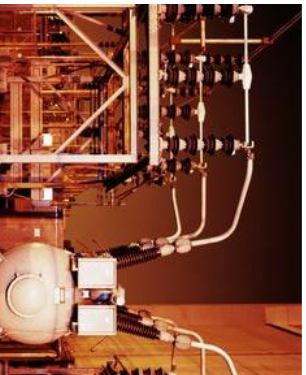


Vulnerability of New York City Energy Infrastructure



Dusk - 14 August 2003

A REPORT BY:



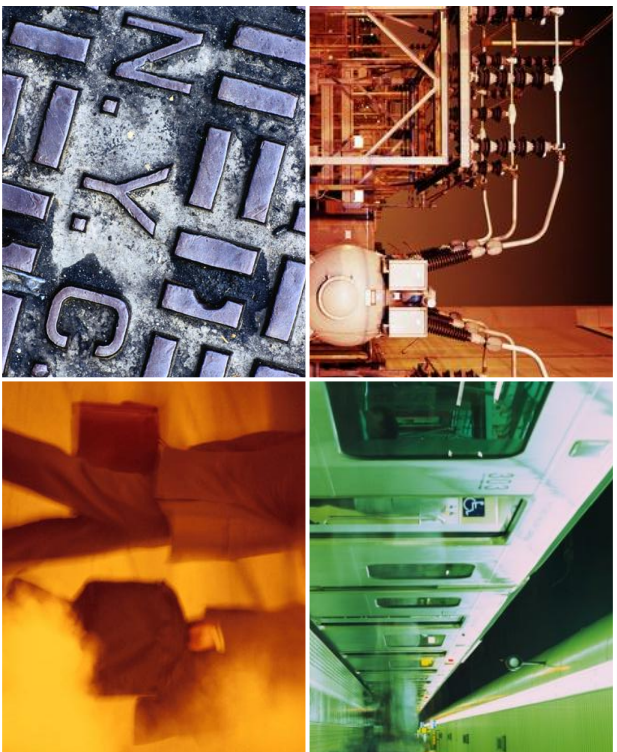
PRESENTED TO THE DEFENSE SCIENCE BOARD BY:

Adam Victor

TransGas Energy, LLC
Washington, DC
23 October 2006

PROPRIETARY DOCUMENT – INTERNAL USE ONLY

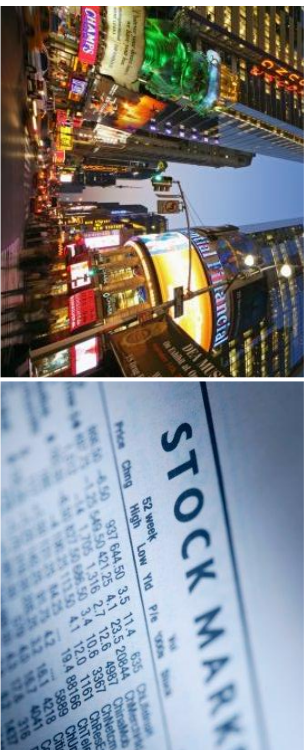




What's Being Covered

- The Vulnerability of Energy and Transportation Infrastructure in New York City
- Proposing Real Alternatives to Mitigate Risks
- TGE and the Synfuel Solution
- Fixing Energy in New York City - A Call to Action





Understanding Risks

New York City is America's:

- FINANCIAL CAPITAL - 44 Fortune 500 companies worth \$1.18 trillion
- MEDIA CAPITAL - 200 newspapers and 350 consumer magazines have offices plus record companies, TV stations, radio, etc.
- CULTURAL CAPITAL - 114 museums alone, with treasures worth...?
- LARGEST CITY - 8.2 million people in NYC and 18.7 million in the NY metro area





Historical Context

In 1946, NYC's energy infrastructure was unequalled :

- No failures in its first 50 years existence
- Electric system buried (since 1888)
- World's finest self-sufficient subway system

A 1946 Blackout scenario would not affect:

- The steam system
- The Subways
- Telephones
- Computers or air conditioners

'Worst Case' scenario: lights out

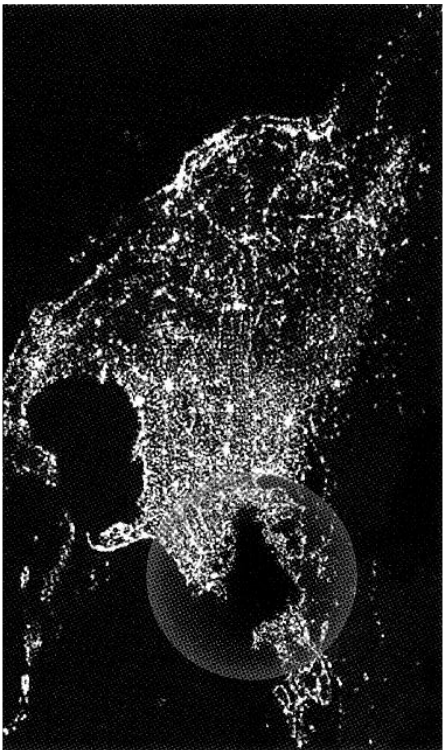




Energy and NYC Today

Blackout of August 2003:

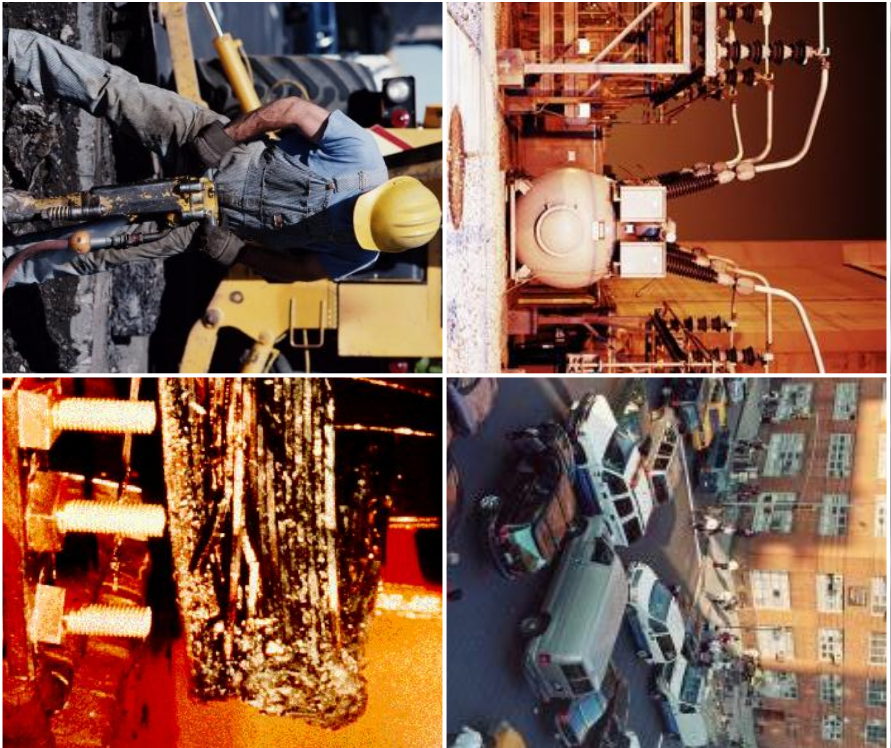
- four-day steam system failure
- Winter conditions would have caused a **"steam freeze"**
- Grid failure due to an additional 2000MW need

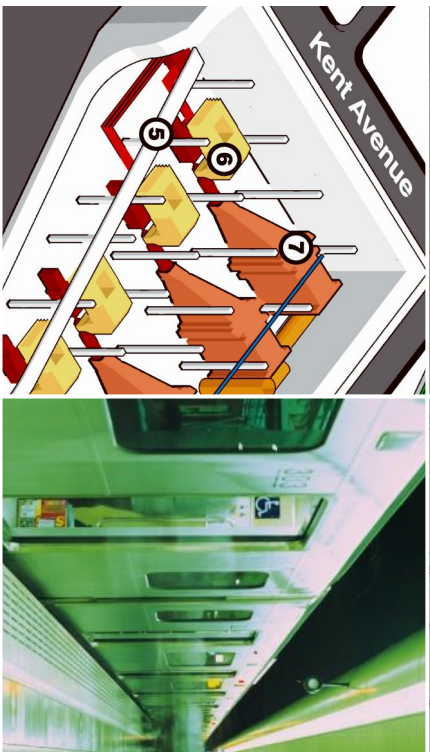
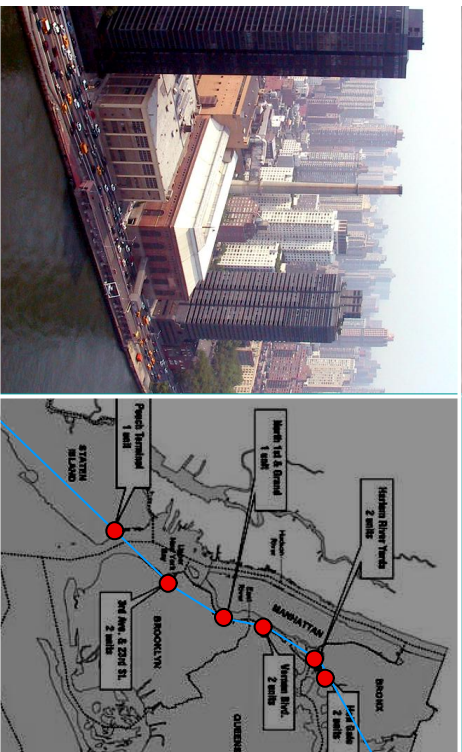


Power and NYC Today

Queens Meltdown 2006:

- Load pockets with no voltage support
- Estimated 100,000 people without power for 10 days
- Millions in loss and damages
- Fused cables requiring a major repair initiative



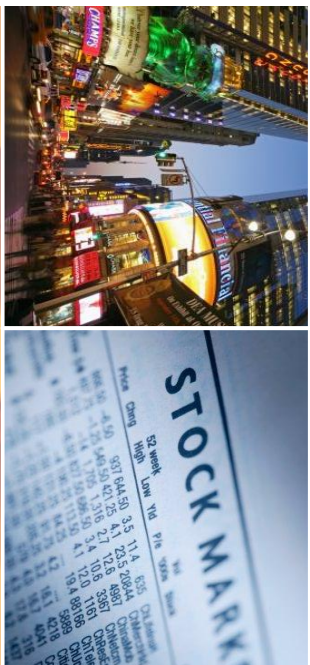


Energy and Transportation

Major power vulnerabilities:

- 1 gas line supplies 65% of “in City” electric generation
- Only one plant can withstand a 20 foot storm surge (out of service in 2009)
- No “hardened” plants
- Subway system: fully reliant on the grid
- **Electric demand continues to outpace growth of in-city generation**





Steam? Who cares?

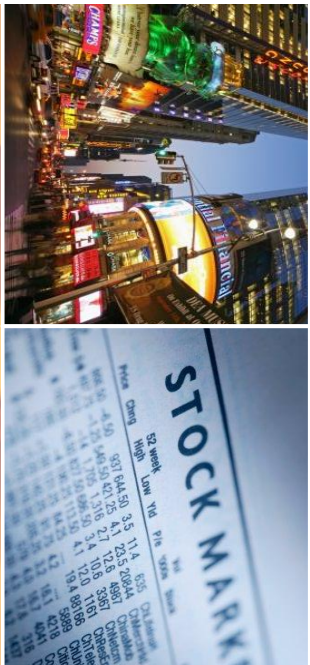
BUILDINGS

- Virtually every large building heated exclusively by a 100 year old district heating system
- Includes all hospitals south of 96th Street
- 750,000 people depend on the steam system

INFRASTRUCTURE

- Over 130 miles of steam mains and 3,000 un-insulated steam traps
- Fire suppression and sanitary water supplies susceptible





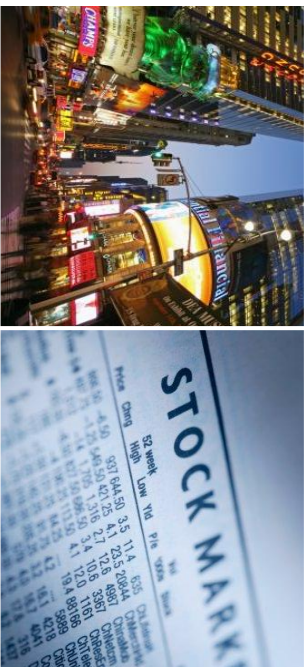
The Steam Equation

NO STEAM = NO HEAT = CATASTROPHIC DAMAGE

The NYC steam system operates at up to 400 pounds per square inch and is susceptible to “Water Hammer” if re-pressurized too rapidly.

**HOW LONG TO GET EVERYTHING
BACK UP AND RUNNING?**





Critical Steam Loss

A steam system failure in winter months would spell disaster:

WITHIN 12 HOURS

- Outside and inside temperatures match to within a few degrees
- Municipal and building water pipes freeze and potentially crack

WITHIN 24 HOURS

- Hospitals, seniors and the most vulnerable would have to be evacuated
- Most commercial and retail operations would close and merchandise, food and other products would be damaged or ruined
- The United Nations could not operate - global implications
- The financial district could not operate - national/global implications

WITHIN 48 HOURS

- A mass evacuation of millions from Manhattan

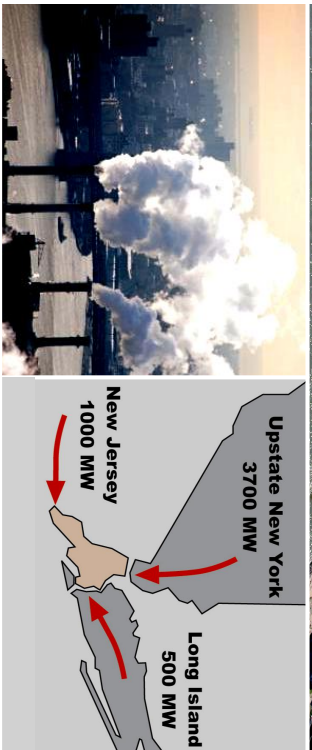
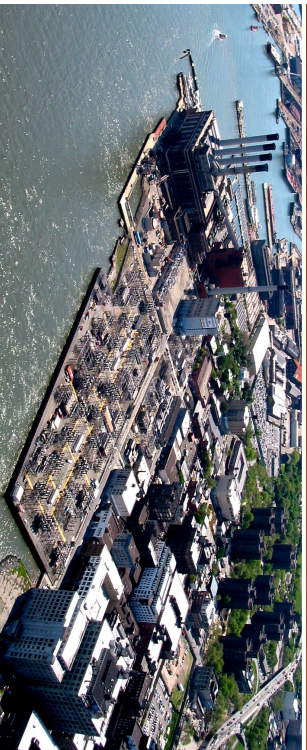




HOW LONG TO GET NEW YORK BACK UP AND RUNNING AFTER A STEAM FREEZE?

FACT: Prior to the collapse of the Soviet Union, it took the Soviet Army **120 days** to solve a steam freeze in Kiev, a city of approximately 2.5 million.





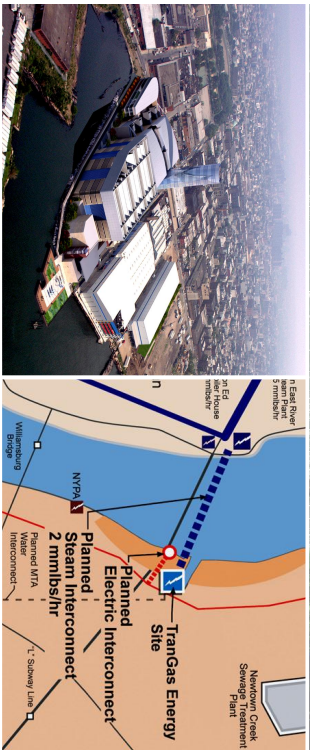
Grid Exposure

New York City relies on substantial amounts of transmitted power:

- Unprotected - and still not fixed - could occur again in the next nanosecond
- Susceptible to natural disaster
- Subject to human error (“leaning on the system”)
- Out of our control: Ontario and Quebec are the difference between enough power and a Blackout

POWER CONSUMPTION GROWS EXPONENTIALLY EACH YEAR

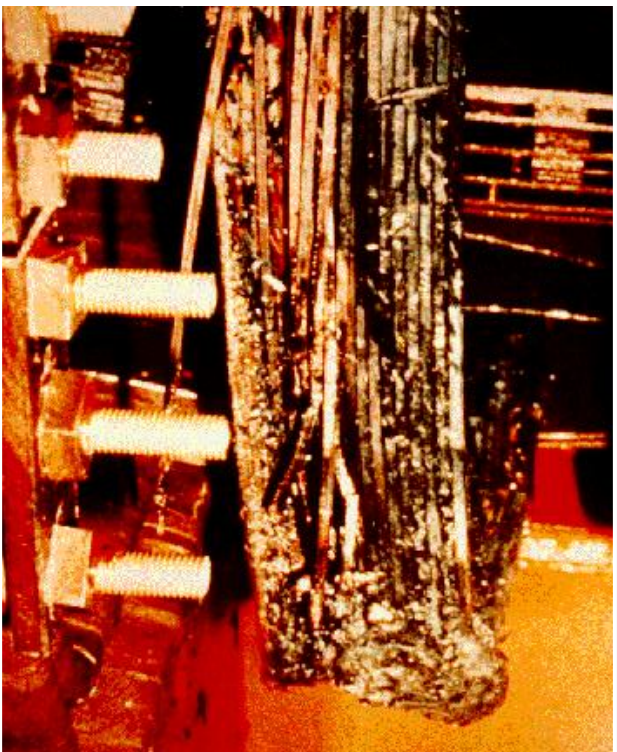




Mitigating Risks

- Power generation - must be nearer to the point of consumption
- Transmission is a liability, not reliability
- NYISO - selling “ancillary services”
- “Reactive power” VARS (volt-amperes reactive) - the difference between grid stability and “meltdowns”



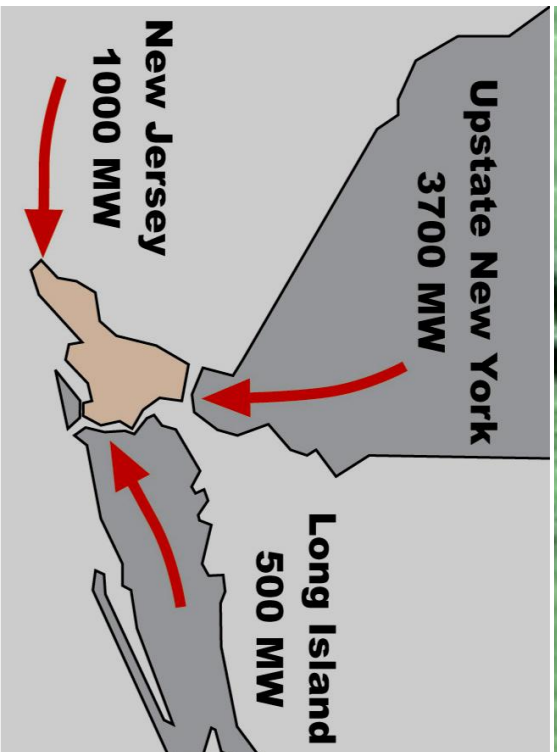


Meltdowns

- Queens Blackout 2006 - a textbook example of meltdown
- A cable merger - 22 melted into one copper ingot
- Time and manpower - 13 days and crews from as far away as Ohio
- Getting off the grid - Manhattan buildings were ordered to turn on generators

Just prior to the meltdown: 2 of 4 major 345kV transmission lines serving New York City failed





Hanging in the Balance

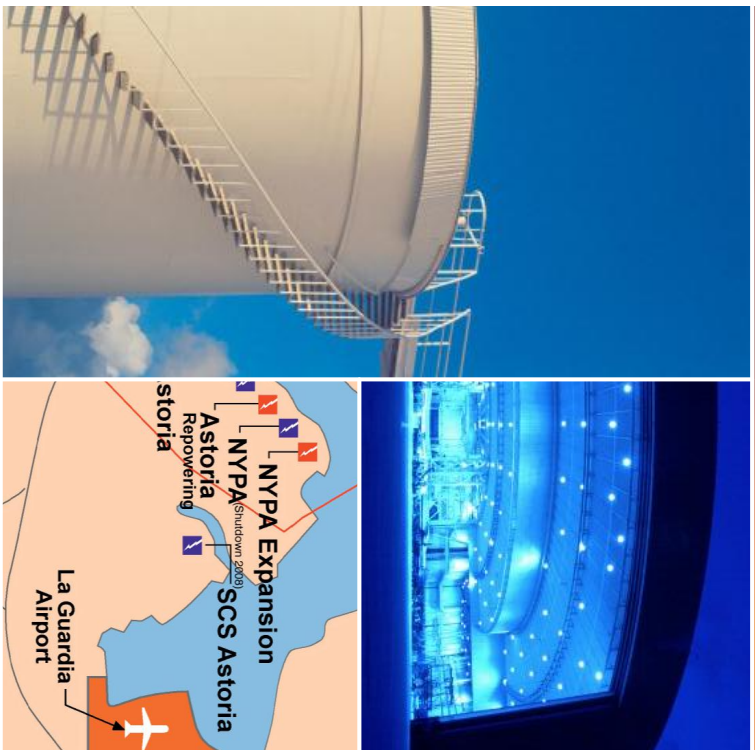
All economic, government, cultural and social activities in New York City rely on four fragile and vulnerable power transmission lines.

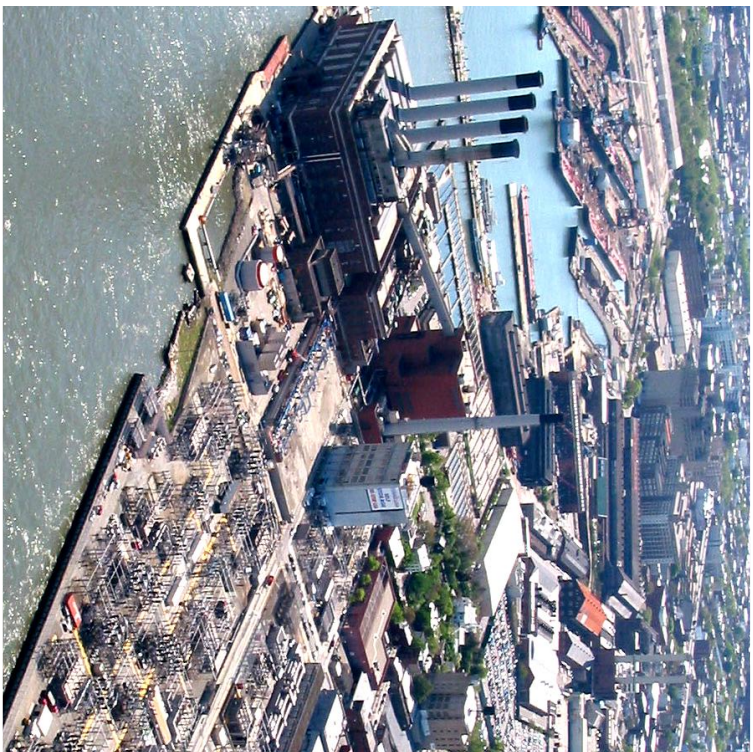




Generation Capacity Concentration

- 65% of in-city generation is based in Northern Queens with:
- One major gas transmission pipeline
 - No extended fuel oil storage
 - In the flight path of La Guardia airport

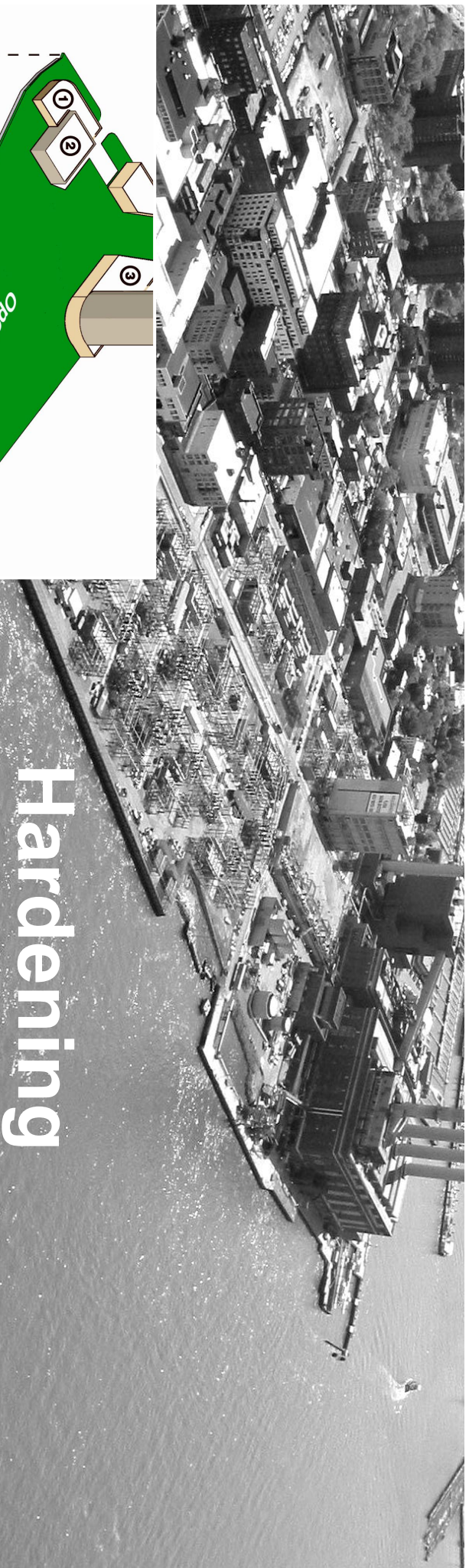




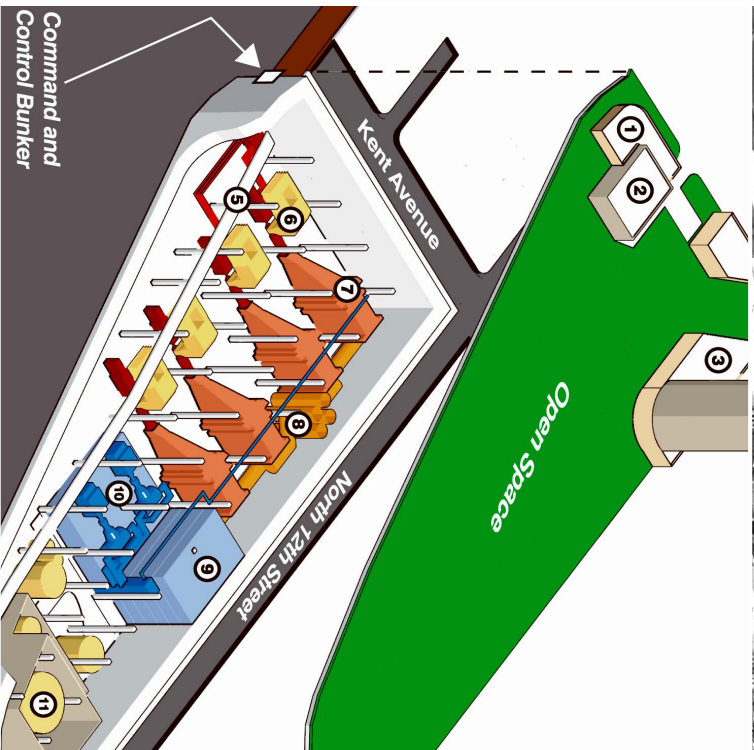
Environmental Liabilities

- A Category 2 hurricane produces 25 foot storm surges:
- No current power plant can withstand it
- No major East River substation can withstand it
- **Only Gas Insulated Switchyards (GIS) can withstand such a surge**





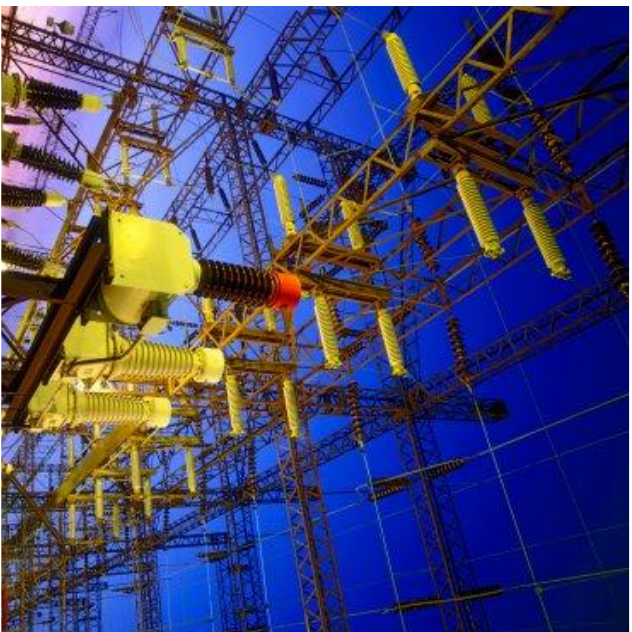
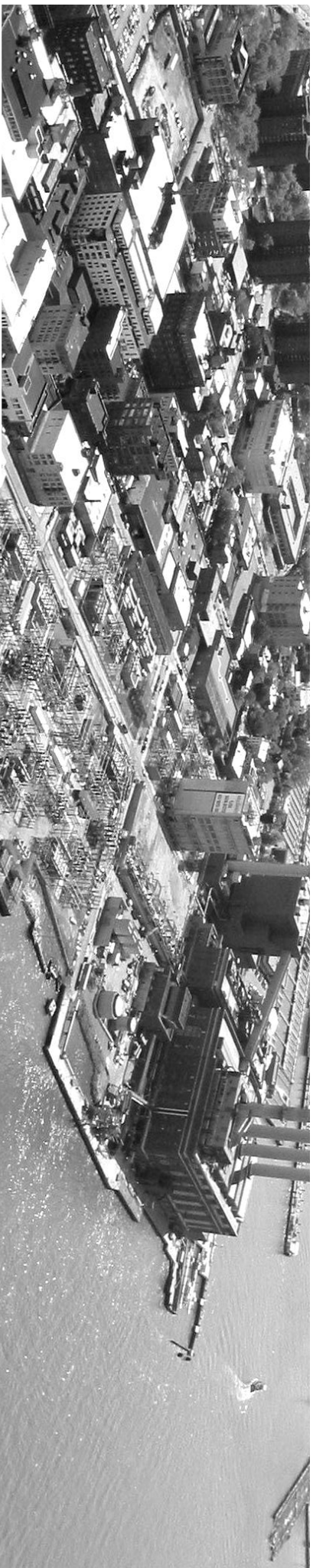
Hardening



- No power plant in New York City is hardened against terrorist attack
- No switchyard is hardened against terrorist attack

Plants need to be buried in a “slurry wall” and employ GIS





Switchyard Vulnerability

- Custom-built, open air, multiple-acre facilities located on the waterfront
- Susceptible to man-made and environmental disasters

NOT ONE is hardened in New York City - they are highly vulnerable

WITHOUT THE FARRAGUT SWITCHYARD

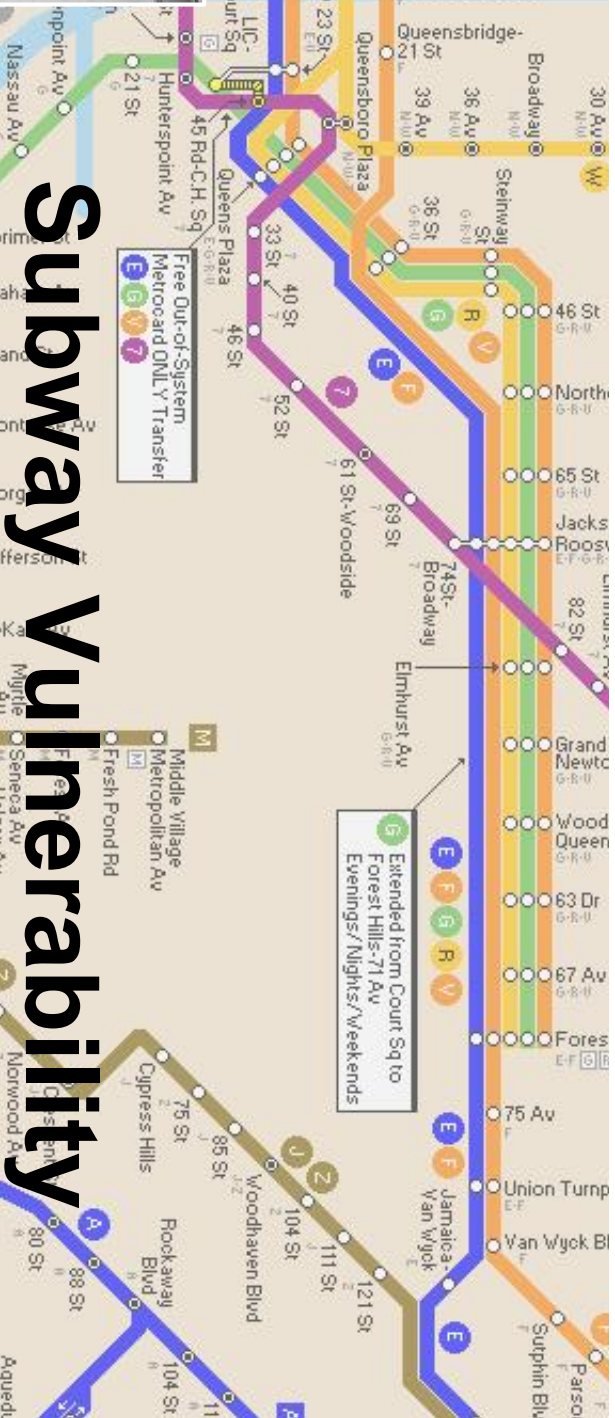
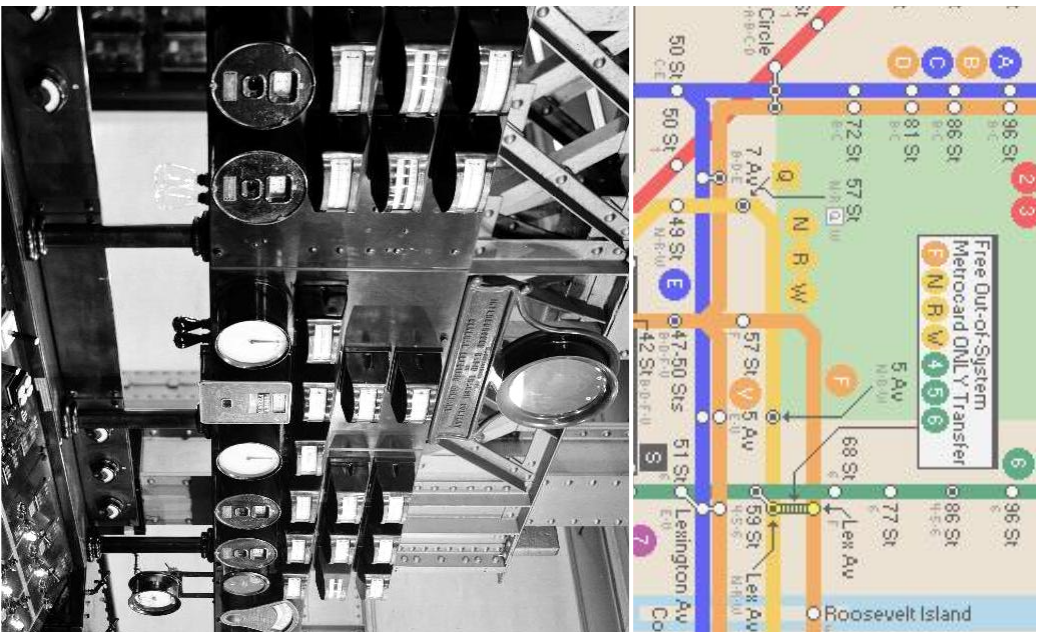
No imported power from the PJM grid

WITHOUT THE 13TH STREET SWITCHYARD

No interconnection with the Poletti plant, which provides power to the Metropolitan Transit Authority and the Financial District

DESTROYING SWITCHYARDS TAKES THE GRID OFFLINE FOR MONTHS





Subway Vulnerability

- **Over 450 miles of tunnels**
 - No blackout lighting system
 - No blackout communications systems
 - Hundreds of homeless people live and hide there, undetected
- **Over 700 stations**
 - Many have multiple exits as well as emergency exits
 - Over 3,000 entry/exit points
- **100 year old mechanical relays**
 - Built originally by Westinghouse - no longer built or stockpiled
- **A recent trash fire took out 20 percent of service**
 - Repairs originally estimated to take five years

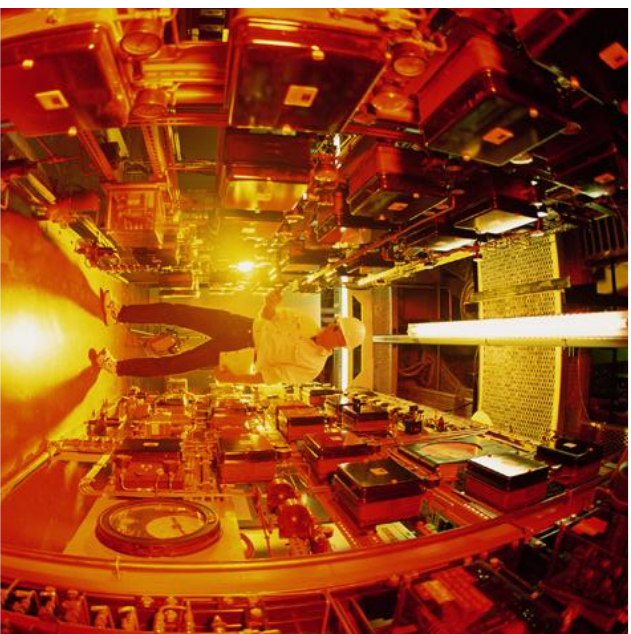




Potential Terrorist Scenario

- City-wide blackout halts the subway system
- All platform battery lighting exhausted in five hours
- All in-tunnel communication ability fail
- Terrorist teams enter subway system, destroying the couple of dozen main mechanical relay stations
- New York City subway out-of-service for several years
- Terrorist teams live below ground – striking at will





The Solution

Trans Gas offered to fund \$700 million in upgrades and improvements:

- A hardened power plant and command and control center that can be isolated from the grid.
- A backup lighting system
- A comprehensive backup communication system fully operational in a blackout
- Hundreds of millions worth of spare mechanical relays





New York has moved well beyond N.I.M.B.Y. to B.A.N.A.N.A.
Build Absolutely Nothing Anywhere Near Anything

**THIS IS NOT A DEMOCRATIC OR REPUBLICAN ISSUE
THIS IS AN ISSUE OF NATIONAL IMPORTANCE AND SECURITY**



A photograph of an American flag waving in the wind, with a microphone on a stand in the foreground. The background is a clear blue sky.

The Politics of the Matter

- **Power plants have no local political support**
 - Typically waterfront land
 - In direct competition with land developers
- **NYS Article X was established to maintain objective site decision processes**
 - Intense local political pressure undermined it
- **City sought to condemn TGE's proposed site - after the Kelo Decision - under "eminent domain" for use as a park**
- **The NYS Supreme Court stopped the condemnation – one of the few times eminent domain has been stopped by the courts**

