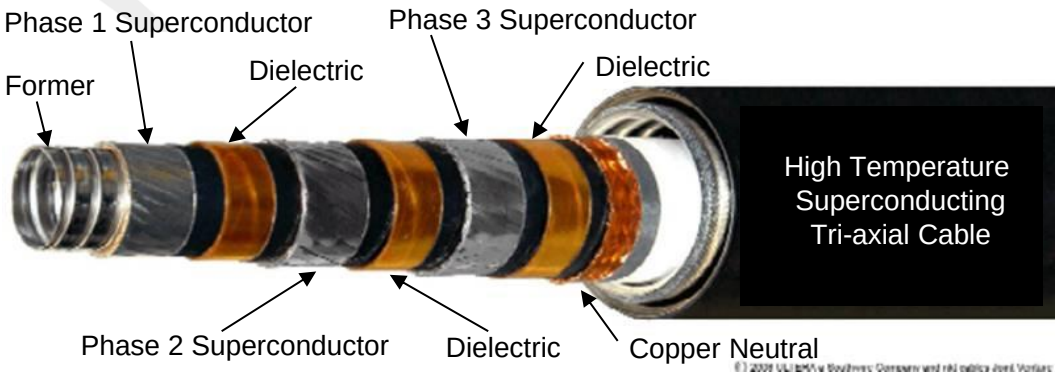
ComEd
An Exelon Company

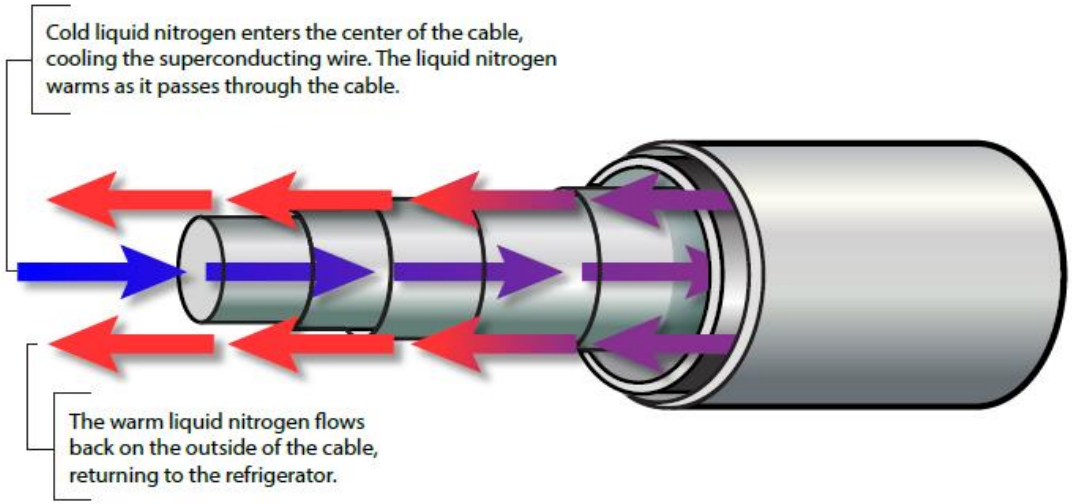
SUPERCONDUCTOR: CHICAGO CBD GRID RESILIENCY

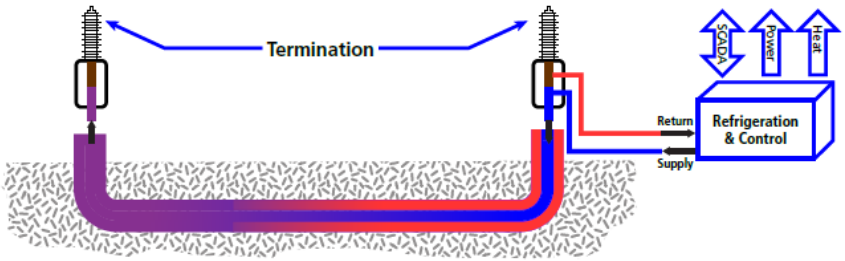
- ComEd and American Superconductor (AMSC) recently agreed to partner with the Department of Homeland Security (DHS) in its Resilient Electric Grid Program
- Developing plans to deploy high temperature superconductor cable in Chicago's central business district (CBD).
- The project will connect five substations in Chicago's CBD, greatly enhancing grid resiliency
- At more than 3 miles in length, this represents the most extensive superconductor project of this nature in the world

ComEd
An Exelon Company

CONCENTRIC PHASE HIGH TEMPERATURE SUPERCONDUCTOR CABLE

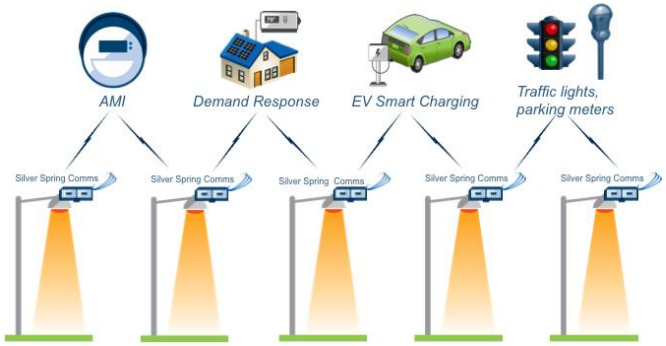






ComEd
An Exelon Company

SMART CITIES: SMART LED STREETLIGHTS



- ComEd is evaluating opportunities to offer smart LED streetlight service to the communities we serve
- ComEd's wireless communications network is the backbone of the system
  - Two-way communications for monitoring and control of meters, streetlights and future devices
- Streetlight control nodes installed on each light fixture include the same wireless radios in ComEd's smart meters
- Web-based streetlight management software provides central management of streetlights and other "smart city" applications
- Benefits include:
  - Energy & maintenance savings
  - Improved security and safety
  - Platform for future smart cities applications

ComEd
An Exelon Company

OTHER INNOVATIONS AT COMED

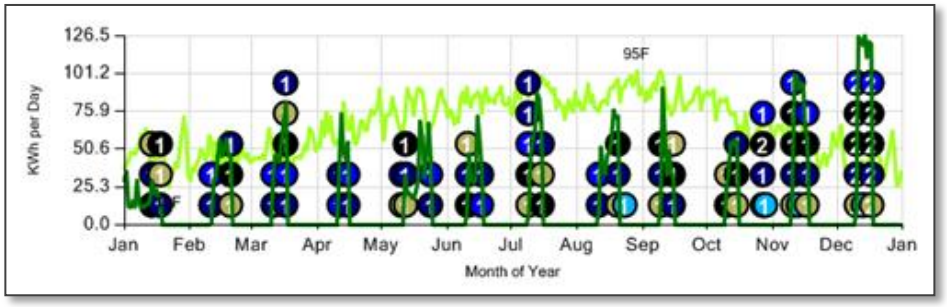
SMART METER DATA ANALYTICS

Meter / Network Analytics:

- Bypass after disconnect
- Unreachable after disconnect

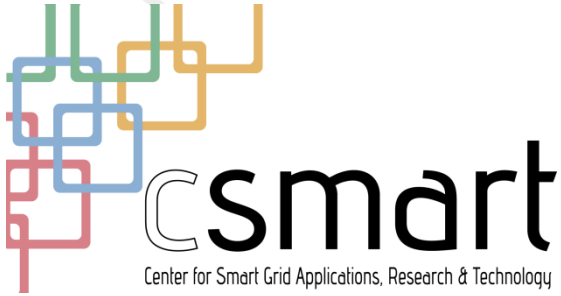
Back Office Analytics:

- Self-restore after remote disconnect
- Zero electric use vs. other utilities (e.g., gas)
- Reverse energy flow
- Load drop on event (partial bypass)
- Power-down event with zero usage
- New meter set – 7 & 30 day analysis



ComEd
An Exelon Company

CENTER FOR SMART GRID APPLICATION, RESEARCH AND TECHNOLOGY (CSMART)



- First lab of its kind to bring in utility, academic and business experts to foster innovation for the smart grid
- Dedicated to researching, testing and analyzing the latest smart grid and smart city technology innovations in a real-world environment.
- The open business environment at CSMART will help advance the development in these key areas not just in Chicago and Illinois but across the United States.

SMART GRID EXCHANGE

- ComEd is evolving into a 21st century utility capable of supporting Illinois' transformation into a 21st century digital economy.
  - As a result of the Energy Infrastructure Modernization Act (EIMA), ComEd is investing $2.6 billion into one of the nation's largest grid modernization programs, and a critical piece of these investments is the deployment of over 4 million smart meters.
- Through the SmartGridExchange, companies, entrepreneurs, universities and individuals will explore, guide, and help shape the potential of what the electric grid of the future will do and be.

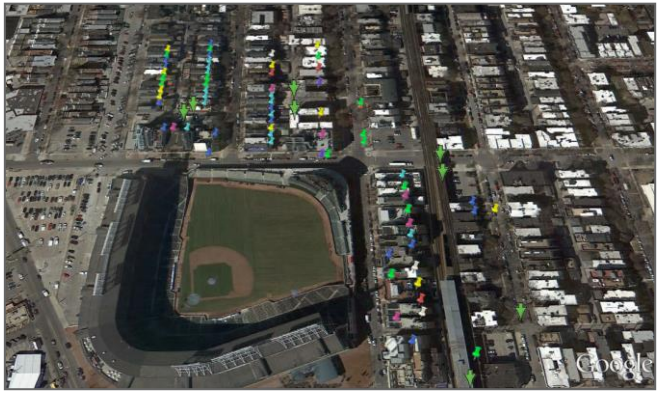
WRIGLEYVILLE VOLTAGE ANALYSIS

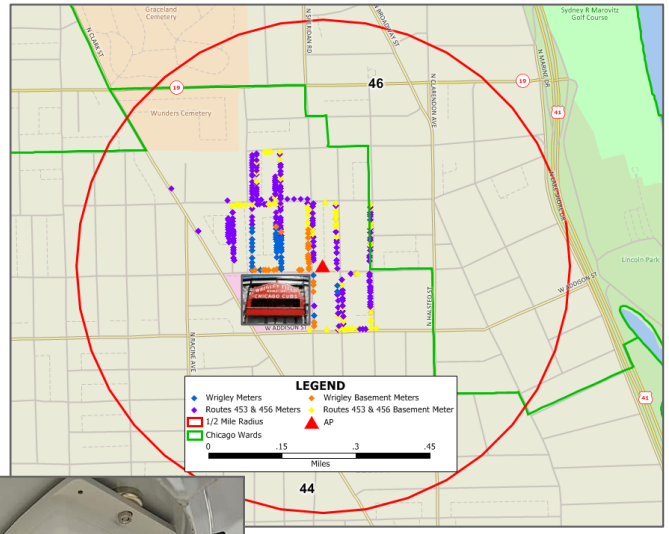
Challenge:

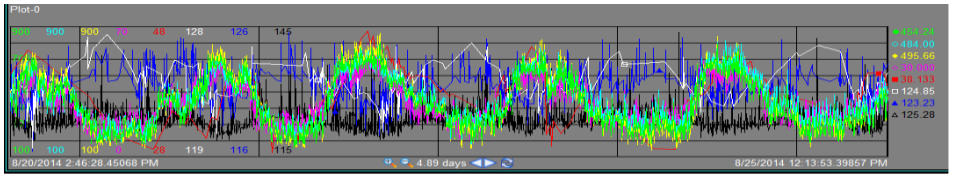
- Low voltage and loading issues with Wrigley Field Rooftop buildings and surrounding neighborhood in 2010-2011
- No issues since corrective actions implemented in 2011

Solution:

- Utilize smart meter capability to provide real-time voltage measurement
  - Assess effectiveness of prior actions
  - Predict potential future issues
- Gather time-sequenced load and voltage data
- Pilot Grid Sense TransformerIQ monitoring







ComEd
An Exelon Company

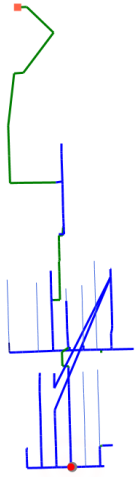
INTELLIGENT SUBSTATION FAULT DETECTION & LOCATION

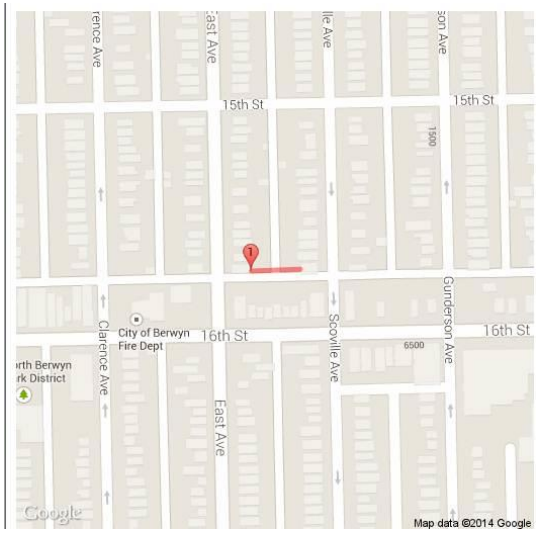
Challenge:

- Identify a more efficient & reliable way to detect and locate faults on the distribution system

Solution:

- Utilize data collected from microprocessor relays in ComEd's intelligent substations, along with algorithms to predict fault locations
- Results are integrated into automated email and text notifications that show the probable fault locations on Google Maps with GPS coordinates.
- Allows crews to go get to the repair location more quickly





ComEd
An Exelon Company

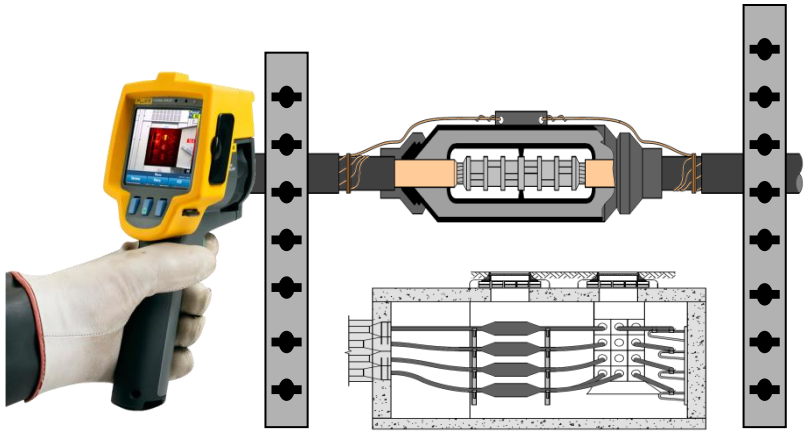
MANHOLE THERMOGRAPHY

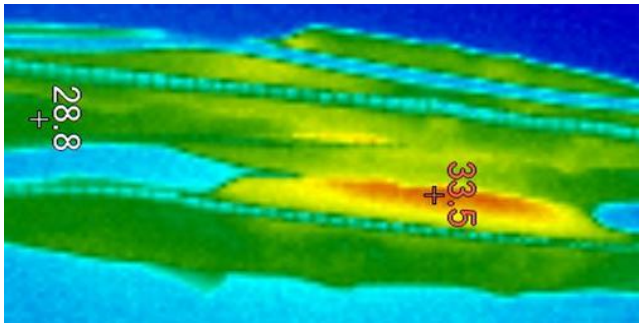
Challenge:

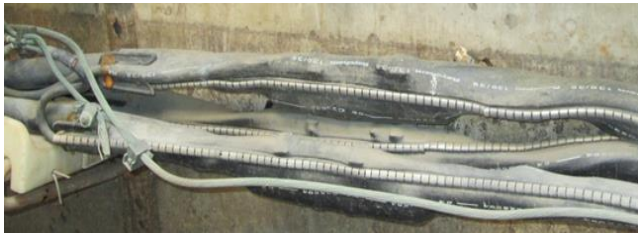
- Identify hidden cable defects (“hot spots”) which are at risk of failing

Solution:

- Use of infrared imaging to inspect cable joints
- Measure the temperature differential between the conductor and the connector
- Criteria:
  - Red: Critical/severe
    - ✓ ≥15ºC (≥27ºF) ΔT
    - ✓ Exit structure
    - ✓ De-energize
  - Yellow: Intermediate
    - ✓ 4-14ºC (5-25ºF) ΔT
    - ✓ Suspend feeder reclosing
    - ✓ Periodically monitor (every 1-2 hours)
  - Green: Minor
    - ✓ 1-3ºC (2-4ºF) ΔT
    - ✓ No immediate action







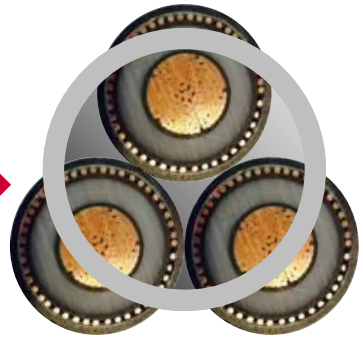
ComEd
An Exelon Company

69KV LPFF CABLE REPLACEMENT

Challenge:

- Replacing low pressure fluid filled cable with XLPE
- Currently available 3-1/C XLPE replacement cables will not fit into the existing 4” single duct
- No available ducts in the existing conduit package
- New conduit packages are expensive
- There is only one cable manufacturer in the world that makes the LPFF 3/C Cable; Okonite Cables in Paterson, NJ.

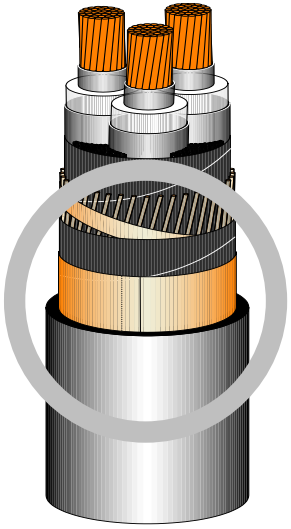
Typical 3/C 69kV LPFF cable in a 4” duct



3-1/C 69kV XLPE cables relative to a 4” duct

Solution:

- Developing a 1-3/C replacement XLPE insulated cable system.
  - Prototype testing began in March
  - Final design testing planned for Q4 2014



1-3/C 69kV prototype

ComEd
An Exelon Company

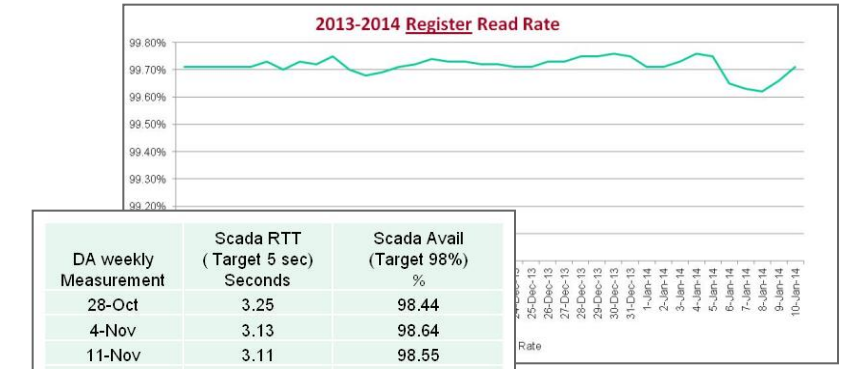
WIRELESS NETWORK HEALTH INDICATORS

Challenge:

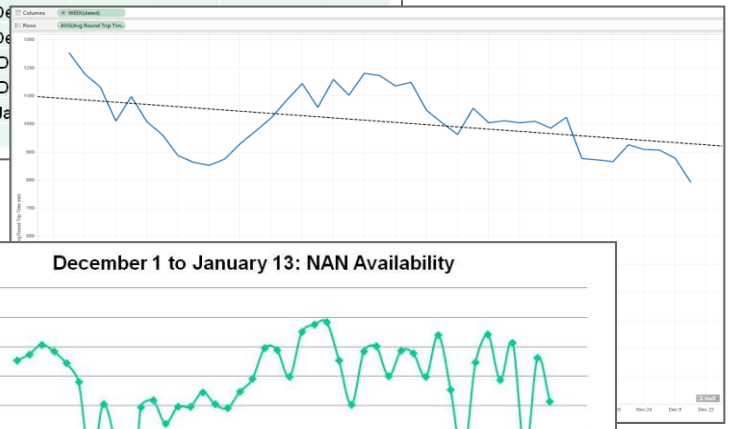
- Establish performance indicators to ensure ongoing health of the SSN communications network

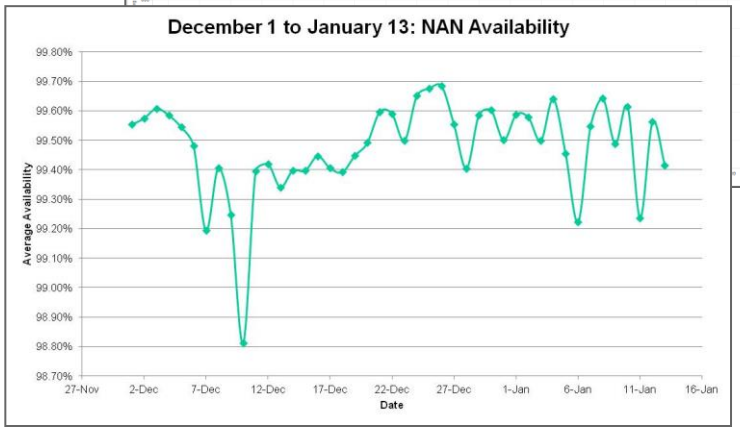
Solution:

- Established the following indicators and targets:
  - AMI Register Read Rate: 99.5% by 2PM
  - SCADA end-to-end availability: 98%
  - SCADA end-to-end round trip time (RTT): 5 sec
  - SSN neighborhood area network (NAN) availability: 71%
  - SSN NAN RTT: 2 sec
- Currently meeting all targets
- Benchmarking to ensure appropriate targets and measurement methodology



DA weekly Measurement	Scada RTT (Target 5 sec) Seconds	Scada Avail (Target 98%) %
28-Oct	3.25	98.44
4-Nov	3.13	98.64
11-Nov	3.11	98.55
18-Nov	3.34	98.54
25-Nov	3.24	98.33
2-De		
9-De		
16-D		
23-D		
2-Ja		





ComEd
An Exelon Company

AIR CRANE TRANSMISSION POLE SETTING

Challenge:

✓ Find a more efficient way to quickly erect steel transmission poles

Solution:

✓ Utilize “air crane” helicopters

✓ Erected 28 steel transmission poles

✓ 44 individual lifts completed in just 4.5 hours

✓ Savings: eight weeks, $500,000

International Utility Working Group 2013

ComEd
An Exelon Company


ComEd
An Exelon Company
powering lives