

# Distributed Generation Con Edison

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## Agenda

- ◆ Overview of Con Edison System
  - Statistics
  - Customer Considerations
  - System design
- ◆ DG in Con Edison's System
  - Utility uses
  - Customer uses
- ◆ Connecting DG
  - Interconnect process
  - Design considerations
  - Parting thoughts

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## Con Edison Electric Distribution System

- = Con Edison Company
- = Orange & Rockland

<b>Area:</b>	604 sq mi
<b>Population:</b>	8,800,000
<b>Electric Customers:</b>	
<b>Network:</b>	2,400,000
<b>Radial:</b>	835,000
<b>Total:</b>	3,200,000
<b>Peak Load (2005):</b>	13,000 MW*

*Including Westchester*

## Characteristics of NYC Customers

- ◆ Extremely dense land usage
  - Many high rise buildings
  - Extreme competition for space
  - Robust energy demand
- ◆ Need for high reliability
  - Safety
  - Customer needs
- ◆ Service based economy
  - Financial institutions
  - Information technology
  - High rise housing



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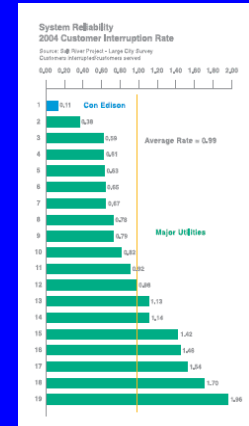
## Design Basis of Distribution System

- ◆ **Second Contingency**
  - High density load areas
  - Urban and financial districts
- ◆ **First Contingency**
  - Low load density areas
  - Suburban area
- ◆ **Separation of feeders**

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## Network Characteristics

- ◆ **High Reliability**
- ◆ **Totally Underground**
- ◆ **Multiple Feeders**
- ◆ **Multi-level Electronic Monitoring and Control Capabilities**
- ◆ **Analytical Capabilities**
- ◆ **Real-Time Remote Control**



## Electric Distribution System Networks

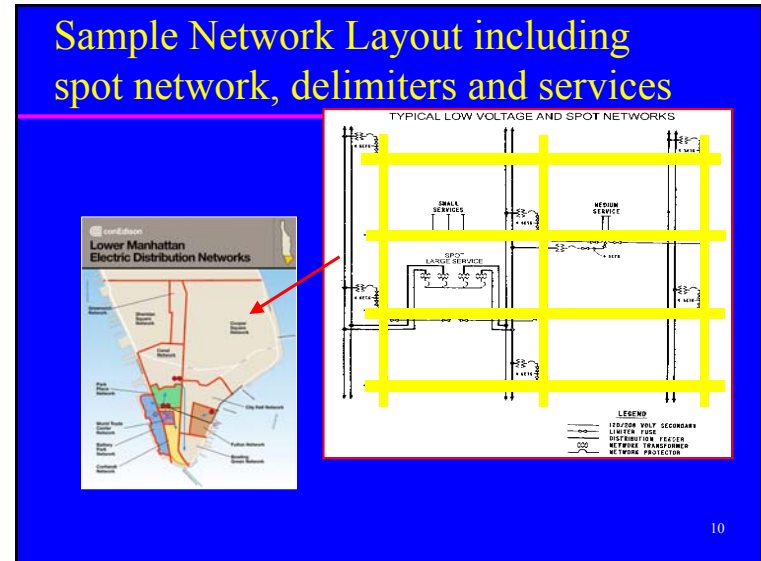
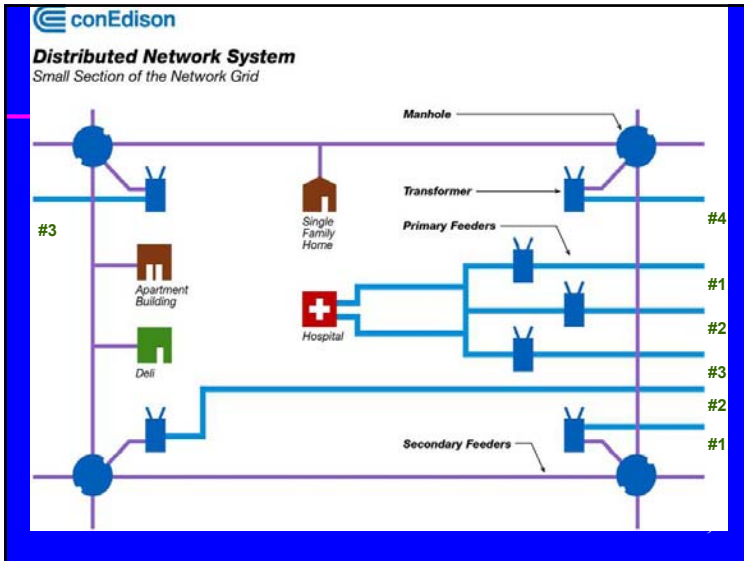
Networks	56
Feeders	897
Network Transformers	24,000
Manholes & Boxes	260,000
Primary Feeder Cable	27,000 km
Secondary Cable	80,000 km

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## Intersection of Wall St. & William St. 1913



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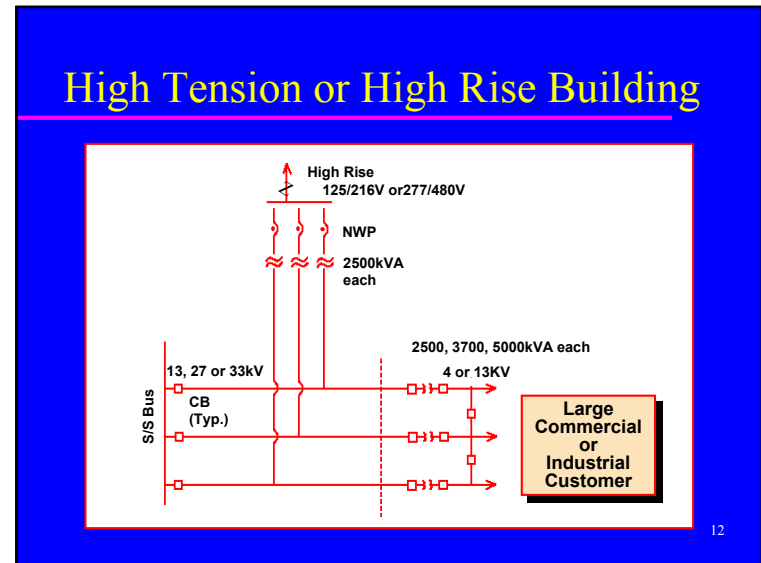


## Con Edison Electric Distribution System

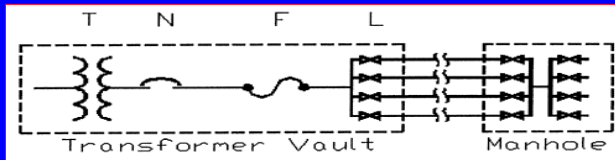
Network: Many simultaneous paths for power to flow to customers.

- ◆ Each network is fed from one area substation.
- ◆ Typically:
  - ◆ 12 - 24 primary feeder
  - ◆ 250 - 750 transformers
  - ◆ 7,500 - 75,000 customers
- ◆ Of 56 major networks
  - ◆ 33 in Manhattan
  - ◆ 10 in Brooklyn
  - ◆ 7 in Queens
  - ◆ 6 in Bronx
- ◆ Except for Manhattan, other Areas have extensive amounts of isolated networks and radial distribution.

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## Networks Elements



**T**ransformer: Transforms the voltage from primary (13 or 27 kV) to secondary (120/208 volts).

**N**etwork Protector: Isolates network from primary feeder fault.

**F**uses: On each network protector to backup for primary feeder fault & secondary fault.

**L**imiters: Weak links on each cable end to isolate secondary faults to a single section of cable.

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## Use of DG at WTC



- ◆ Over 100 MW mobile DG deployed throughout downtown Manhattan
- ◆ Primarily used to feed large customers (120/208 and 460 V)
- ◆ Round the clock monitoring of units
- ◆ Kept lights on while networks were restored

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## Use of DG at WTC



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## The usage of DG throughout the system is growing

- ◆ Utility Usage
  - Emergency Power
  - System support
  - T&D deferral or replacement
- ◆ Customer Usage
  - Added layer of reliability & Power Quality (UPS)
  - Cogeneration opportunities

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## Other uses of DG at Con Edison

- ◆ Contingency response
- ◆ Temporary SS deferral
- ◆ Tariff enabled NYISO participation of standby generators
- ◆ Component of DSM programs
  - DG RFP Ruling by PSC
  - Current DSM RFP including DG

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## Customer interest in NYC

- ◆ Emergency DG
  - Critical customer loads
  - Differentiates telecom and IT space
  - Ability to participate in ICAP, EDRP
- ◆ Peak Shaving or Cogeneration
  - Perceived favorable “spark” spread
  - Ability to match thermal load

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## Challenges to DG in NYC

- ◆ Challenges of NYC
  - Emissions
    - » Non-attainment area
    - » Noise and aesthetics
  - Space is at a premium
  - Logistics
  - Interconnection requirements

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## Customer DG we see in NYC

- ◆ Significant emergency diesel generation
- ◆ Large commercial customers are target for base load
- ◆ Some “green” applications
  - Photovoltaics
  - Fuel cells
  - Microturbines
  - Others include tidal and wind

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## Interconnection Overview

- ◆ Preliminary Discussions
  - » Customer's considerations and proposed operation
  - » Focus on existing service to site and proposed interconnection
  - » Application and associated documents and process
- ◆ Review of Design Submittal
  - » Stamped by a Professional Engineer
- ◆ Detailed Specifications (Standard Contract)
  - » Signed by both Con Edison and customer
  - » Amendment - prepared by Con Edison
- ◆ Verification Testing
  - » Procedure developed by customer
  - » Witnessed by Con Edison forces
- ◆ Interconnection Charges
  - » Costs related to the DG billed to the customer

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## Concerns in Design Review

- ◆ How does the proposed generator affect the existing electric system?
    - ◆ Available Short Circuit Current & DG contribution
    - ◆ Light load condition and backfeed
    - ◆ Inadvertent islanding
    - ◆ Inadvertent energization
    - ◆ Equipment ratings
    - ◆ System protection and integration
    - ◆ Existing service reinforcements/modifications
    - ◆ Power Quality
- Site-specific design review

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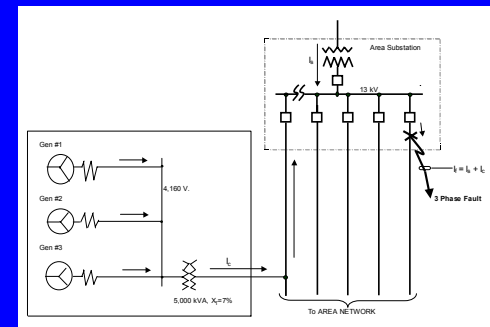
## Concerns in Design Review

- ◆ Network interconnection protection requirements in: *Con Edison Handbook for Dispersed Generation*
  - Intertie circuit breaker (52IT)
  - Anti-islanding protection (81U/O, 27/59)
  - Reverse power protection (32R)
  - Network protector interlocks
  - Short circuit/Overcurrent protection (50/51)
  - Synchronizing & sync check functions (25)
  - Disconnect switch (89)

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## Fault Current added by the CHP

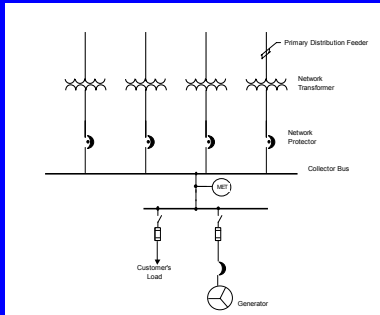
- ◆ Area Substation Fault Duty Limitations



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## Effect of CHP System Sizing

- ◆ A short circuit study determines the available fault current
- ◆ Customer load must be evaluated to size generator(s)



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## Tariff Implications of DG

- Electrical Interconnection (Operating modes)
  - Buy-back (SC11) : not compatible with distribution network system
  - Supplemental (SC 14RA): CHP system run in parallel supplying portion of load, Con Ed provides remainder
  - Standby: CHP system runs continuously, providing all loads, Con Edison available if CHP system is down (SC14RA)
  - Isolated: no interconnection with Con Ed system
- Gas Interconnection (Rider H)
- Steam Interconnection
  - Backup steam rate (SC-4)

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## Parting Thoughts

- Review customer specific needs
- Look for standard equipment where possible
- Consult applicable tariffs, interconnect specs & incentives
  - [www.coned.com/dg](http://www.coned.com/dg)
- Work with customer CPM
  - State electric, gas and/or steam needs up front
- Contact DG point of contact
  - Damian Sciano, (212) 460-1154, scianod@coned.com

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