SourceOne
A Veolia Energy Company

Managing the Utility Relationship

Strategic Approaches, Best Practices, and Tools for Microgrids

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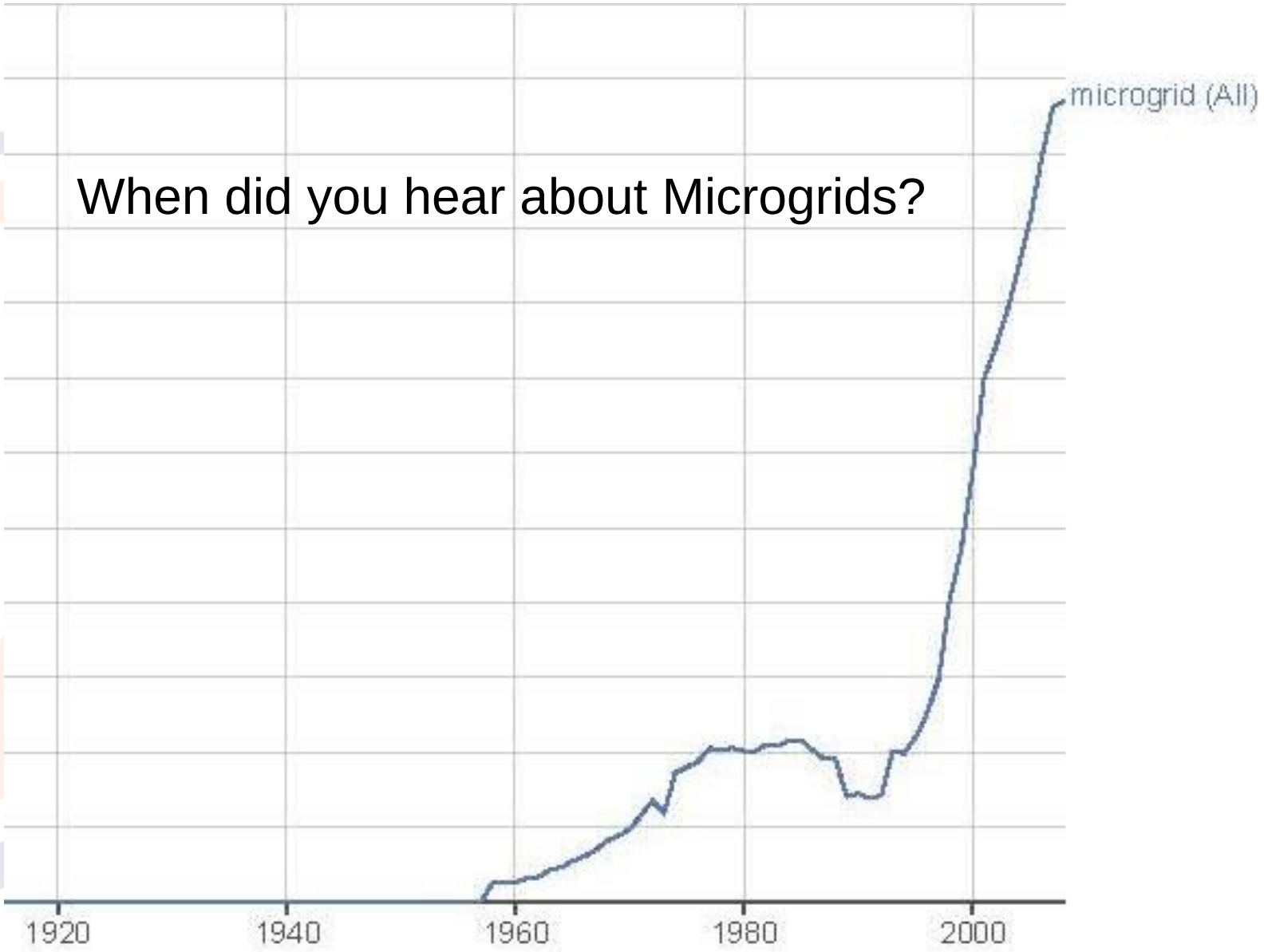
SourceOne is a leading energy management and consulting firm helping customers develop and deploy sustainable, resilient, economical energy solutions.

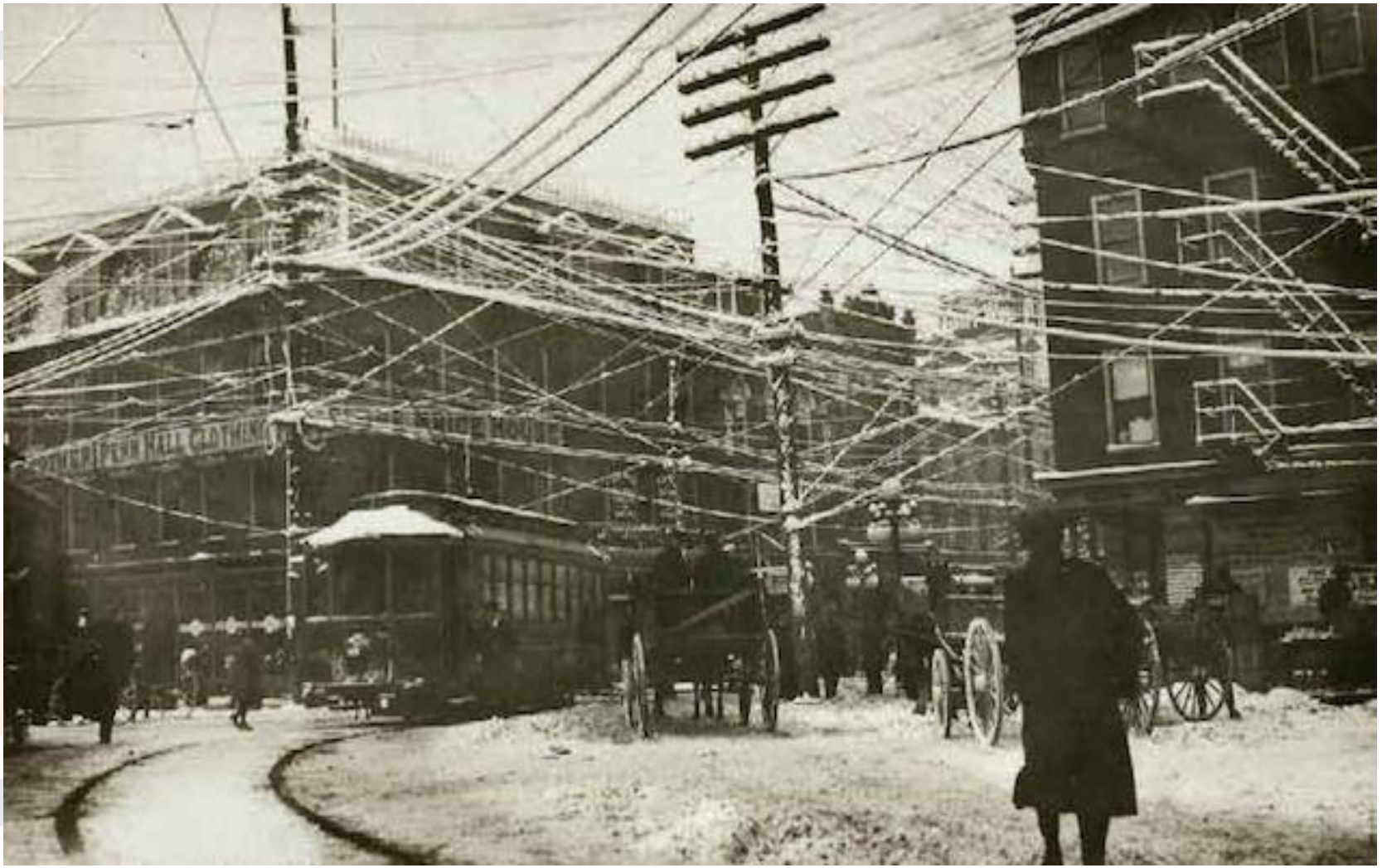
Agenda

- Terms
- Managing the Utility
- Back up tariffs
- The Interconnection Process
- Sample Projects
- What's Next?

When did you hear about Microgrids?



The Original Microgrid



Microgrid Defined

- "a small network of electricity users with a local source of supply that is usually attached to a centralized national grid but is able to function independently"
- Local Generation
- Usually connected to the grid
- Ability to island
- Ability to buy and sell power

Utility Terms

- **PURPA** - the Public Utility Regulatory Policies Act enacted November 9, 1978 compelled utilities to purchase energy produced by Qualified Facilities (QFs) if they were developed at cost equal or below what a utility would have to pay for a traditional power plant.

Back Up Tariffs

- Under PURPA utilities were required to take electricity from Qualified Facilities and to provide Back Up and Supplemental Power.
- ***They were not required to do it economically for the cogen.***
- ***Terms:***
  - ***Contract Demand***
  - ***Supplemental Power***
  - ***Maintenance Power***

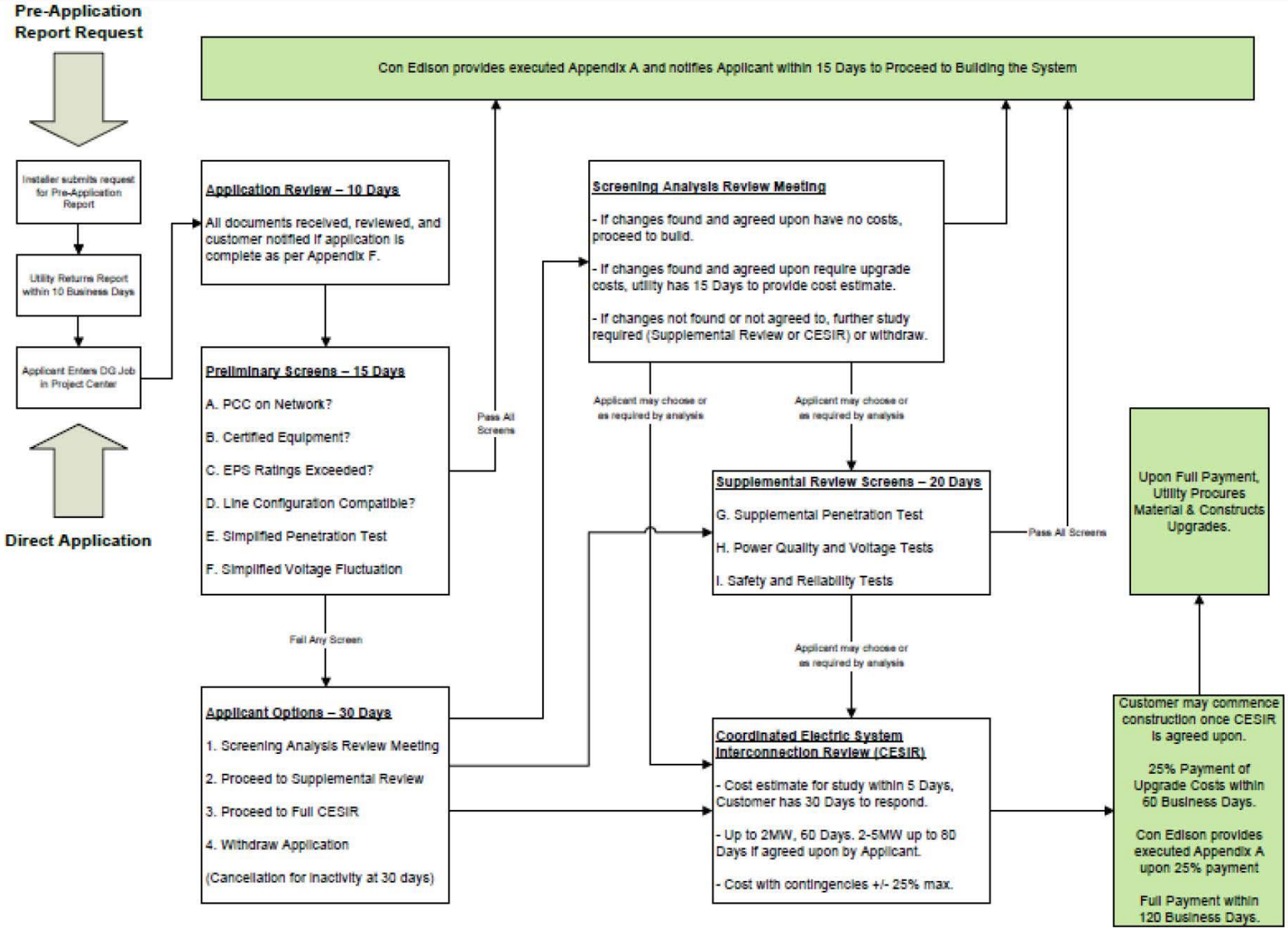
Wholesale vs. Retail Terms

- Retail
  - Behind the Meter
  - Net Metering
  - Standardized Interconnection Requirements (SIR)
- Wholesale
  - Transmission Level
  - LBMP

Dealing with Utilities

- Know the rules – Every state and utility has different rules
- Be Respectful
  - Understand the process
  - Don't waste peoples time
  - Don't threaten
- Know what can be negotiated

January 2017 NYS SIR - Simplified Process Flow Chart for 50kw – 5MW



How Much Does This Cost?

Between zero and a boatload!

Import Only:

- Minor fees
- Some relaying and metering

How Much Does This Cost?

Export and Import:

- Application fees
- System Impact Study
- Hardware including:
  - Direct Transfer Trip
  - RTU & SCADA
  - Substation improvements
  - New or upgraded feeders

Payment Info:

- Revenue Recovery Test
- Advance for Construction
- CIAC – Contribution in Aid of Construction (+approx. 25%)

Case Studies

- Easy – Cooper Union
- Custom – NYU
- Hard – Bank of America Tower

Cooper Union – "Easy"

Foundation Building

New Engineering Building

Cooper Union – "Easy"

Solutions

- Install Small Recip Plants in each building
- Natural gas fired
- Behind the meter
- Con Edison SIR
- Standard Backup Tariff

450 kW Recip Engine

NYU Downtown – "Custom"

NYU Downtown – "Custom"

Original Co-generation Operation

- 30 year old equipment (was good at the time)
- 700-900 kW Caterpillar Engines and (1) 2400 kW steam turbine operating as an island
- Operating on diesel fuel
- Has performed very well, needs upgrading – capital infusion
- Plant will need modifications to meet regularly updated environmental standards

- Supplies electricity to 7 University buildings and HTHW to 40 buildings, chilled water to 30

NYU Downtown – "Custom"

CHP Plant Options

Base Case

- Re-power existing CHP plant, new plant will be more efficient, reliable and able to serve more buildings

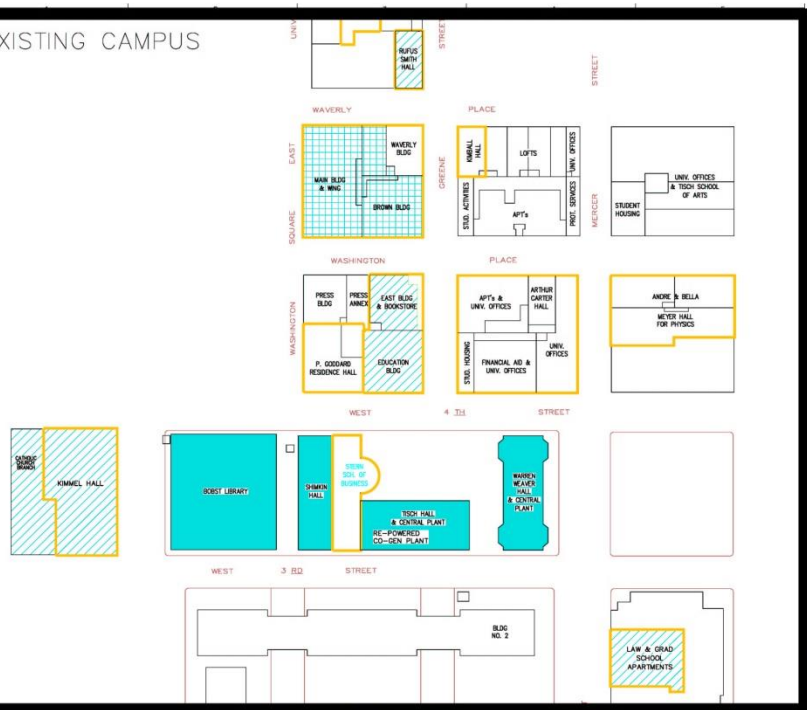
Abandon Generation Plant

- Revert to Con Edison for all electric supply
- Rebuild boiler plant

Expand CHP Plant

- Build vault on Mercer Street
- Install (2) 5500 kW gas turbines with heat recovery
- Connect an additional 22 buildings to existing NYU electrical distribution system

EXISTING CAMPUS



RE-POWERED CO-GEN PLANT

EXPANDED CO-GEN PLANT

SourceOne
Power Technologies
110 WALL STREET, NEW YORK, NEW YORK 10005
Telephone: (212) 612-7600 Fax: (212) 612-7601

LEGEND

- HTHW ZONES
- CHILLED WATER SYSTEM
- CO-GEN
- CO-GEN LIFE SAFETY BACKUP
- CW — CHILLED WATER
- HW — HOT WATER
- (2) — NUMBER OF ACCOUNTS
- 1000 — PEAK KW RATING
- 100 (NYPA) — ADDITIONAL PEAK KW RATING
- SES PROPOSED
- 75.00 — 24 MONTH AVERAGE MONTHLY LOAD FACTOR (%)
- COGEN SUPPLY
- BACKUP OR LIFE SAFETY
- SEASONAL COGEN POWER
- PROPOSED ADDITIONAL COGEN POWER

COGEN REDEVELOPMENT

WASHINGTON SQUARE PARK CAMPUS
NEW YORK, NEW YORK

NOT FOR CONSTRUCTION

DRAWING REVISION STATUS

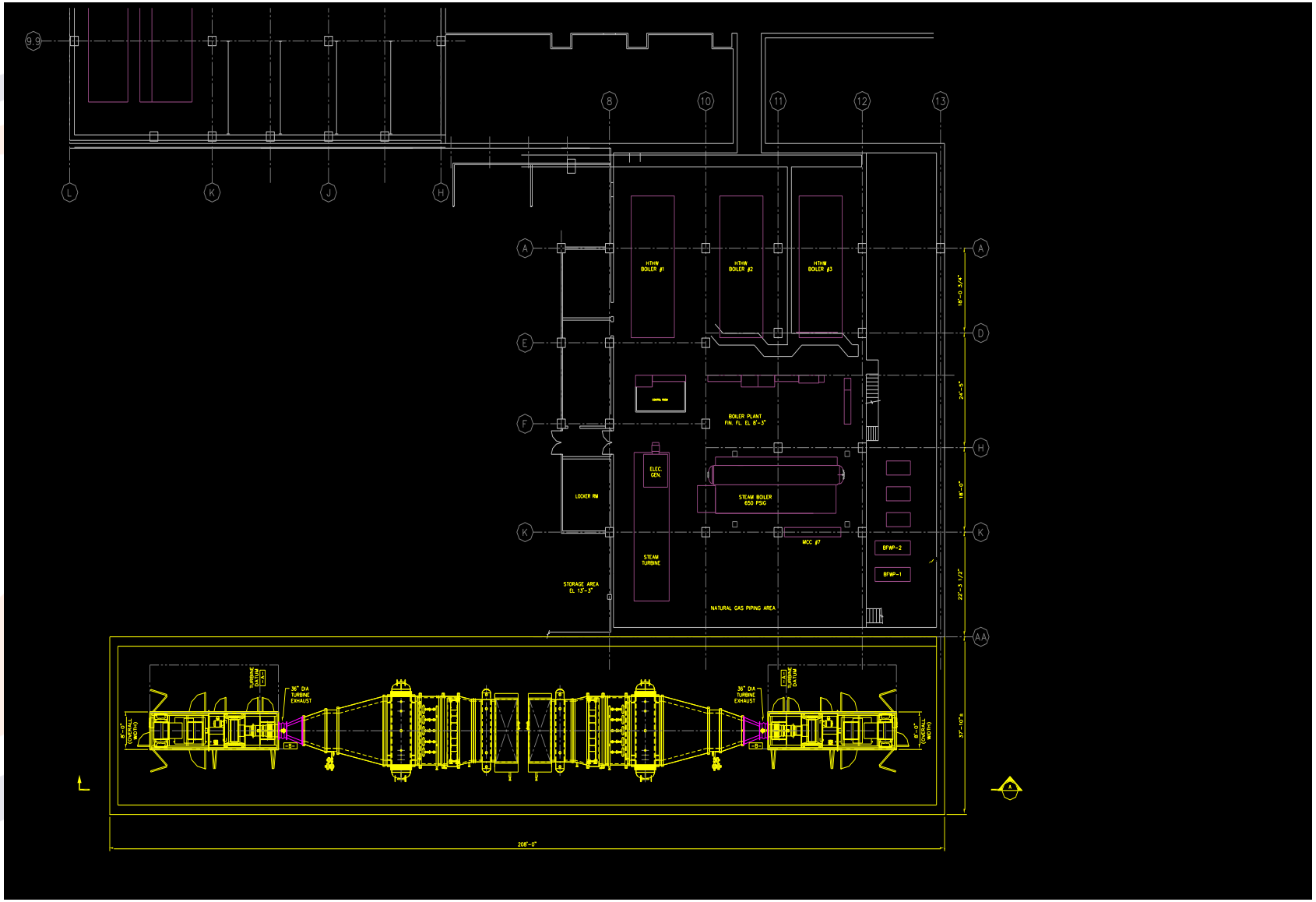
NO.	DATE	DESCRIPTION

PROJECT NUMBER:	00-000
CADD FILE NAME:	
BREF FILE:	
DATE:	August 2005
DRAWING SCALE:	AS SHOWN
DRAWN BY:	--
CHECKED BY:	--
APPROVED BY:	--

SHEET TITLE:

DRAWING NUMBER:

Two 5.5 MW Gas Turbines in Vault



Existing lot adjacent to boiler plant

NEW YORK UNIVERSITY

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Construction of new cogen vault

NEW YORK UNIVERSITY

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NYU Downtown – "Custom"

Main Utility Interconnection

- 15 kV direct feed to Con Ed Substation
  - Import and export on High Tension tariff
  - Buy back at LBMP (Wholesale)
  - Supply at Standard Back Up tariff
    - Contract Demand
    - As Used Daily Demand
    - Energy charges
    - 12.5% Annual Maintenance charge

NYU Downtown – "Custom"

22 Individual 208 V Services

- NYU maintains existing LV feeds to buildings
- NYU also connects them to the 5 KV cogen network – uses existing "revocable consent" to cross city streets
- Con Ed puts them on standard backup service
- NYU pays ***TWICE*** for these 22 buildings

Bank of America Tower – “Hard”

Bank of America Tower – "Hard"

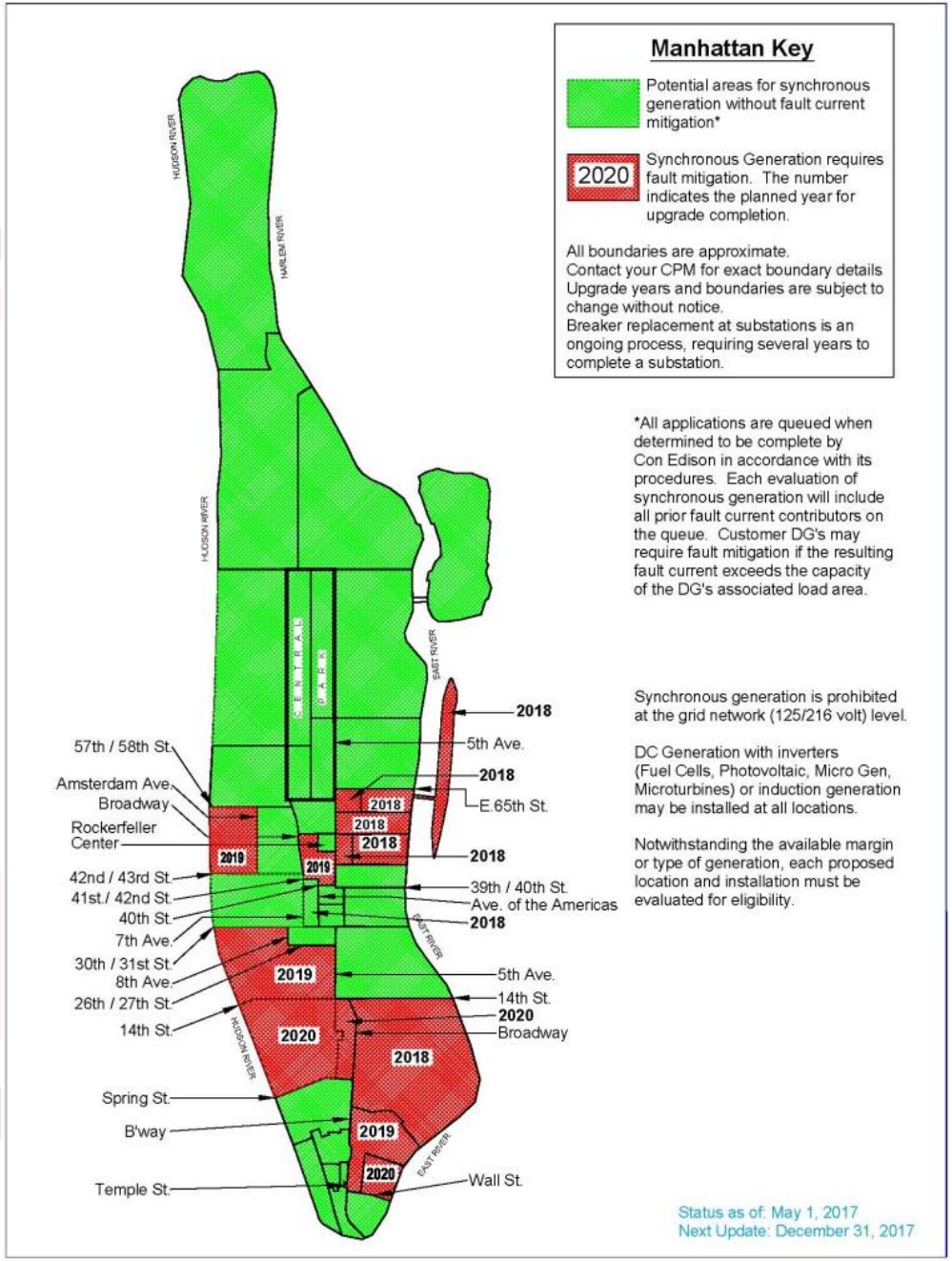
Developed by the Durst Organization

- Challenges of installing a CHP in a high rise building
- 2 Million ft2
- 11 Utility interconnections
- Fault current issues at Con Ed sub-station
- Space is at a premium
- Fire Department issues

Bank of America Tower – "Hard"

11 Network Interconnections

- Very expensive to interconnect behind the meter on all 11 feeds
  - AC/DC/AC load control not practical
- Con Ed offers to do a High Voltage Interconnect for export and a low voltage feed for supply
  - Sell at wholesale – buy at retail. Kills project
  - Durst appeals to PSC. Con Ed develops special tariff to allow netting out CHP export meter



Con Ed Substations with Fault Current Limitations

Bank of America Tower – "Hard"

Fault Current

- Overloaded sub-stations must be able to disconnect in 1 ½ Cycles
- Solutions include AC/DC/AC load control and Fast fuses – both expensive
- Durst designs fast fuse solution while appealing to Con Ed
- Con Ed finds neighboring substation to connect to

Lessons Learned

- Political influence can be used at the appropriate time
- Most issues are solvable – understand what you are asking for and propose a solution
- Don't throw the lower level guys under the bus – they are doing what they are supposed to and usually want to help

What's Next?

- Storage – Is Tesla a car company or a battery company?
- Understand all the value streams of a DG or storage solution
- PURPA re-purposed