Combined Heat & Power
&
The Urban Energy Revolution

NYIT -- Sept 28, 2012

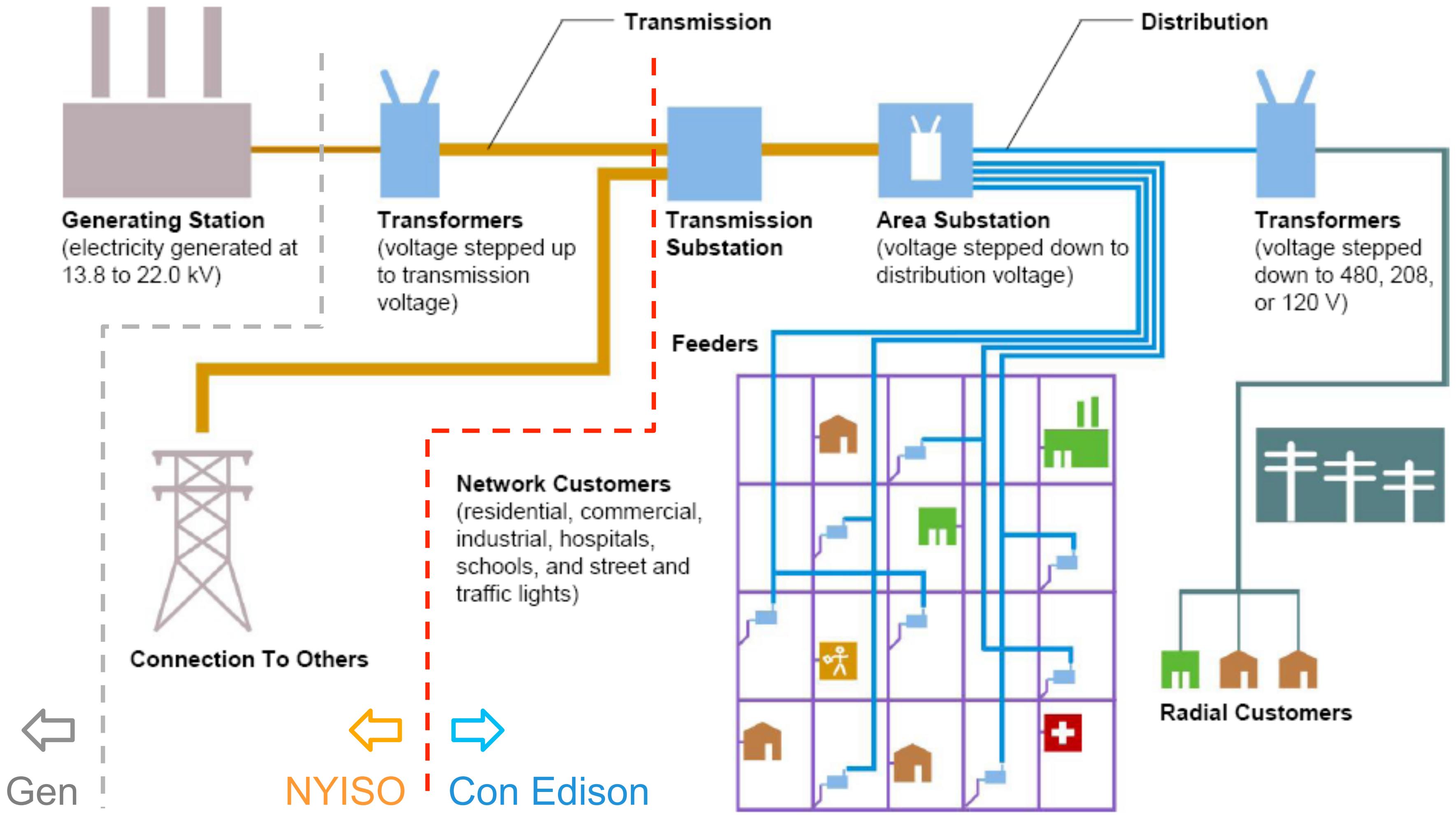
Agenda

- Distributed Generation Overview
- Interconnection - Technical
- Interconnection – Process and Rates
- Recent Developments and Future Opportunities

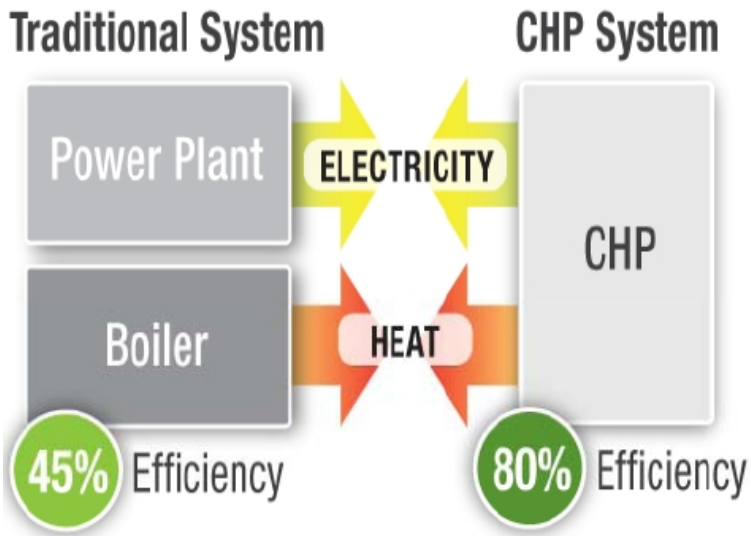
What is Con Edison?
Public Utility Energy Provider

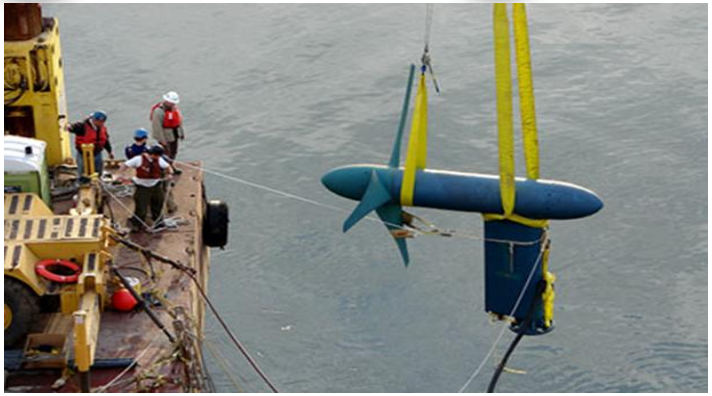
	Customers	Infrastructure	Service Territory
Electric	3.3 million	One of the largest underground systems in the world	All 5 boroughs and Westchester County
Gas	1.1 million	4,333 miles of gas mains and services	3 out of the 5 boroughs and Westchester County
Steam	1,760	Largest district steam system in the world	Manhattan below 96^{th} Street

The Electric System - Restructured



What is distributed generation (DG?)

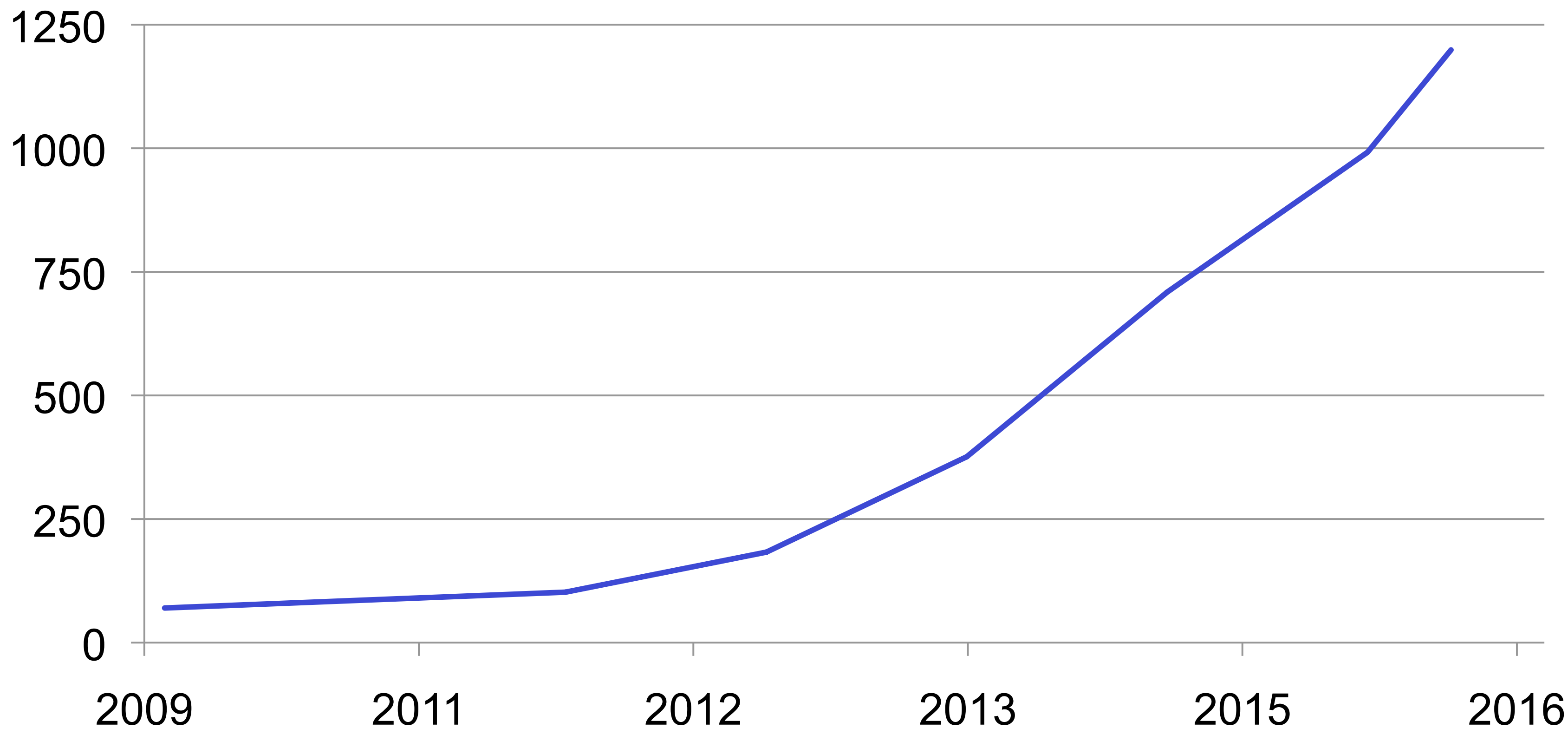




Distributed Generation Overview

Technology trends

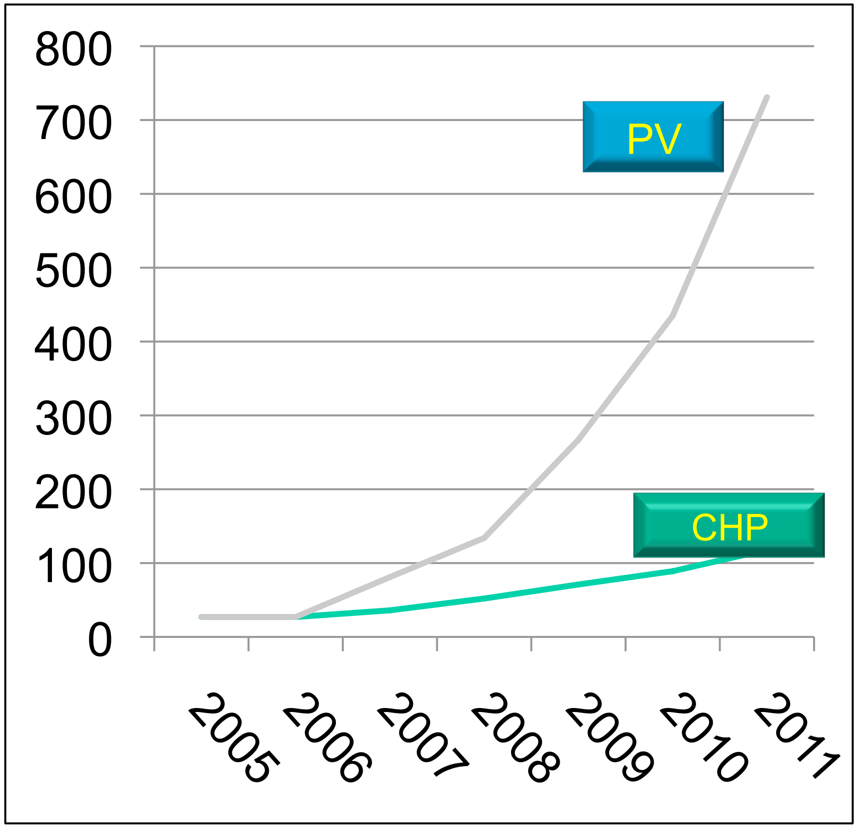
Cumulative Number of DG applications



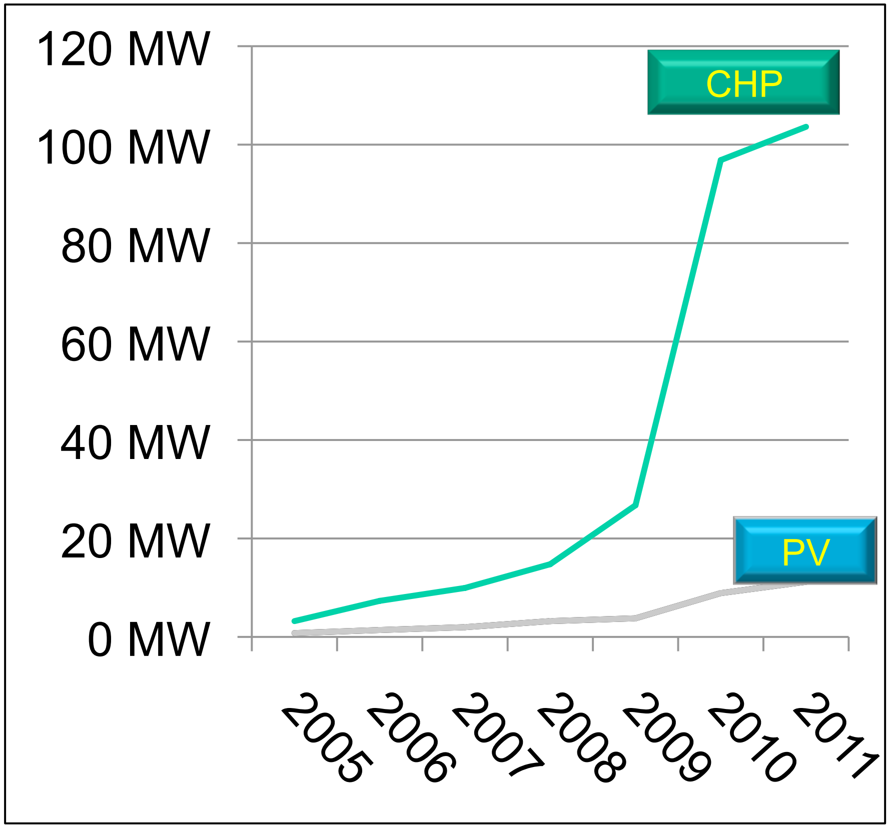
Distributed Generation Overview

Technology trends

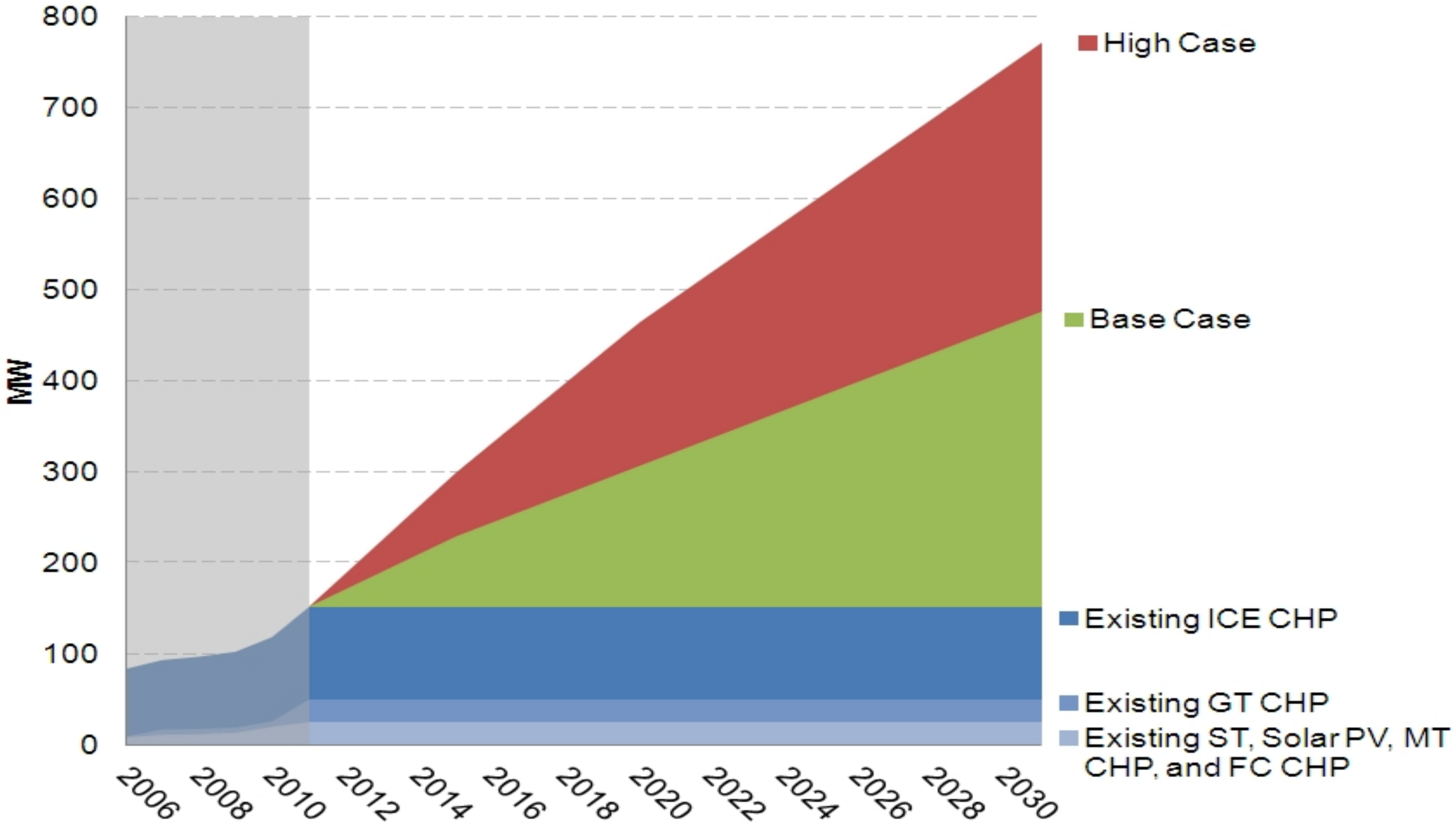
Total Customers by Technology



Total Installed Capacity



Long-range plan projections



Distributed Generation Overview

Technology overview

	Reciprocating Engines (NG)	Gas Turbines	Microturbines	Fuel Cells	Solar PV
Capacity	10kW - 5+ MW	500kW – 20MW	30kW – 250kW	5kW – 2MW	< kW-20 MW
Electrical Efficiency	69% – 78%	49% – 66%	47% – 59%	54% – 82%	20% – 45%
Capital Cost [$1000/kW]	1.2 – 2.3	1.5 – 5.5	2.6 – 3.15	5.6 – 10.0	6.0 –7.5
O&M Cost [$/MWh]	12 – 29	5 – 14	16 – 35	43 – 51	22 – 25
Nox [lb/MWh]*	0.05-2.17	0.07-2.4	0.06-0.54	0.02-0.06	--
CO2 [lb/MWh]**	1,145-1,359	1,024-1,877	1,377-1,736	773-1,440	--

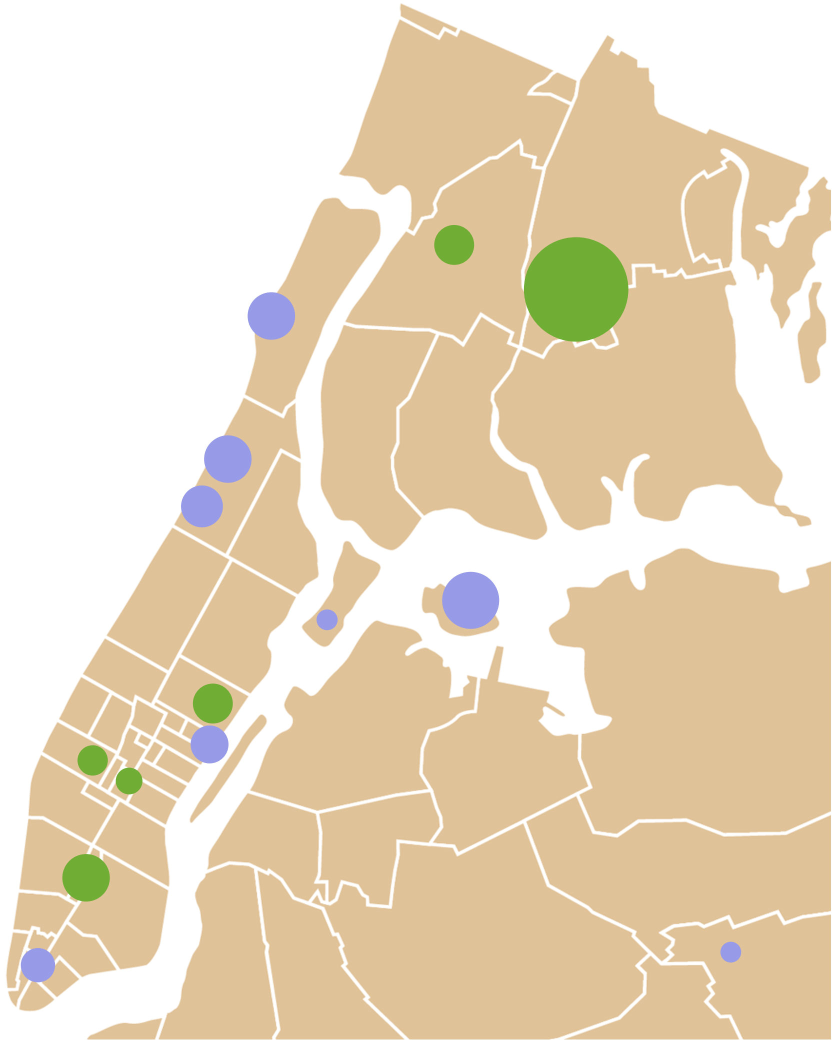
*New York State: 0.48. East River 1 and 2: 0.04-0.08. NYS 'Clean DG' Standard 1.6. California: 0.07
**New York State: 705. East River 1 and 2: 626.

Distributed Generation Overview

Current and expected large-scale CHP

Forecast CHP (2012 – 2018)

Existing large scale CHP



Factors affecting CHP adoption

Economic

- Large upfront cash
- Fuel price risk
- Payback period
- Incentives

Technical & Operational

- Retrofit difficulty
- Not core business
- O&M costs
- Commissioning
- Space constraints

Environmental

- LEED Scoring & Green Branding
- Uncertain environmental regulation

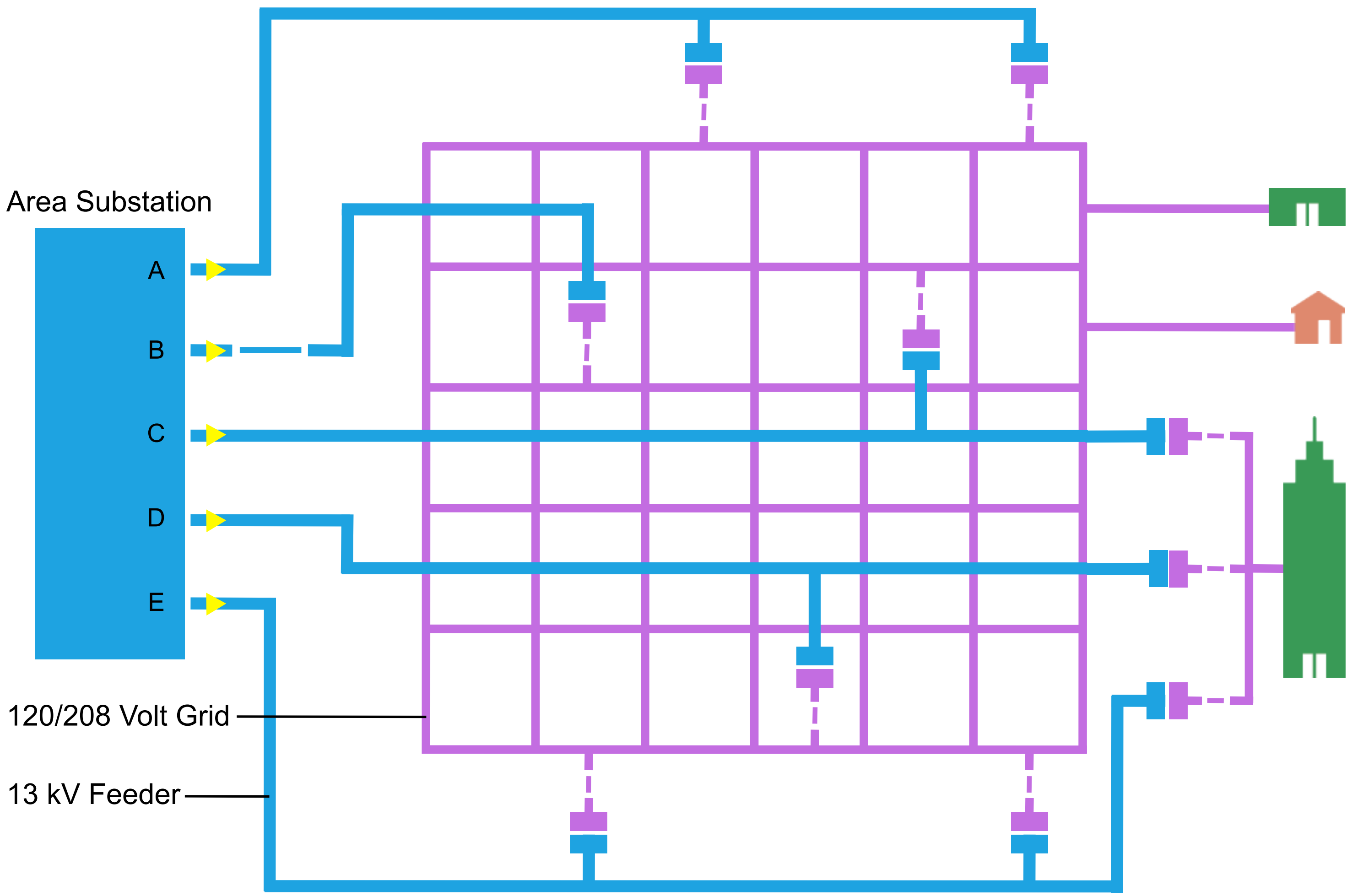
Potential impacts on our distribution system

- Increased fault duty on company circuit breakers
  – Customer side solutions available
- Impact on network protectors
  – Smart Grid Pilots
- Islanding
- Harmonic distortion contributions
- Voltage flicker

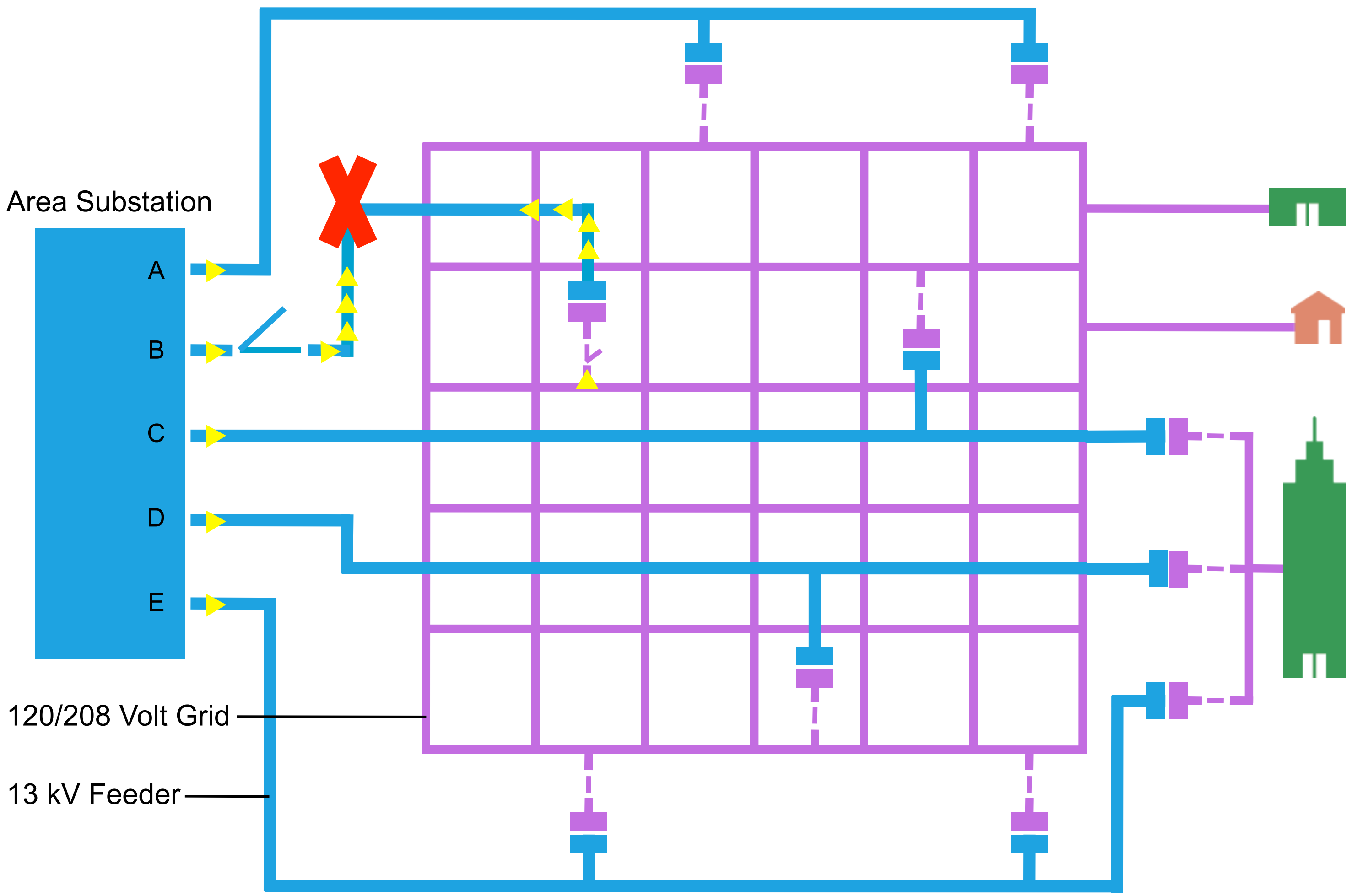
- Potential high gas main extension costs
- Customer-side high-pressure gas DoB/FDNY concerns

Distributed Generation Overview

Service considerations

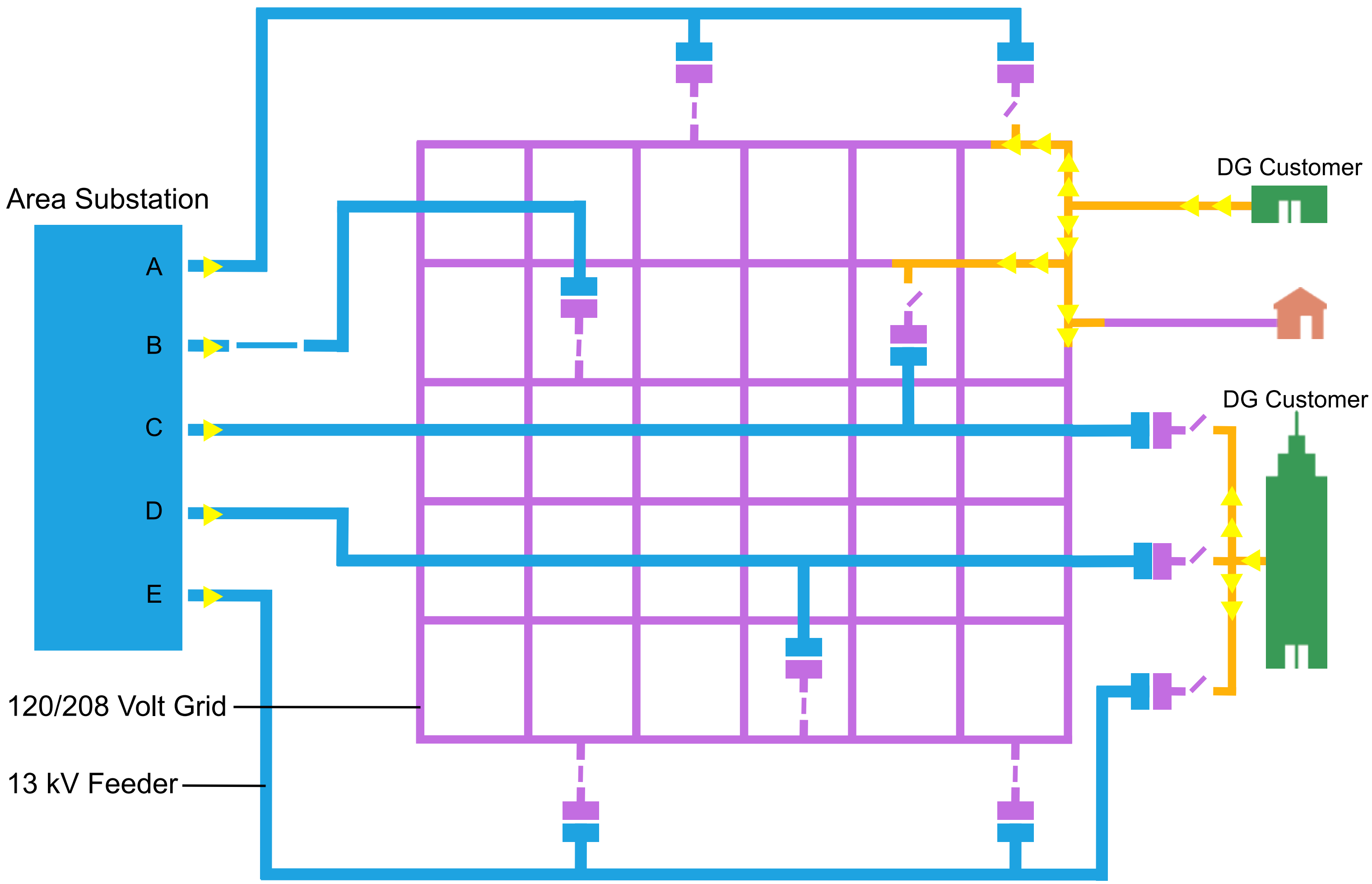


Purpose of network protectors

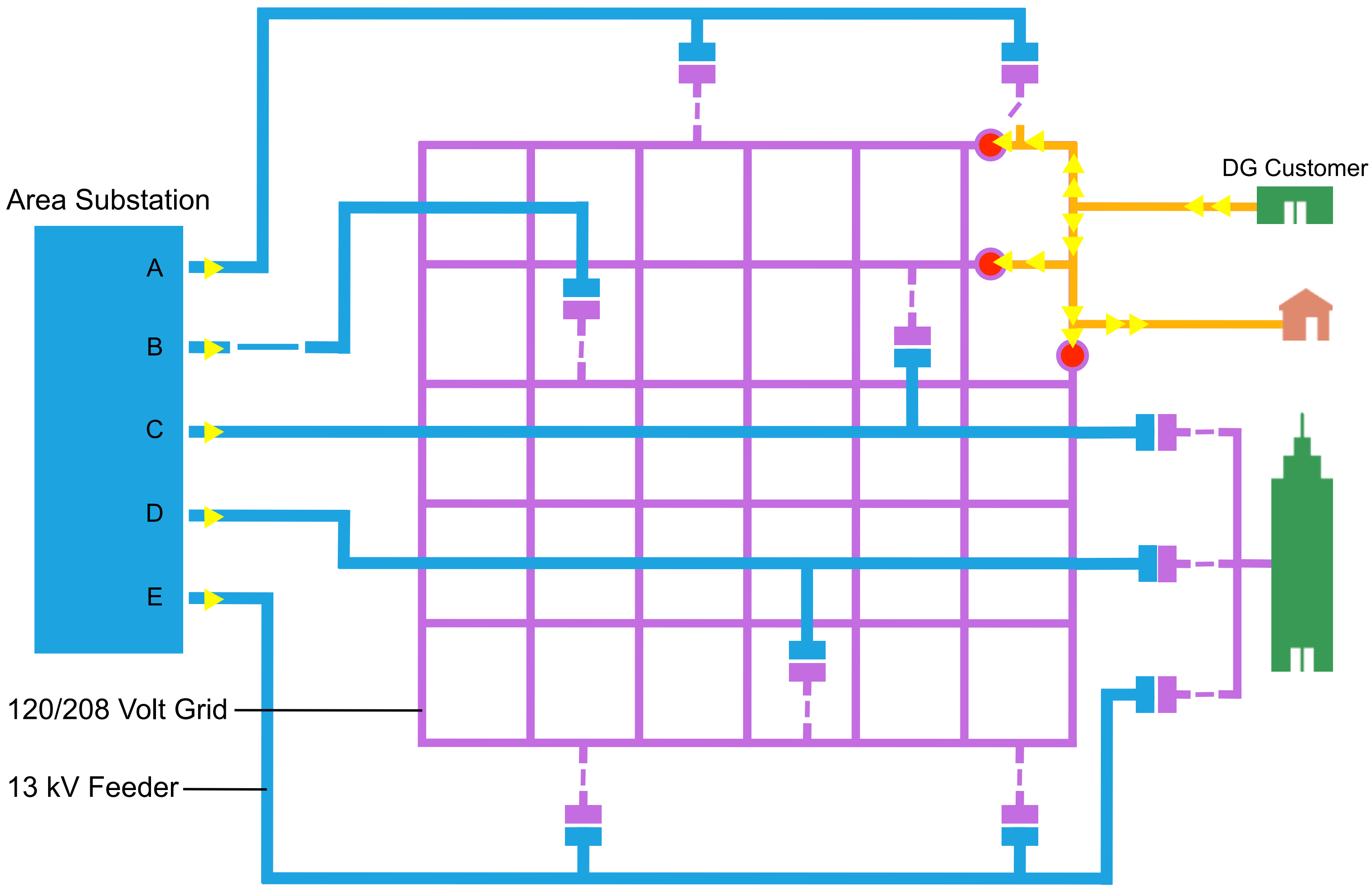


Distributed Generation Overview

Network protector considerations: *reliability*



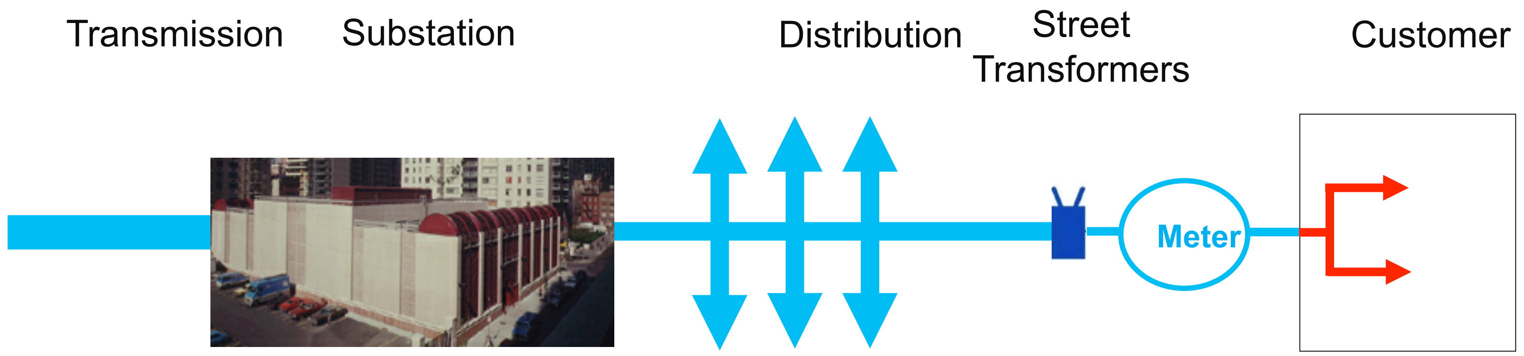
Network protector considerations: *islanding*



Interconnection process

- Interconnection application – electric, gas, or steam
- Design reviews
- Contract/agreements and engineering specifications
- Interconnection/installation
- Testing
- DG rates – Electric and Steam standby, Gas Delivery
  - Rider H Gas/Cross Commodity Support
- Incorporate into load forecasting and planning

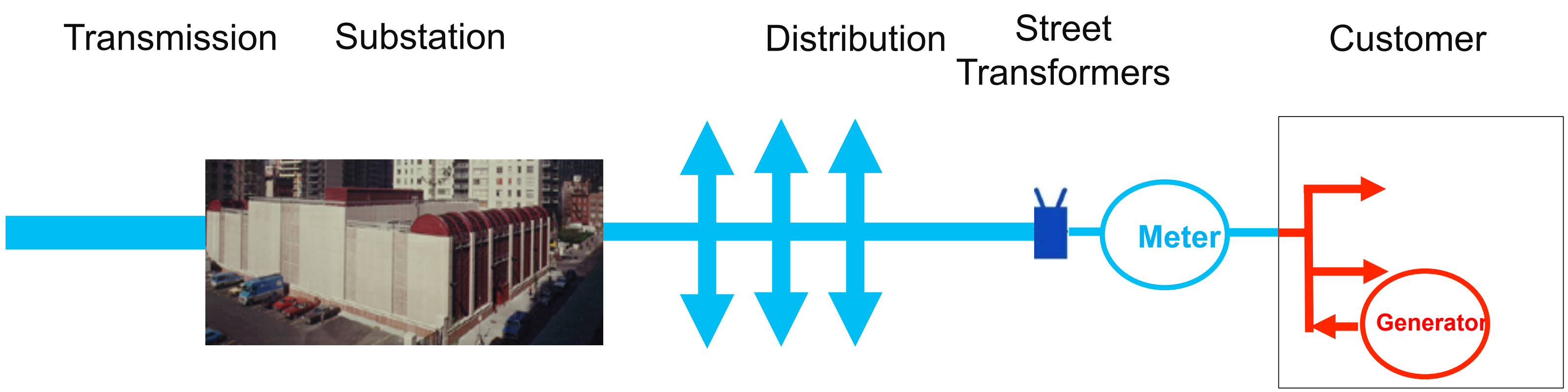
Rate Design Considerations



Standard non-DG Interconnection – costs recovered through kW and kWh charges

Recent Developments and Future Opportunities

Rate Design Considerations

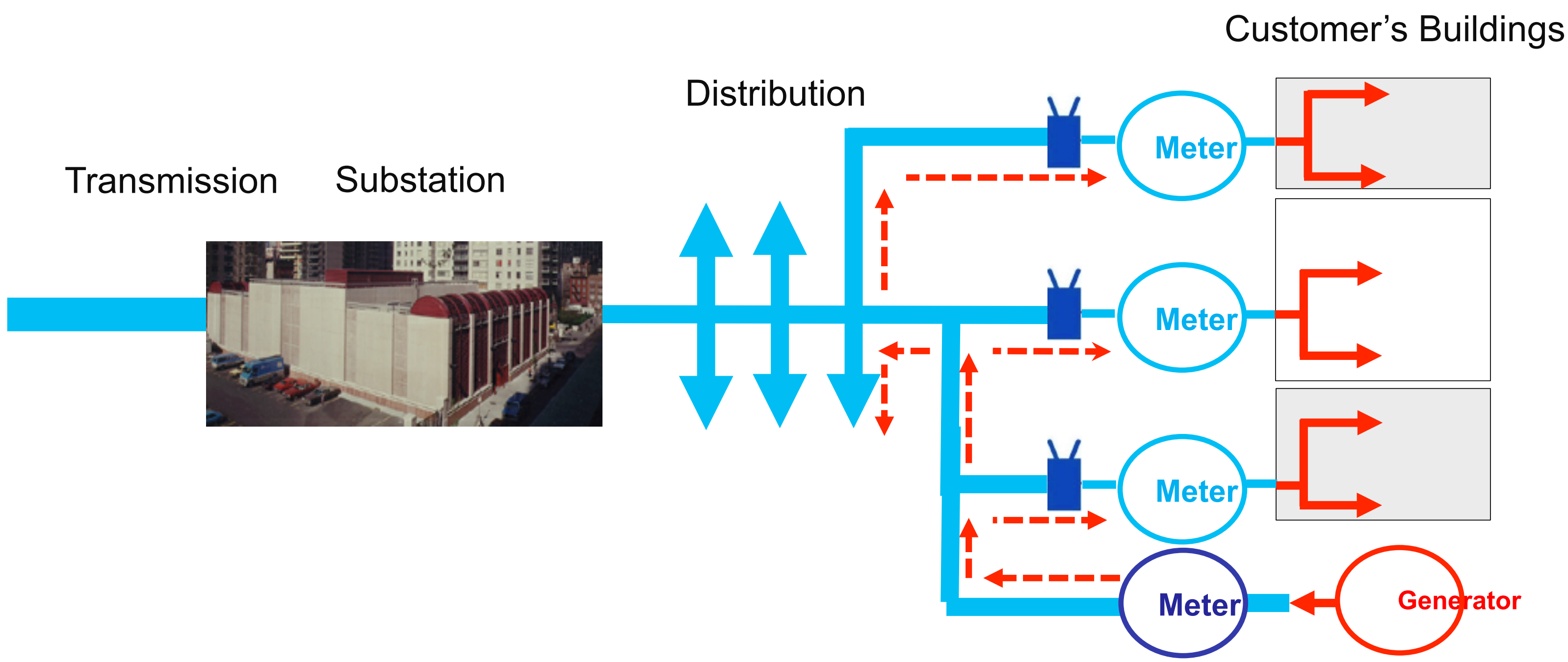


Standard DG Interconnection – costs recovered through kW charges

- Contract Demand and Daily As-Used Demand

Recent Developments and Future Opportunities

Rate Design Considerations



Offset (or Campus) DG Interconnection - Costs recovered through kW charges

- Contract Demand and Allocated Daily As-Used Demand

DG opportunities and challenges (utility perspective)

- Opportunities
  - Large potential load reductions
  - Target substation and distribution projects
  - Cross commodity impacts
  - Demand response and customer load control
- Challenges
  - Reliability, timing, and control of demand reductions
  - High penetration
  - Customer fit and economics
  - Environmental impacts

From energy consumers to energy partners

- Systems
  - Interconnection, demand-side markets, monitoring, modeling
- Technology
  - Communications
  - Industry standards
- Future: Customers active part of energy equations
  - Energy resources, control room systems, building management systems, remote dispatch

Recent Developments and Future Opportunities

Utility response to increased adoption

coned.com/dg

coned.com/es

Thank you!

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