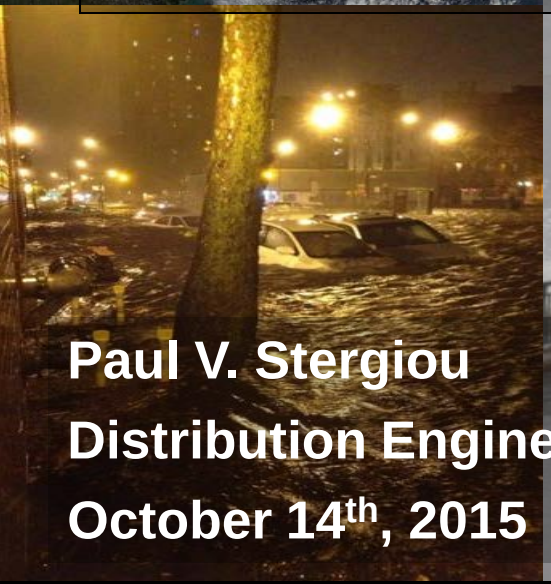
Consolidated Edison Company of New York, Inc.

Electric Distribution Storm Hardening Initiatives



Paul V. Stergiou
Distribution Engineering
October 14th, 2015

Energy For New York City And Westchester

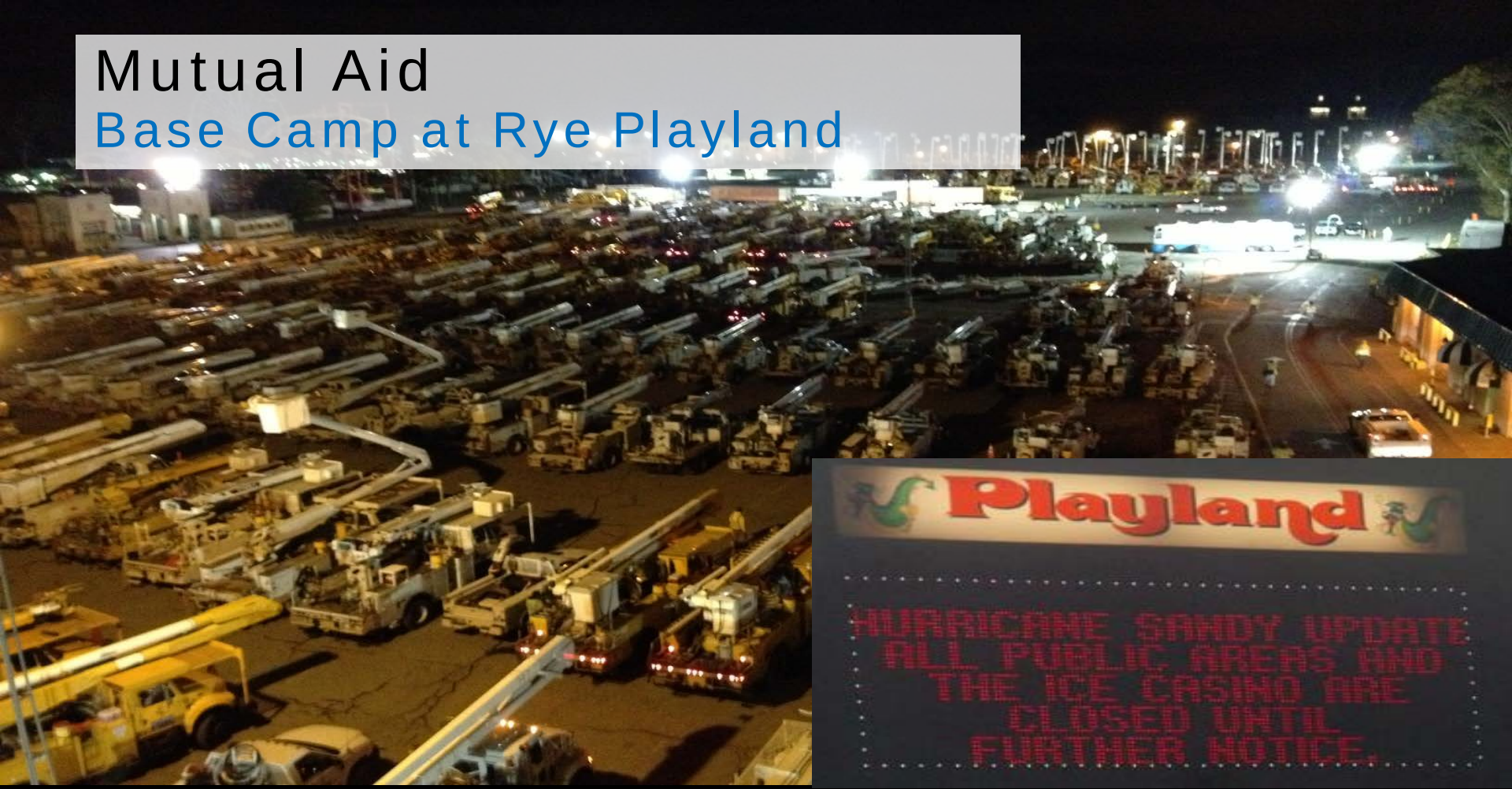
- **3.3 million electric customers**
- **Record System Load: 13,322 MW**
- **36,000 miles of overhead transmission and distribution lines**
- **94,000 miles of underground transmission and distribution lines**
- **1.1 million gas customers**
- **4,300 miles of gas mains**
- **1,800 steam customers**
- **105 miles of steam mains and lines**
- **690 MW of regulated generation**

Storm Preparations:
Guided by Corporate Coastal Storm Plan

- Plan triggered Oct. 24 based on National Weather Service forecasts
- Reviewed:
  - 24/7 staffing plans
  - Equipment vulnerability
  - Inventories
  - Protection plans for equipment in flood zones
  - Need for outside assistance

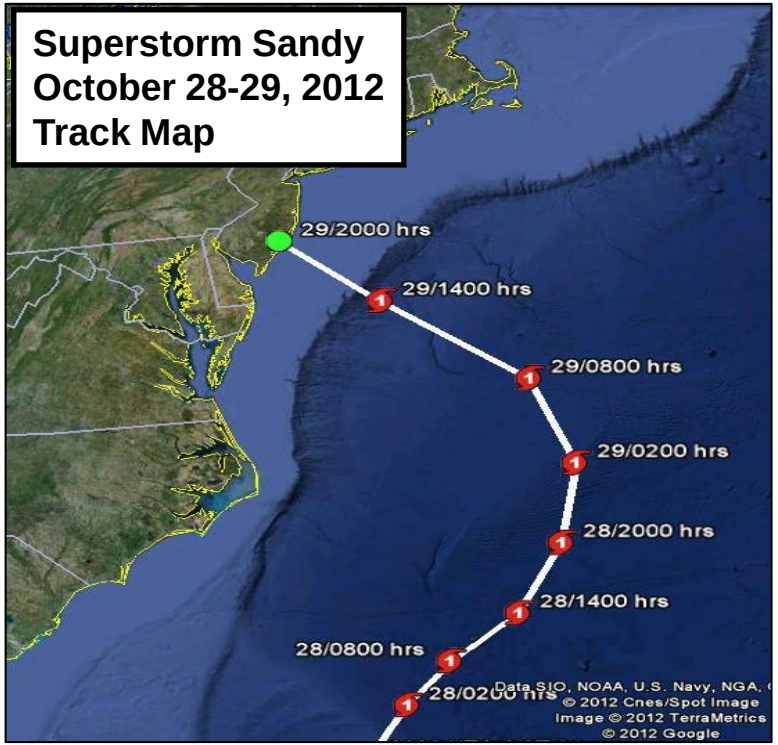
Mutual Aid

Base Camp at Rye Playland



Superstorm Sandy Details

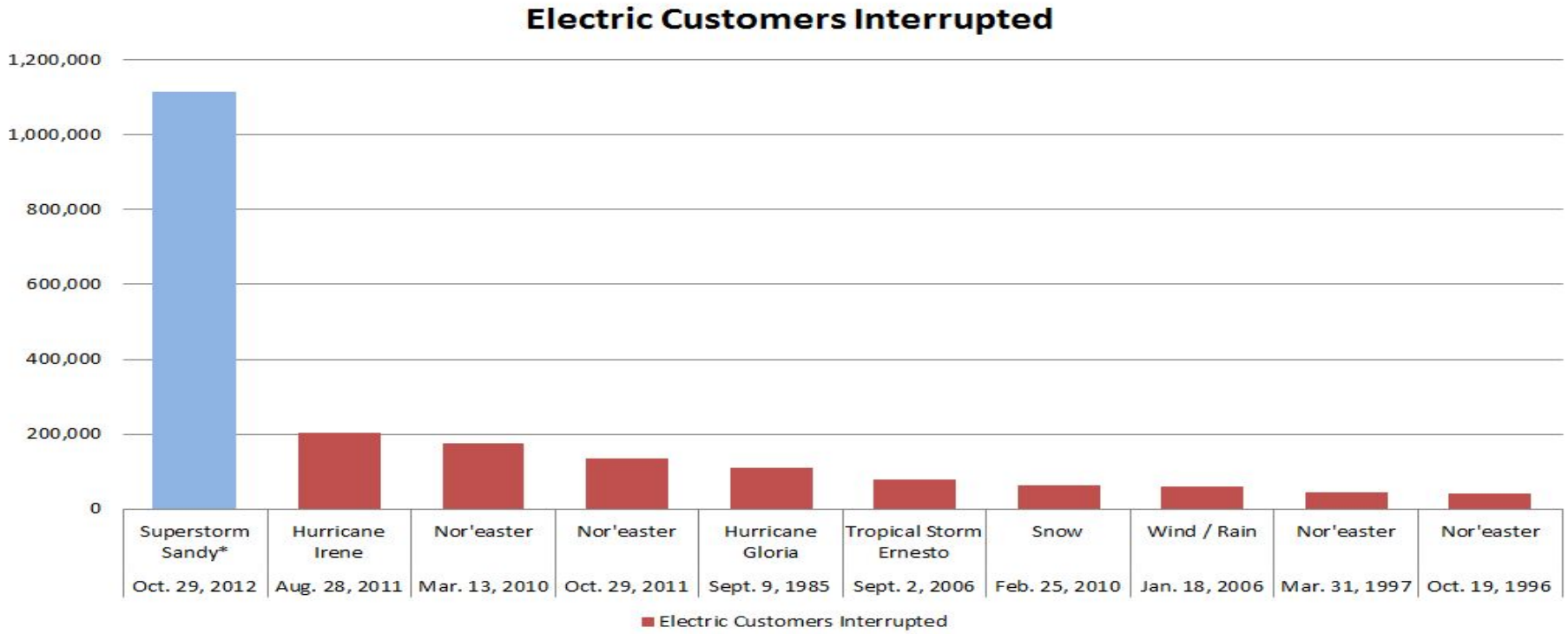
- Storm Classification: Hurricane/ Extra-tropical
- Sustained winds of 64 mph at LaGuardia Airport with a peak gust of 90 mph on Staten Island
- NYC experienced approximately 30 hours of storm conditions
  - Storm tide recorded at the Battery – 14.06'
  - Largest Atlantic storm on record, spanning more than 1,000 miles
  - More than 8.5 million power outages across 21 states



Impact of Sandy

- 1.1 million customer outages
- Lost 4,000 MW of generation
- 60% of 345 kV feeders lost
- 5 transmission substations
  - 11 Manhattan networks
  - 3 Staten Island area stations
- 2 steam stations and 561 steam customers impacted
- 398 gas services interrupted

System Performance
Historical Storm Comparison



* includes outages caused by Nor'easter on Nov. 7, 2012

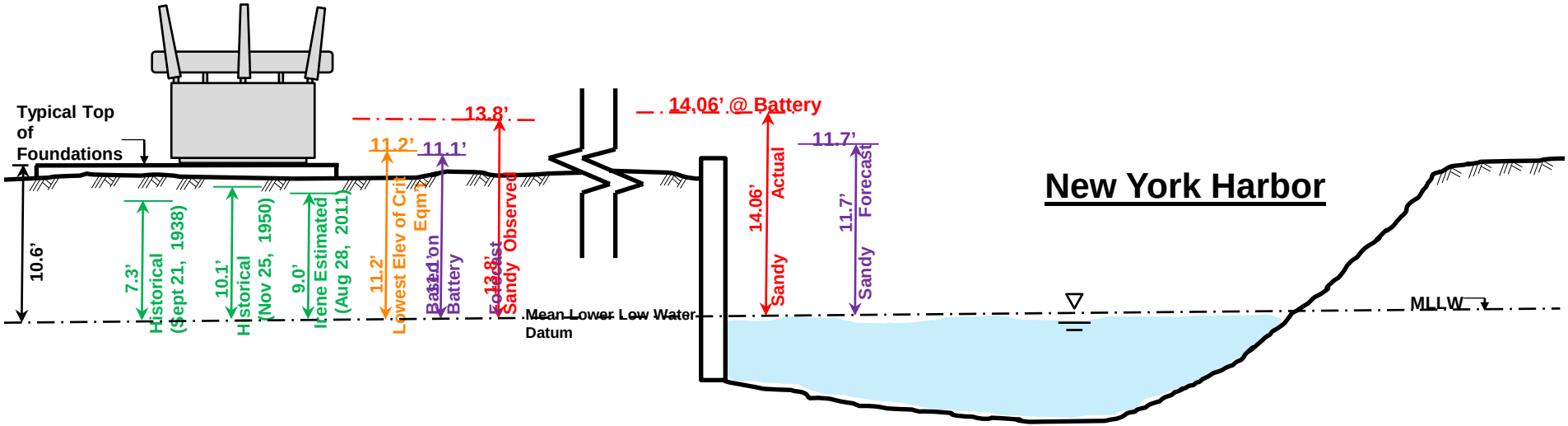
The East River: 14th Street and Avenue C

East River / E 13th Street Complex

Loss of Supply

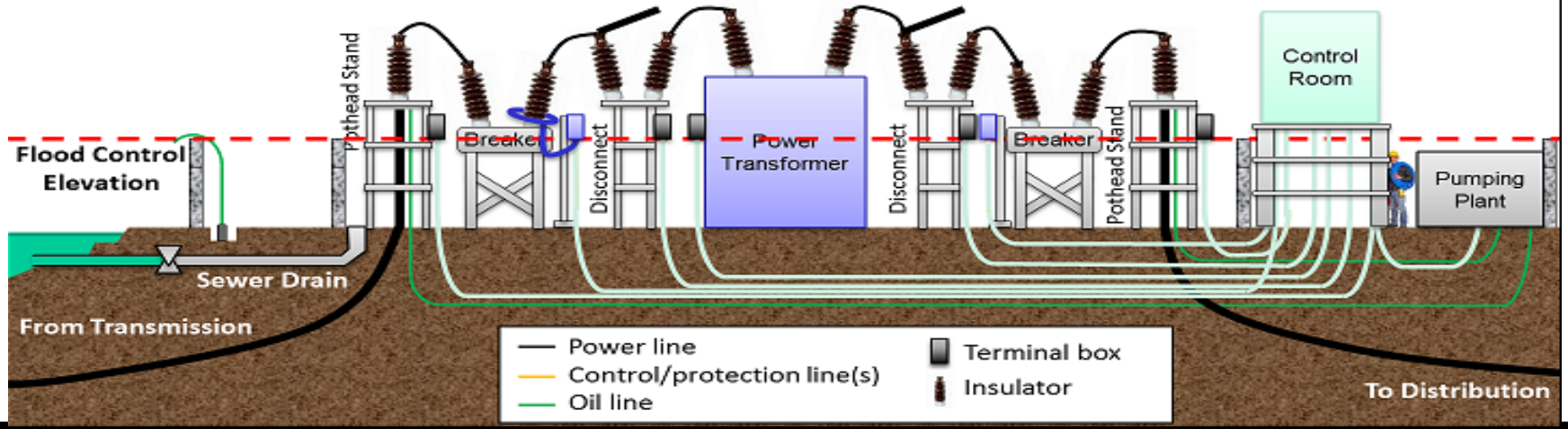
East River Complex

Datum Diagram (Not to Scale)



Final Hardening Measures
2014 through 2016

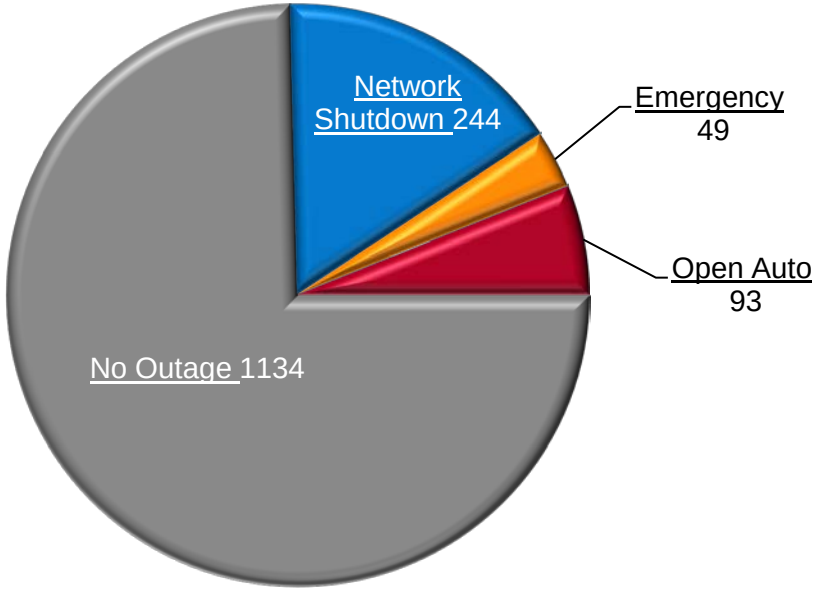
- Distributed and elevation adjustable relay panels
- Elevate control house
- Elevate static terminal boxes
- Change controls to fiber optic
- Future design basis will accommodate new level for future projects



Storm Hardening UG Networks
Goals & Strategy

- Minimize preemptive feeder outages system wide
- Reduce damaged to equipment in the flood zone
- Reduce customer impact in flood zone networks
- Increase restoration speed for network shutdowns

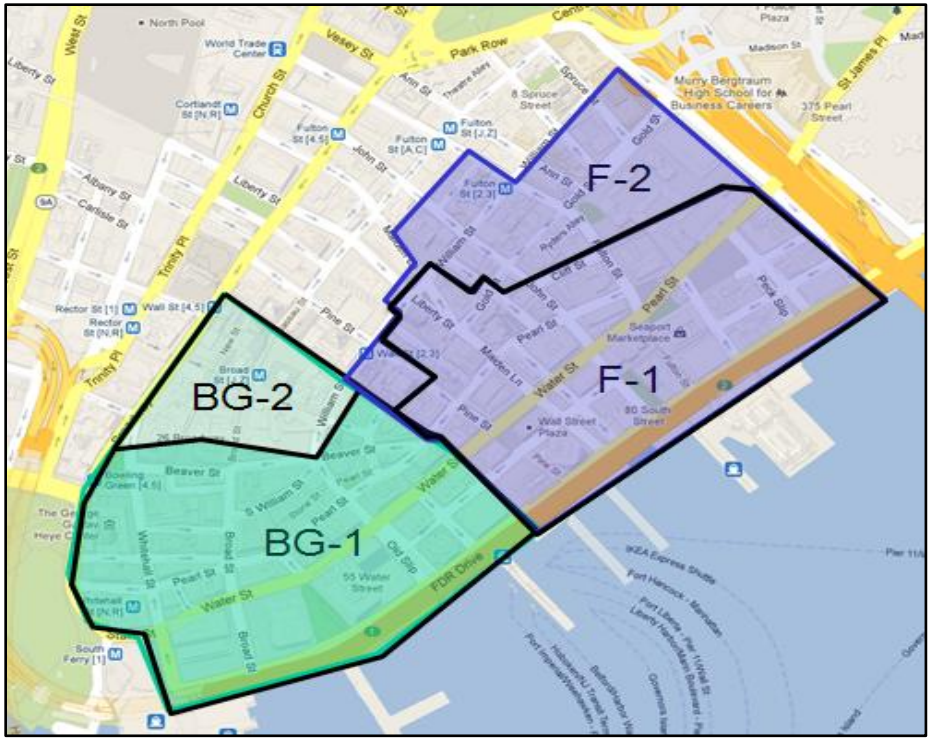
Distribution Feeder Outages



Storm Hardening Initiatives

Underground Distribution

- Network Reconfiguration
- Utilize Latest Technology
- Harden Components
- Mitigate Impact
- Facilitate Restoration



New Sub-Networks

Underground Network Initiatives

High Tension Vaults - Isolation Switches

- Disconnects Customer Installation from Con Ed System
- Con Edison Feeder remains active
- Remote Control operation
- Quick Connect / Disconnect
- Faster Restoration Times

120V Network Protector
Design Evolution

- Replaces & phases out ventilated cabinets

Ventilated End Mounted Cabinet

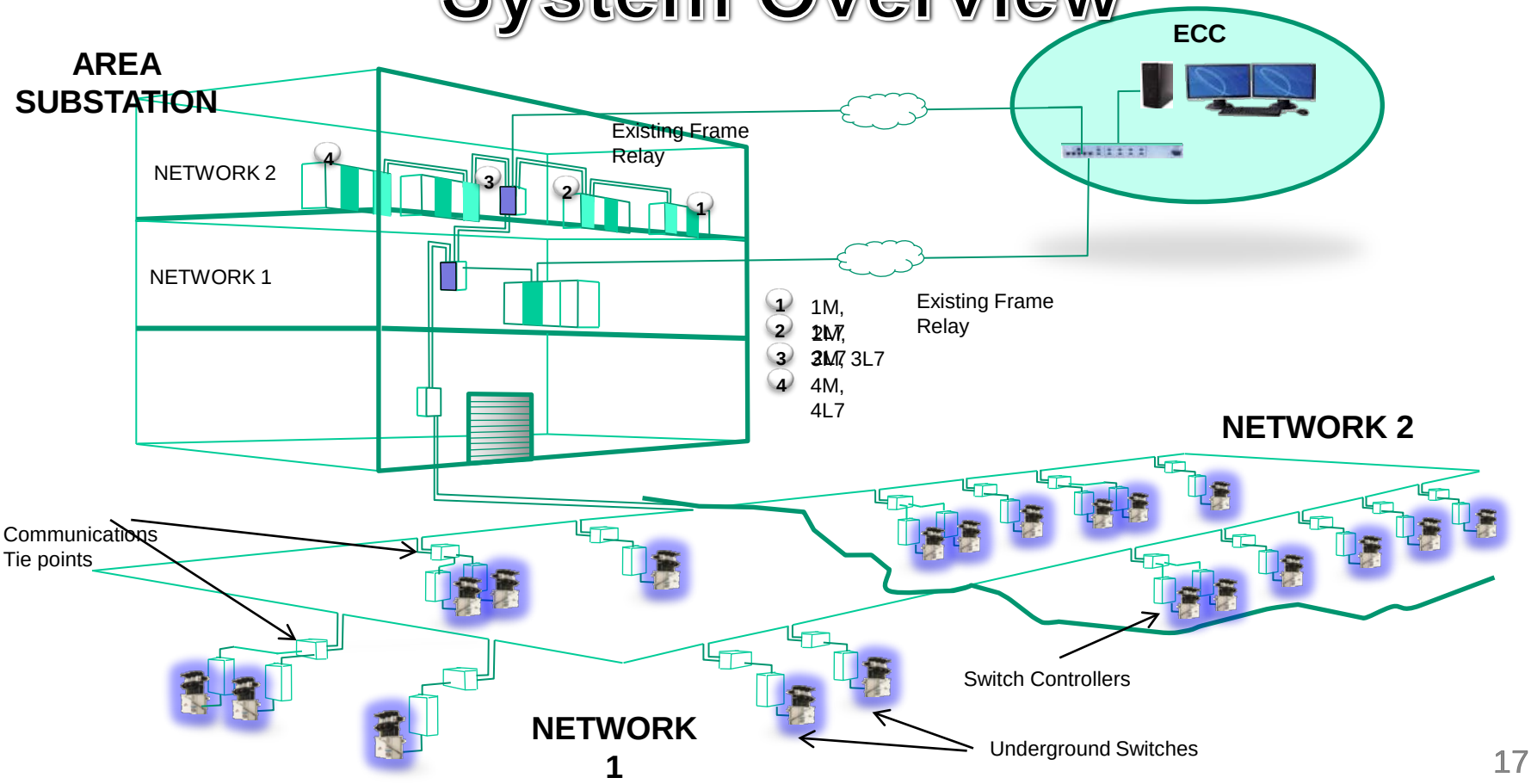
Submersible End Mounted Housing

Underground Network Initiatives

Overview

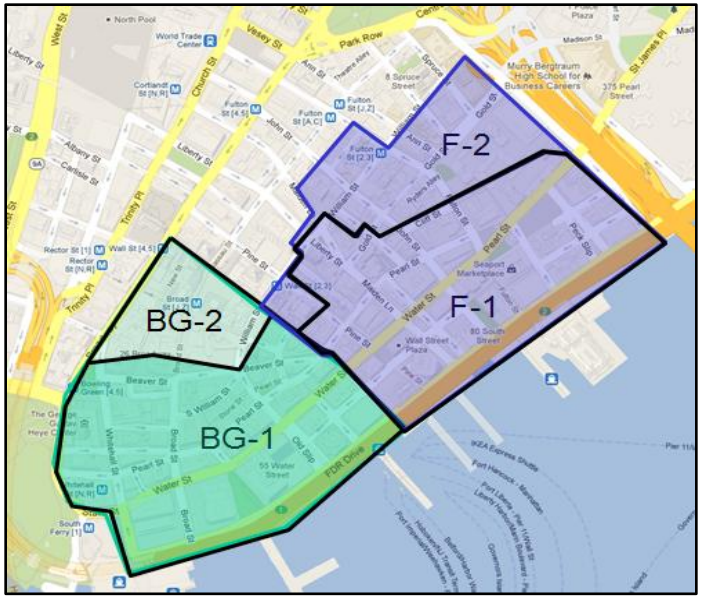
- Reconfiguration of Fulton and Bowling Green networks
- Installation of isolation switches for Brighton Beach network
- Installation of isolation switches for High Tension Vaults in 2013 FEMA 100 Year + 3 Feet Flood Zone
- Replacement of all non-submersible 120/208V equipment in Flood Zone
- Development of submersible 265/460V housing

System Overview



Benefits of New Partitioning System

- Minimize customer interruption
  - 1,789 Residential households
  - 441 Commercial
  - 46,745 Employees
- Faster Restoration
  - Substations remain online
  - Ability to restore individual circuits
- Transmission Planning Tool
- Year round benefit for feeder processing



Sandy's Impact:
Significant Damage to Overhead System

- 70 percent of customers served by overhead systems lost power
- Primary concern of safety
- Worked with city and municipalities to clear roads of trees and debris

Storm Recovery Pole & Transformer Usage			
	Poles	Transformers	Cable [miles]
Sandy Total CECONY	972	922	143.46
Irene Total CECONY	91	163	31.11

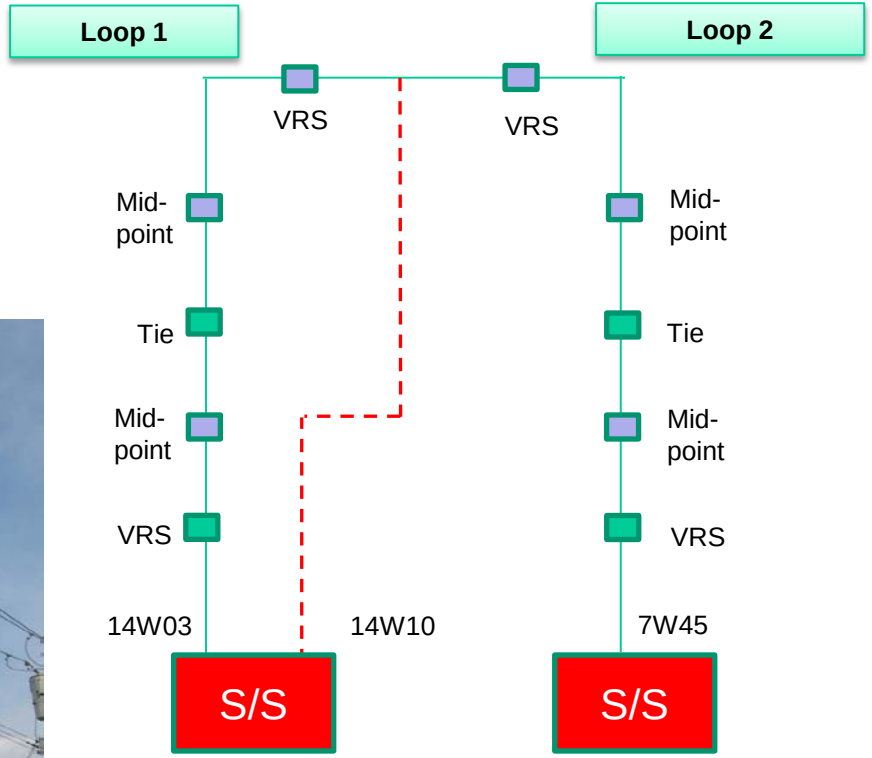
Improve Autoloop Reliability

- Additional supply feeders
- Divide large autoloops into smaller loops
- Upgrade wire and pole sizes to improve resiliency
- Use of more resilient aerial cable
- Sacrificial components to minimize damage

Overhead Distribution Initiatives

Auto Loop - Overview

- Extend new feeder
- Split Auto-loop into two loops
- New storm hardened cable



Storm Hardening Initiatives

Overhead Distribution

- Advanced Equipment
- Selective Undergrounding
- Reduce Segment Size
- Sacrificial Components

Spacer Cable

- Low profile design reduces risk of tree contact
- High strength messenger provides greater resiliance against falling limbs
- Cable jacket reduces momentary outages from wind or incidental tree contact
- Compact configuration reduces tree trimming

Breakaway Connectors

- Service connection breaks away at pole when force exceeds 500lbs
- Service cable is disconnected and denergized
- Separate breakaway for each individual service
- Accommodates single, double or triple service configurations

Breakaway Connection

Isolation Devices (Fused Bypass)

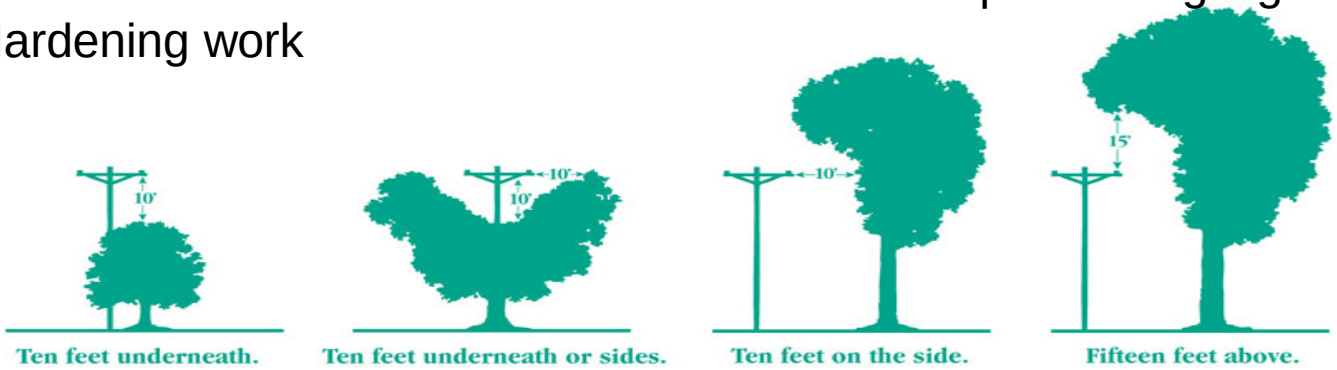
Selective Undergrounding

- Meeting with Municipalities to determine critical circuits to harden.

Harden Components:
New Pole Designs

Enhanced Line Clearance Program

- Foundation program continued to ensure 10 X 10 X 15 Clearance every three years is achieved on High Voltage Feeders.
- Increased removal of damaged or unhealthy hazard trees near High Voltage feeders
- Obtain additional clearance on High Voltage Feeders that have higher outage rates and affect customers more frequently
- Obtain additional clearance on Feeders where we are performing significant Storm Hardening work



Ten feet underneath. Ten feet underneath or sides. Ten feet on the side. Fifteen feet above.

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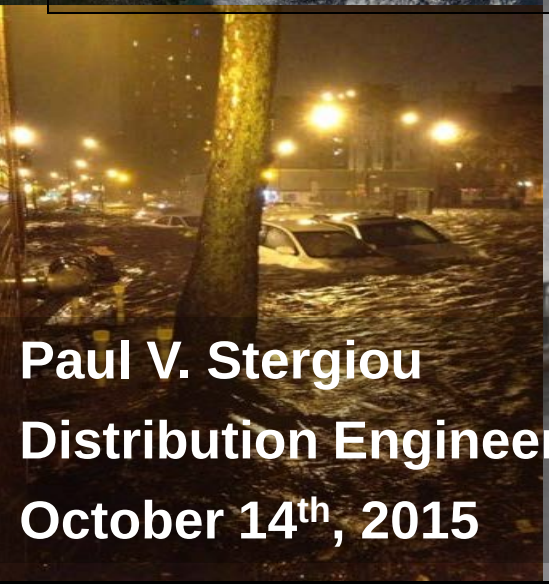

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