

Cogeneration A Win-Win Solution

New York-Presbyterian Hospital

Weill Cornell Medical Center



Background



NYP-Columbia University Medical Center

- 2,400 Beds
- 5 Major Campuses
- 33 Buildings
- 8.6 Million SF
- Top 2% Energy User
- 200 million kWh
- 2.5 million MMBTUs fuel
- Peak Demand 42 MW

Weill Cornell Medical Center

NewYork-Presbyterian
Weill Cornell Medical Center

nyszerda
Energy. Innovation. Solutions.

- Upper East Side NYC
- 12,000 tons hybrid plant
- 570,000 PPH Steam
- Peak Demand 14 MW
- 7.5 MW Gas Turbine Gen
- HRSG
 - 40,000 PPH unfired
 - 70,000 PPH fired



1932



No. 229. Aerial View of New York Hospital.

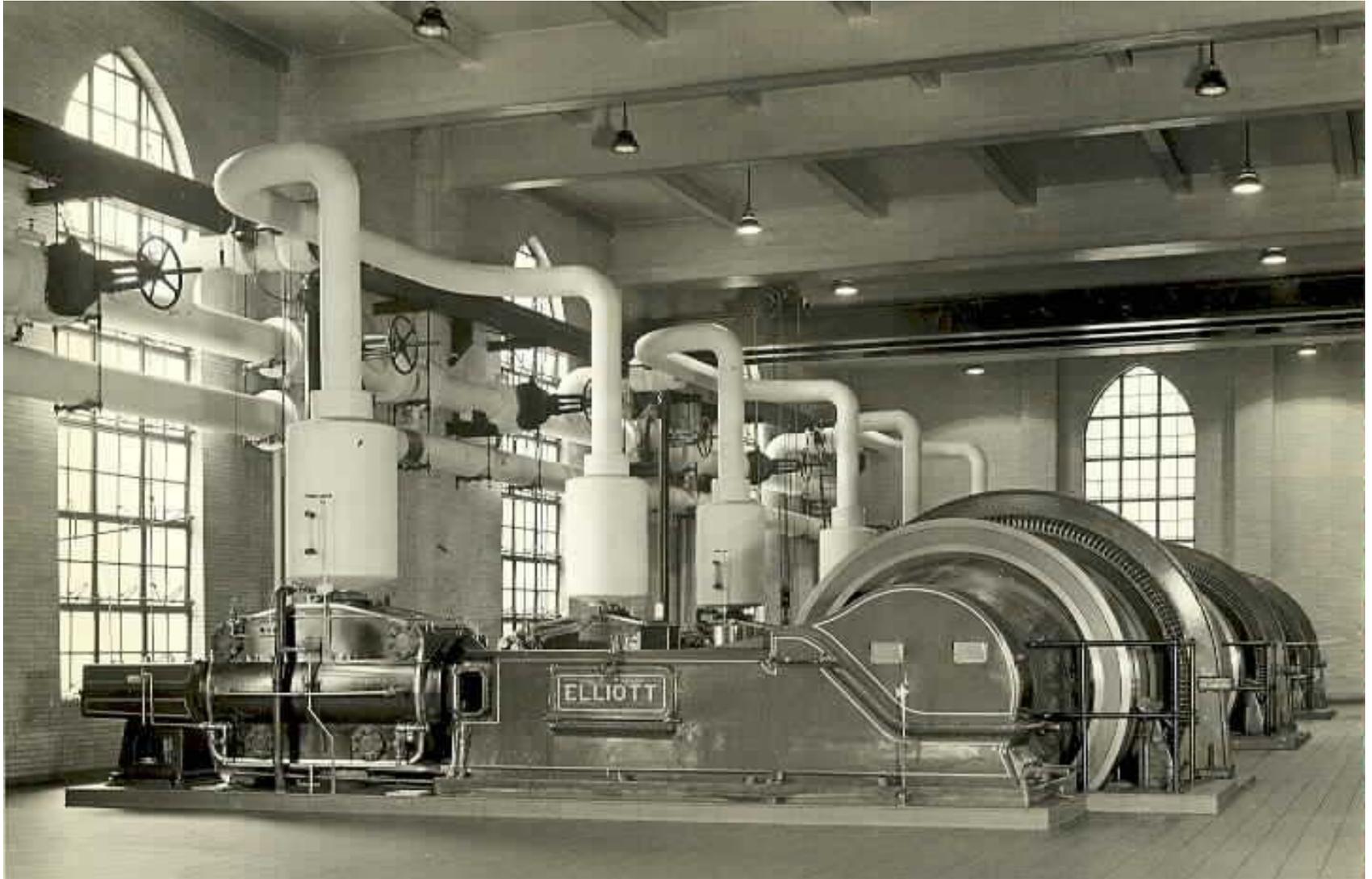
ARNOLD AND KELLOGG



Dynamo
Room

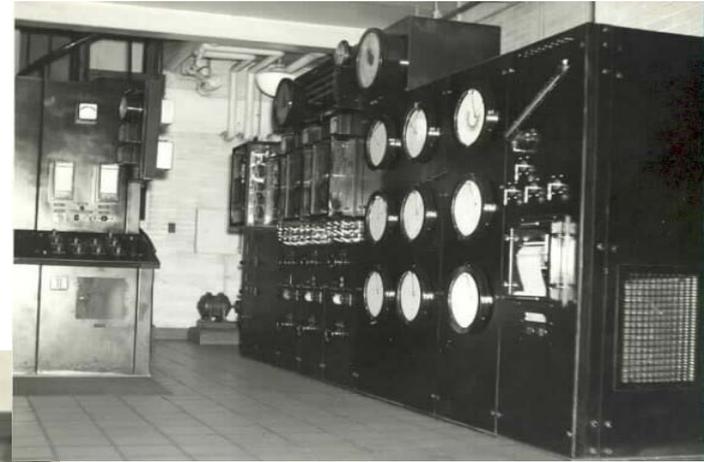
Boiler
Plant

Dynamo Room 1932



Courtesy of the Medical Center Archives of NewYork-Presbyterian Hospital / Weill Cornell Medical Center

Operations 1932



1932 Statistics

Output

Cost

Steam	519,272,300	0.29434 per M lbs
Electricity	8,102,810 KW-hrs	0.010711 per KW-hr
Refrigeration	36,334 tons	0.81964 per ton
Ice	34,821 cakes	0.582

Low Pressure steam for Heating / Hot-Water 171,672,251 lbs.

Energy Cost Trends

	1932	2011
Steam Output (lbs)	519,272,300	871,033,746
Steam Cost/Mlb	\$ 0.29	\$25.25
Electricity Imported CHP Produced (kWh)	8,102,810	63,192,600 51,778,352
Cost/KWh	\$ 0.01	\$ 0.1812

Energy Management at NYP Hospital

- Competitive Energy Purchasing
 - Lock in fuel & electricity futures
 - Hedging strategies
 - Natural gas & fuel oil switching

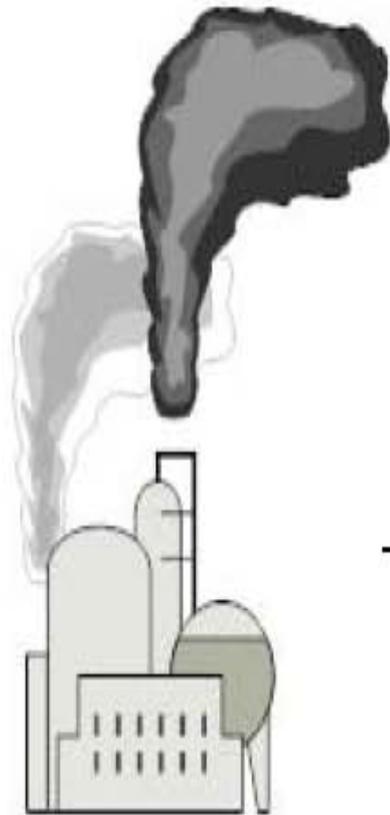
 - Economic Development Incentives
 - EPA Energy Star “Partner of the Year” for an unprecedented seven years
 - Host of the Department of Energy SmartHospitals Training Seminar
 - NYSERDA Grants
 - PlaNYC Mayor’s Challenge Participant
 - Reduced greenhouse gas emissions by 50%

 - Demand Response Programs

 - Equipment Upgrades, Asset Management

 - **COGENERATION**
 - Single greatest opportunity to reduce utility costs at Weill Cornell Campus
-

BEFORE COGENERATION



UTILITY POWER PLANT
35% EFFICIENCY

7.5 MW - 13.0 MW

FULL DEPENDENCE ON
UTILITY (CON EDISON)



WEILL CORNELL MEDICAL CENTER

Cogeneration Case Study NYP/Weill Cornell

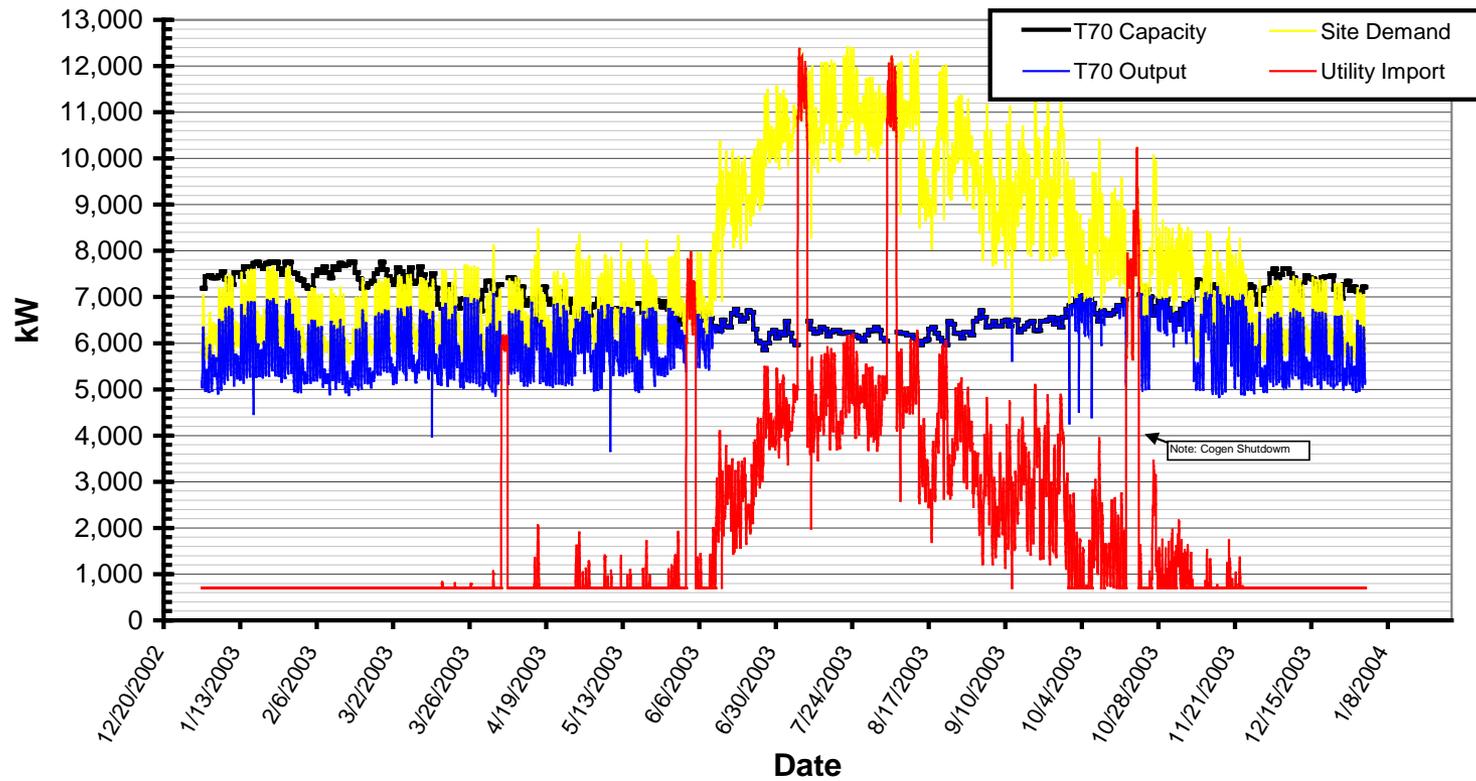


- Largest size to fit into existing boiler plant
- Gas turbine drive
- 7,500 kW electric generator (>1/2 of peak demand)
- Heat recovery boiler with duct firing (1/3 of steam requirement)
- First gas turbine in hospital based plant in Manhattan!

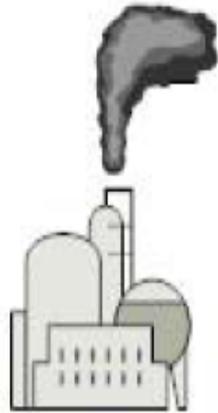
By purchasing 10% more fuel, NYP avoids purchasing 80% of their electrical needs.

Hourly Energy Profiles

**NYPH Downtown CHP System Simulation - Annual Taurus 70 Electric
Production and Total Site Demand by Hour
2003 Load With Additional 200,000 sq ft Expansion Projected Use (1200 kW
peak)**



WITH COGENERATION



UTILITY POWER PLANT
35% EFFICIENCY

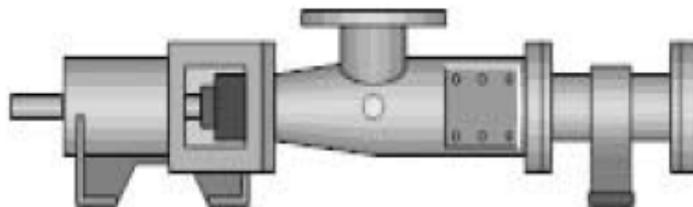
REDUCED DEPENDENCE
ON UTILITY (CON EDISON)

0-5.5 MW



WEILL CORNELL MEDICAL CENTER

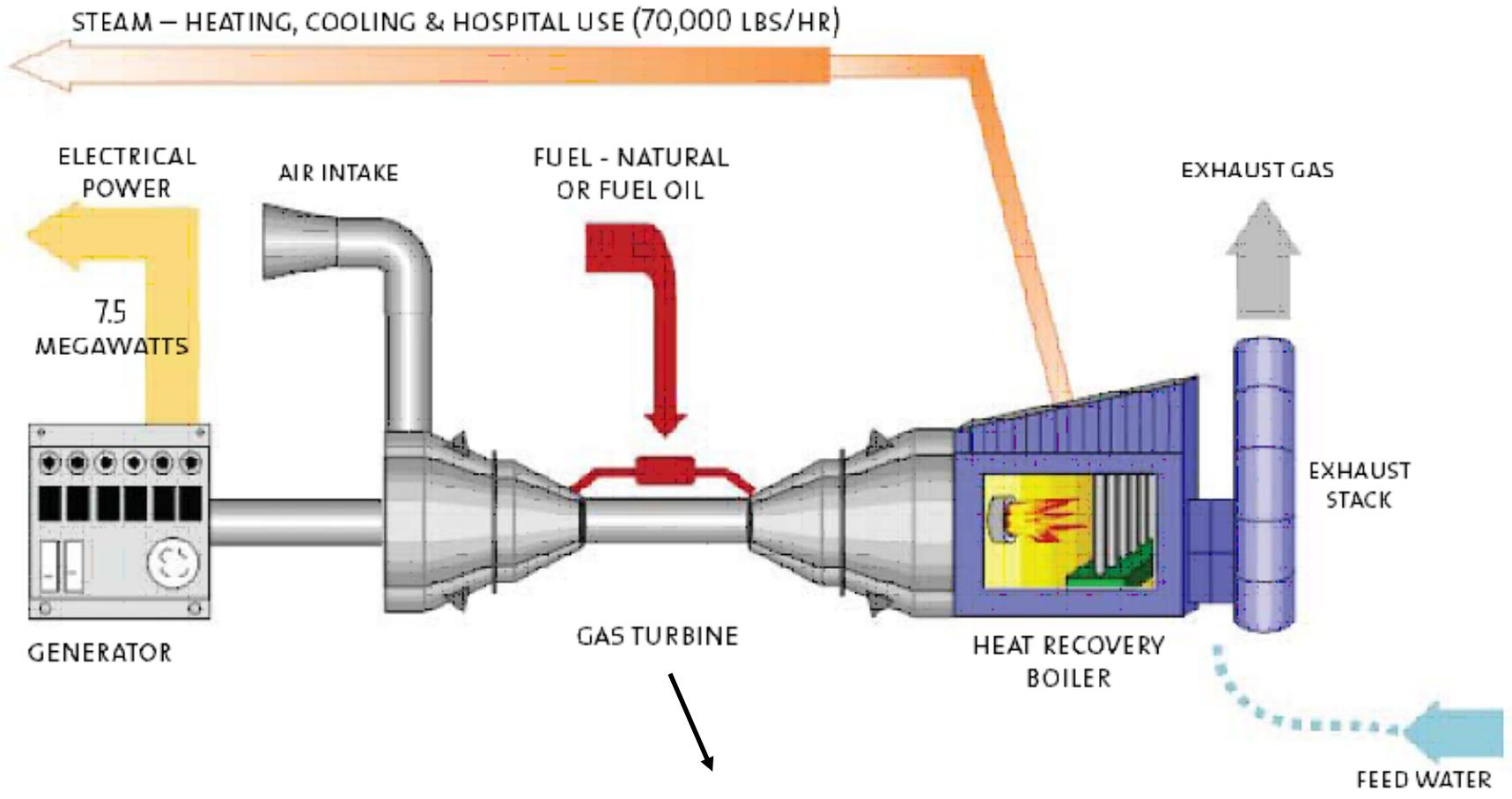
7.5 MW



COGENERATION
ELECTRICAL
OUTPUT

COGENERATION
85% EFFICIENCY

- Reduced Dependence on Utility Grid
- Increased Use of "Clean" Power
- Reduced Carbon Footprint



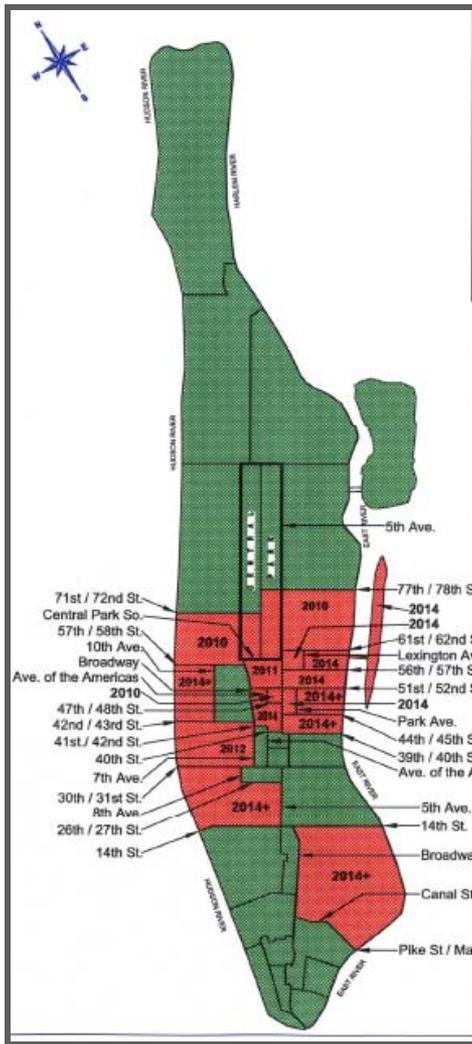
COGENERATION SYSTEM DIAGRAM

Bumpy Road Ahead...



The bumps in the road just make the ride more fun!!!

Con Edison Areas of Connection



- Green area indicates availability for synchronous parallel generation without fault current mitigation
- Red indicates the need for fault current mitigation
- Substations near maximum fault duty
- Dates within Red Zones indicate year of planned network upgrade
- All applications for interconnection are evaluated individually

Con Edison/NYSERDA Solution



- Installed CCL
- Protect Con Ed from fault currents
- Avoided \$380 to \$1,000 per kW in substation upgrades
- \$29 per kW actual cost
- 83 to 91 μ sec reaction time

Con Edison Tariffs: Rate SC14 RA

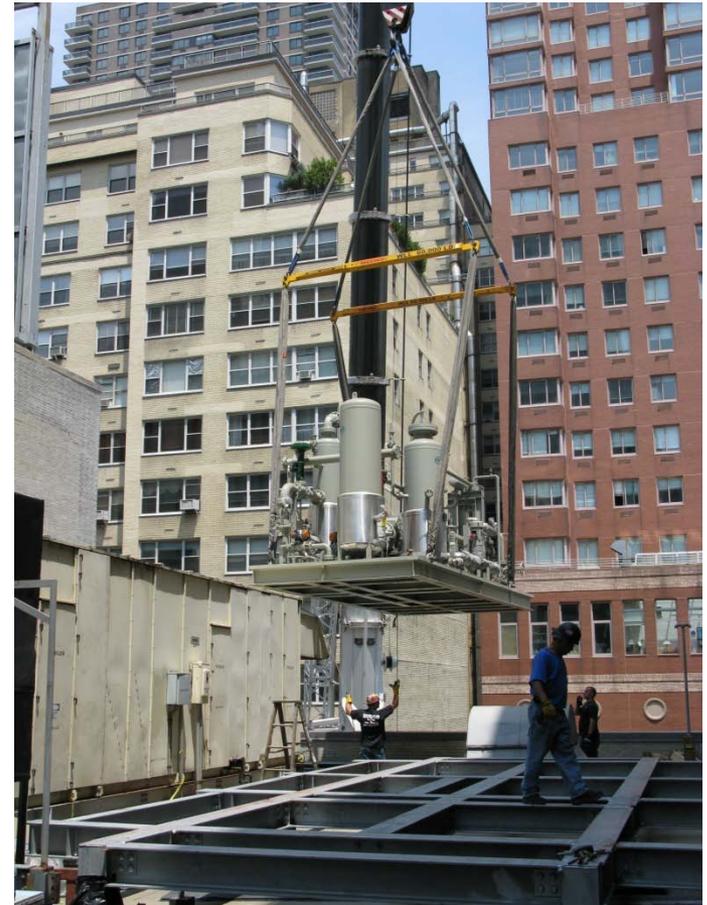
The rules for customers that use DG strictly to support some or all of their own load, and do not sell any to the utility. This service is called “Standby” because the utility must be prepared to support all of the customer’s load in the event that the DG is not available

- ❑ Interconnection Charge
- ❑ Standby Fee (Contract Demand)
- ❑ As-Used Energy (per KWh)
- ❑ As-Used Demand (per KW)

A rate substantially more “Friendly” to onsite cogeneration than in past years; This rate was designed to help to promote additional clean cogeneration within the five boroughs and is in alignment with the Sustainability goals of the Company

Other Agencies...

- **Fire Department of New York (FDNY)**
 - Fire Protection
 - Egress/ Life Safety
 - Process Hazard Issues
- **NYC Department of Buildings (DOB)**
 - Structural
 - Field Inspections
- **Department of Health (DOH)**
 - Approval Process
- **Department of Transportation (DOT)**
 - Traffic Patterns
- **Local Community Board**
- **NYSDEC**
 - Title V Permit



Anticipation avoids schedule delays and additional construction costs!

71st Street Traffic

- *The New York Times* Top 10 “Busiest Streets” in NYC
- Coordinated crane activities with local community board



Benefits to NYP Hospital

- Savings - Reduced electricity cost
 - **By purchasing 10% more fuel, NYP purchases 80% less electricity**
 - **Lower line losses (generation close to load)**
- Enhanced Power Reliability
 - **Provides 100% redundant source of power for Inpatient areas**
 - **Supply 100% of base & 2/3 peak electric load**
- Enhanced Steam Reliability - Adds Capacity
 - **Added 23% firm steam capacity**
- Reduced Financial Risk
 - **Lower exposure to utility cost volatility**
- Positive Environmental Impact
 - **Reduce carbon dioxide emissions by 27,000 tons annually**

Cogeneration Project Economics

Total Project Cost*	\$30.6 Million
Average Annual Savings	\$6.92 Million
NPV	\$42.9 Million
Simple Payback	4.79 years
Plant Commissioned	June 2009

***Based on a NYSERDA
\$1.1 million grant**

Risks of Cogeneration

- The major risk factors requiring consideration in the evaluation process include initial design and construction cost overruns (risk of IRR) and plant availability and performance

- The potential for divergence between fuel and electric rates is also a risk
 - Savings are lower if fuel costs increase and electric rates decrease

Cogeneration Plant today...

- 98% availability
- Two scheduled outages annually
- Simple payback 4.8 years!
- Fuel market price, payback 3-4 years!

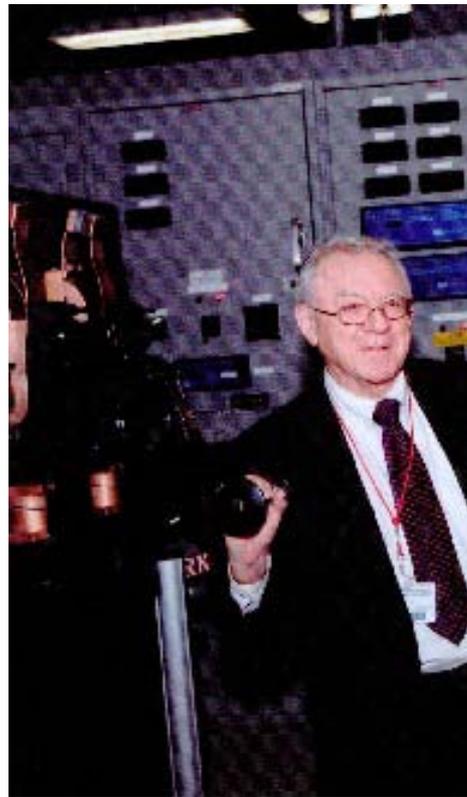


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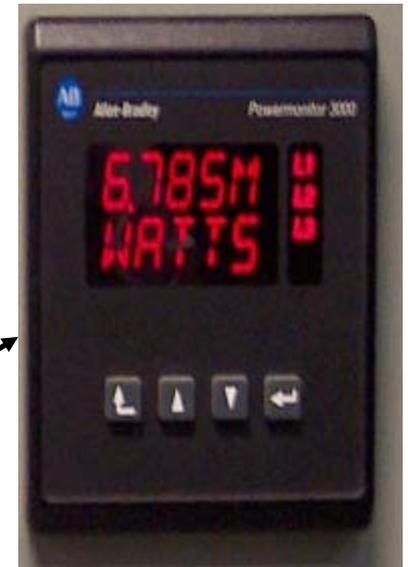
1971

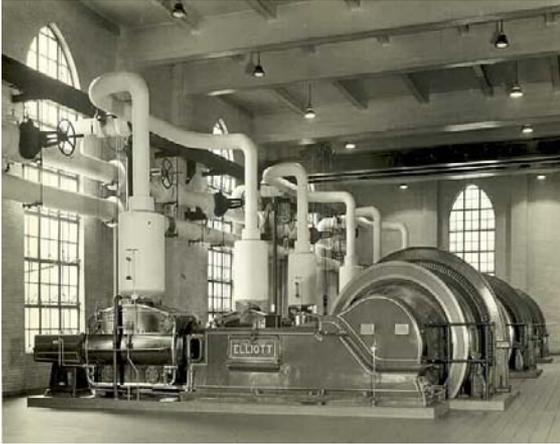
Dynamo Plant
Decommissioning
Ceremony



2009

Cogeneration
Plant Grand
Opening





Courtesy of the Medical Center
Archives of NewYork-Presbyterian
Hospital / Weill Cornell Medical Center

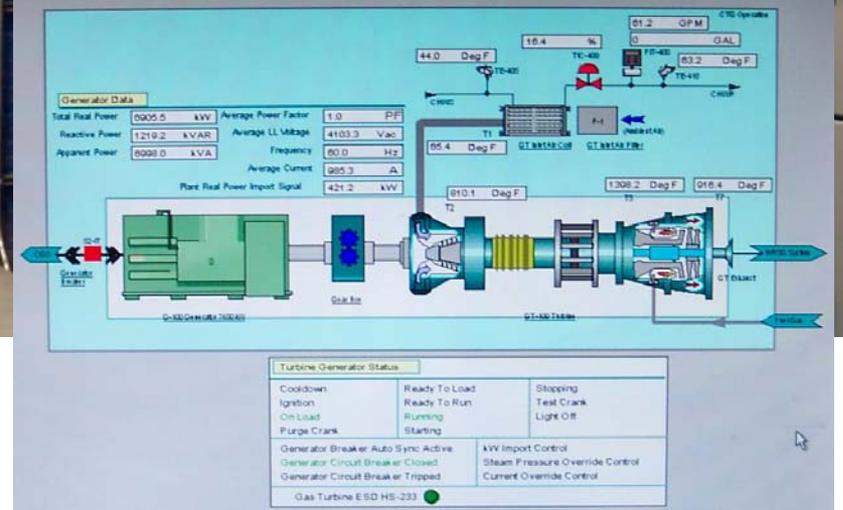


Dynamo Room

2009



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Operations 2009

NYP *green*
BE THE DIFFERENCE

nyszerda
Energy. Innovation. Solutions.