A Warming Climate for District Energy/CHP in the USA

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

Robert Thornton, President

Euroheat & Power

34th Annual Congress

Venice, Italy

26 May, 2009

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

IDEA 100 years

INFORMING
CONNECTING
ADVANCING

since 1909

- Formed in 1909
- Non-profit industry association
- 1200+ members in 25 nations
- 56 % end-user systems
- Majority in North America; 40 States; 100+ colleges/universities

District Energy/CHP 2009

Local Energy, Global Solution

IDEA 100th Annual Conference & Trade Show

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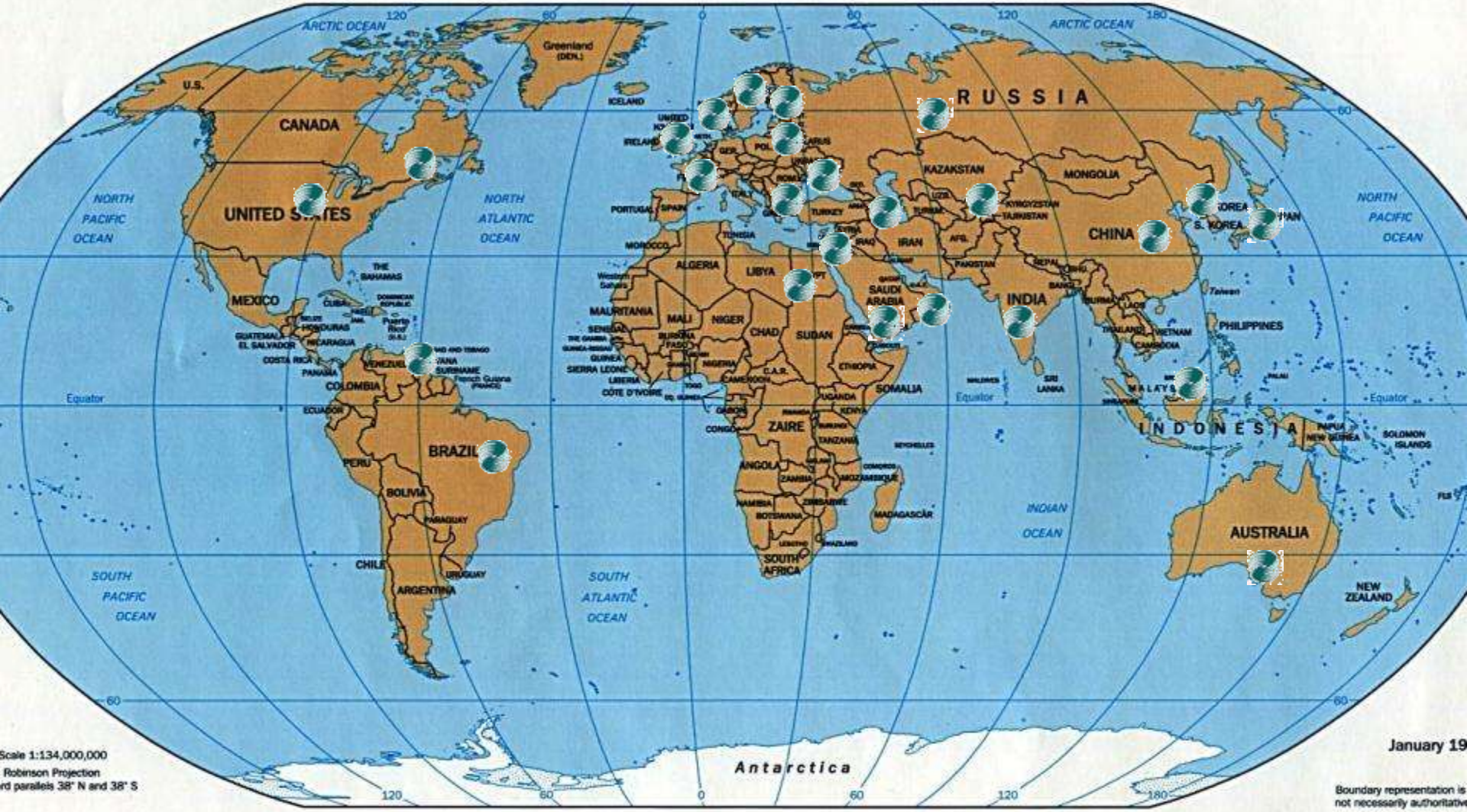

Scale 1:134,000,000
Robinson Projection
rd parallels 38° N and 38° S

January 19

Boundary representation is
not necessarily authoritative

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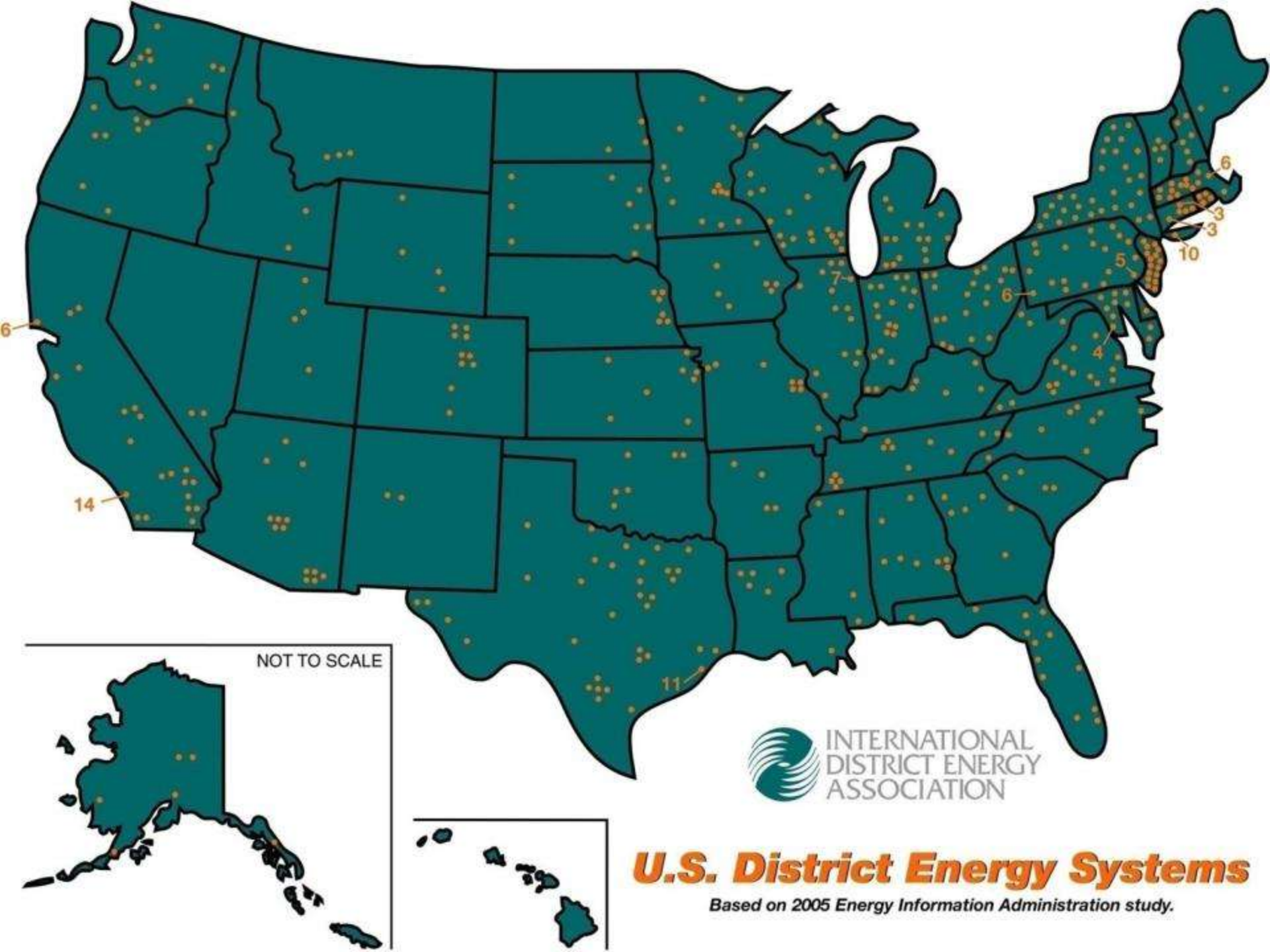
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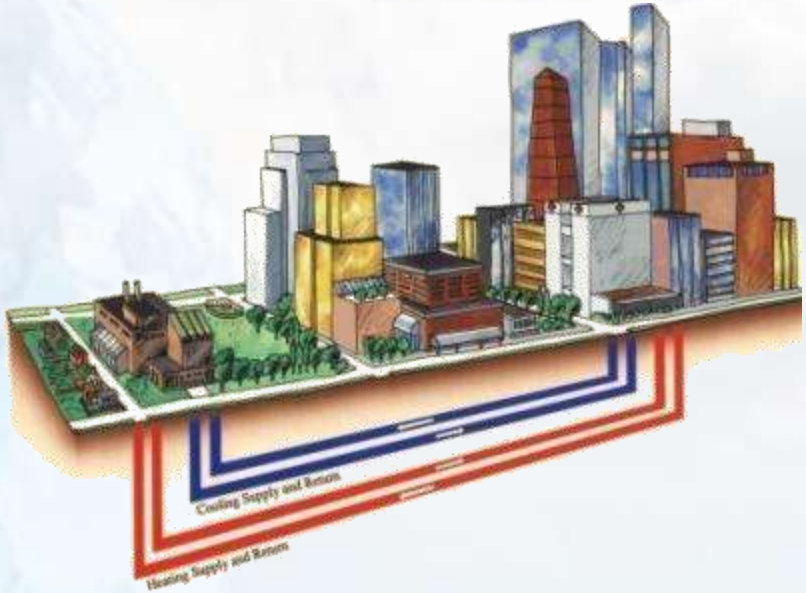
NOT TO SCALE
INTERNATIONAL
DISTRICT ENERGY
ASSOCIATION
U.S. District Energy Systems
Based on 2005 Energy Information Administration study.

Advantages of District Energy

- Underground network of pipes "combines" heating and cooling requirements of multiple buildings
- Creates a "market" for valuable thermal energy
- Aggregated thermal loads creates scale to apply technologies not feasible on single-building basis



- District energy uses industrial grade equipment:
  - greater fuel flexibility
  - increased efficiency
  - reduced emissions
  - higher reliability
  - renewable/recycling energy (surplus heat)

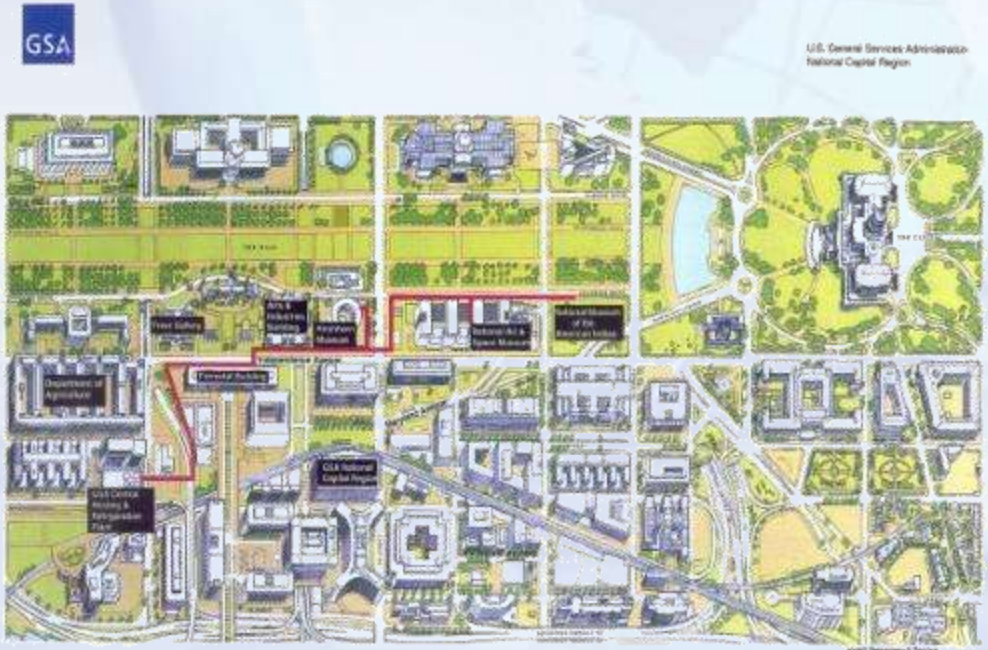
Con Edison, NYC – 660 MW CHP East River Re-powering Project

Downtown District Energy Systems
New York City – Con Edison Steam System

- World's largest steam system – 1850+ customers
- Seven (7) generating facilities supply over 102 miles of underground piping
- Customers use approx. 500,000 tons of steam-driven chillers, displacing 350 MW peak electric demand on grid
- Combined heat and power provides 60% of total annual steam

Downtown System – Washington DC

- Chilled water & steam service
- Very high reliability (99.9998)
- Critical loads (Federal Govt)
- Recently added 17,000 tons and 10 MW CHP



Chilled Water Distribution System
GSA Cogeneration and Chiller Plant Expansion Project

US District Energy Industry Capacity

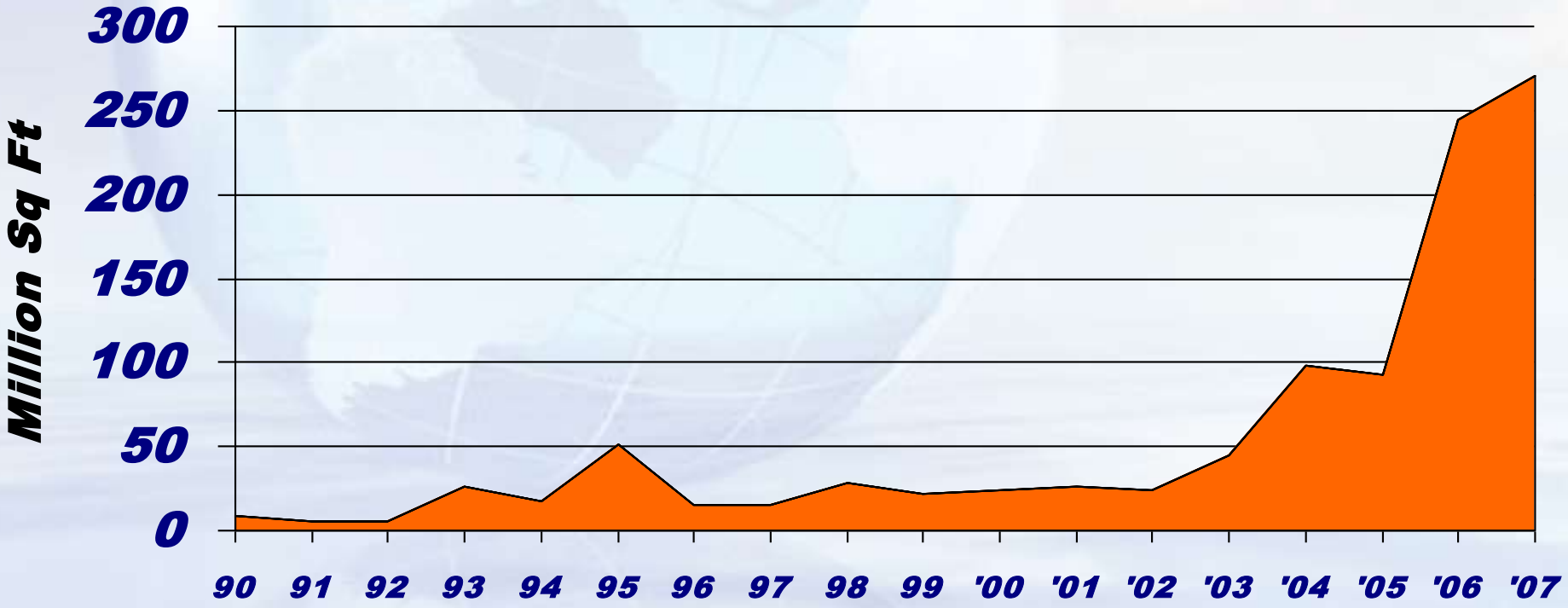
	# Systems Reporting	Gross SF Customer Building Space Served	Heating Capacity (MMBtu/Hr)	Cooling Capacity (Tons)	Electricity Generation (CHP Mwe)
Downtown Utilities	85	1,898,037,560	49,239,000	1,082,355	950
Campus Energy Systems	330	2,489,216,071	82,107,191	1,855,546	2,197

* Based on systems reporting 2005 data to EIA Survey

Global Growth District Energy Space IDEA Members Reporting

Since 1990 Total Reported = 947,846,372 SF

Million Sq Ft Customer Buildings Connected/Committed to District Energy



Downtown District Cooling Systems in North America

Downtown District Cooling Systems

- Scale up with highly efficient equipment
- Cut peak demand on electric grid
- Deploy ice and thermal storage

- Reduce owning/operating costs
- Free up valuable leasable space

- Simplify building operations

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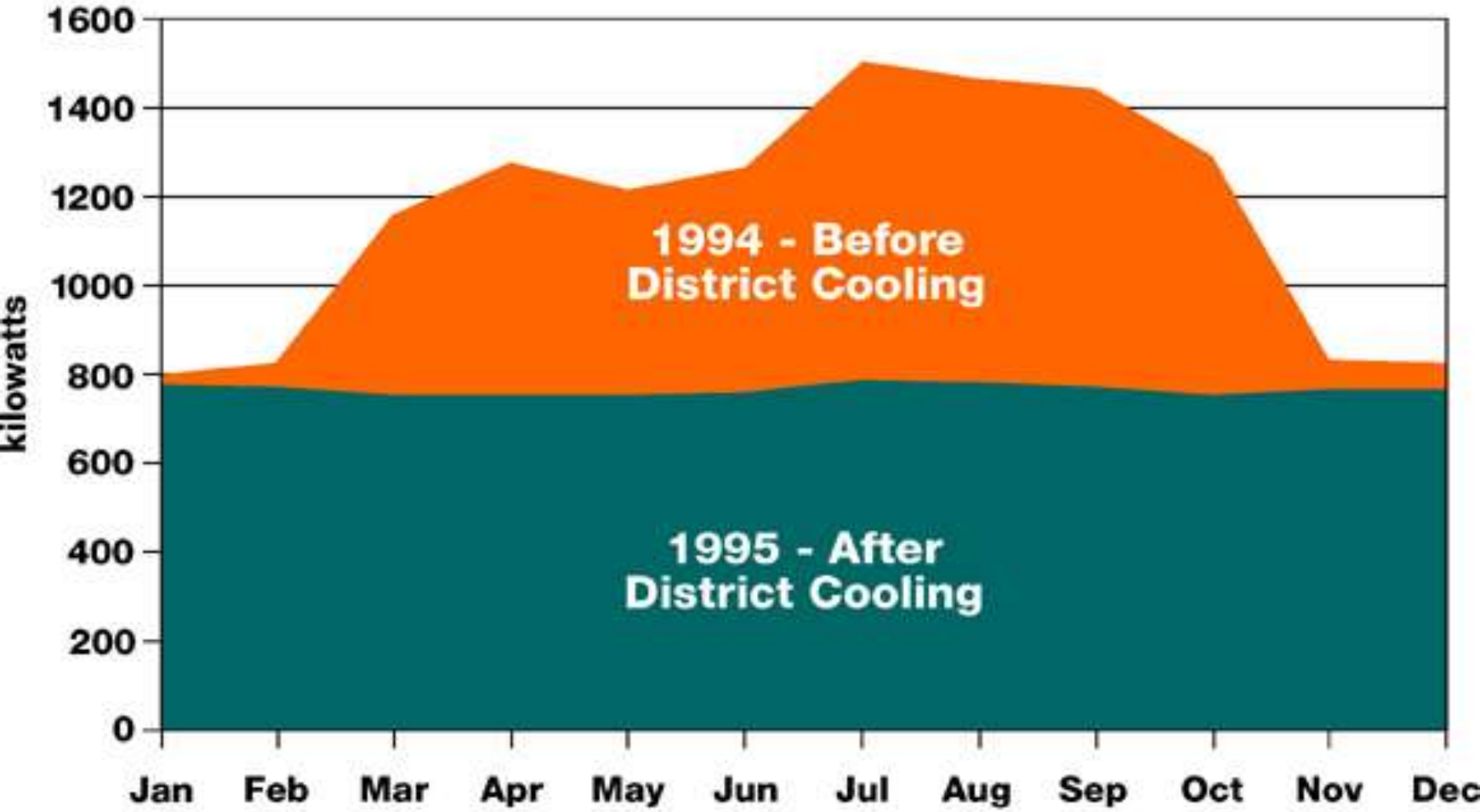
District Cooling Customer Electric Demand Profile



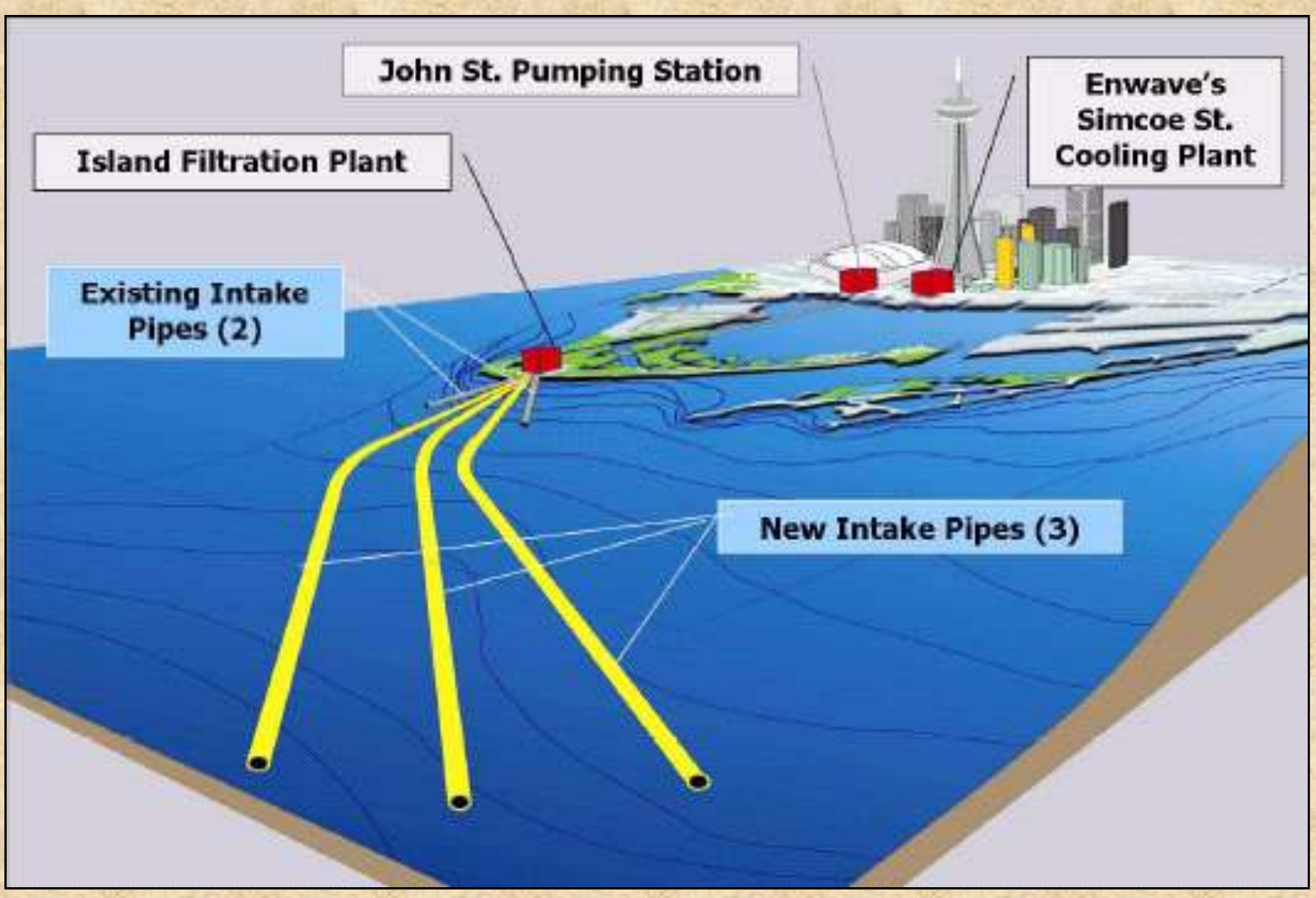
350,000 sf commercial office building built in 1965. Located in Cleveland. Two electric chillers displaced. Actual peak meter readings varied just 2% Jan-July.

Higher Value Buildings

Without District Energy

With District Energy

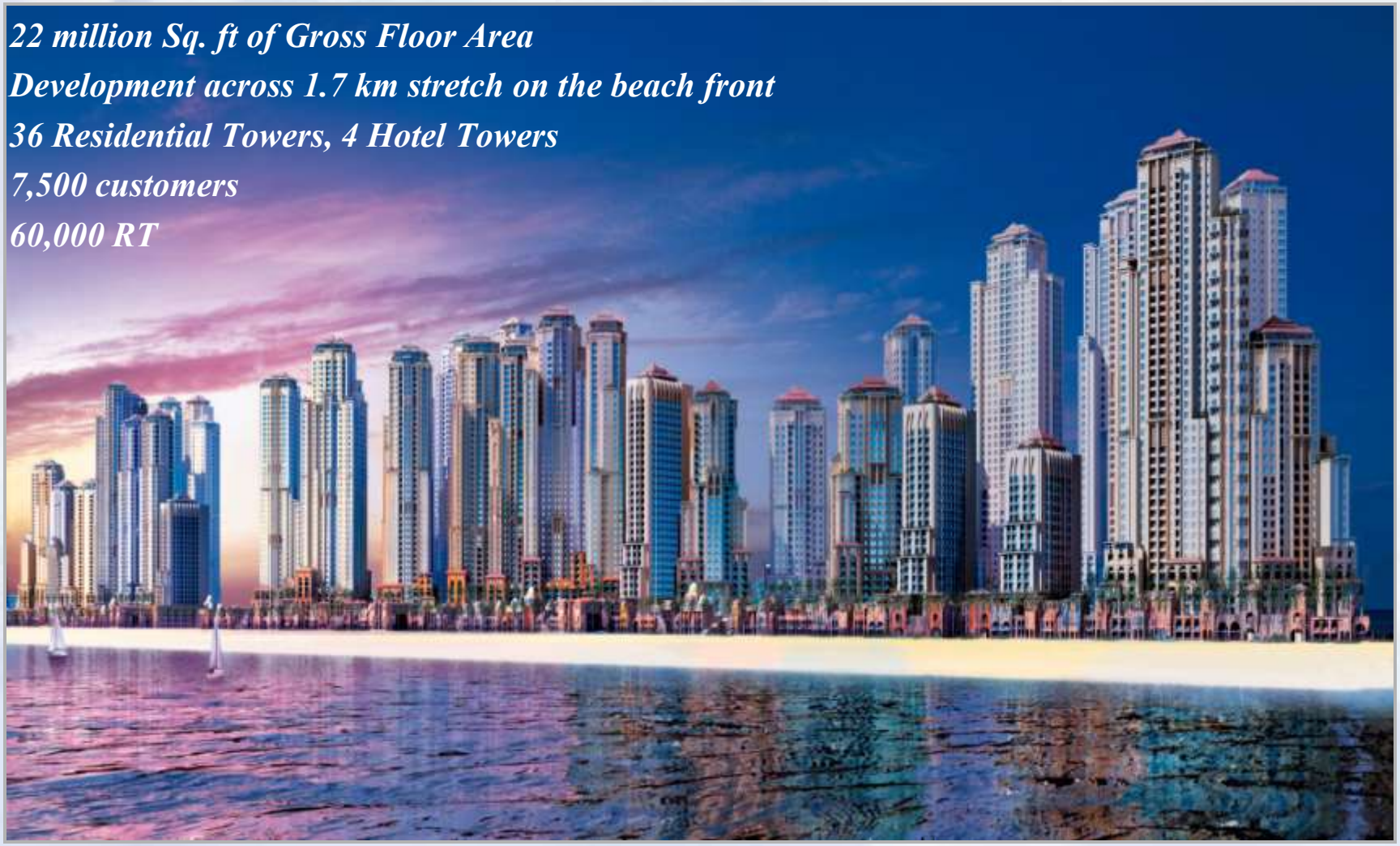
Toronto Deep Lake Cooling – Enwave Energy Corp



Dubai, United Arab Emirates

Palm Jumeirah Island – District Cooling

Jumeirah Beach Residence



free spirited style

Dubai International Financial Centre
60,000 RT North Plant

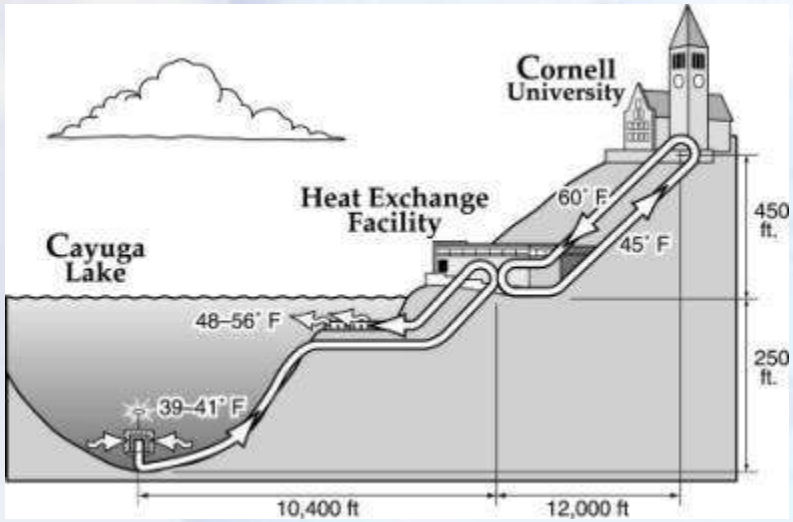
Dubai Health Care City

Dubai Health Care City
56,000 RT Plant Room

U.S. Campus Energy Systems

- Load growth driven by building construction
- Critical care research facilities - reliability is paramount
- Common ownership between plant/buildings
- Able to retain 100% energy savings
- Longer investment horizon
- History of success with combined heat & power (CHP)

Cornell Univ. Lake Water Cooling



16,000 Tons Capacity - $58,000,000

Lake source water: 39-41º F

Lake return water : 48-56º F

Campus loop supply/return : 45º - 60º F

Lake source intake pipe: 10,400 ft long, 250 ft deep

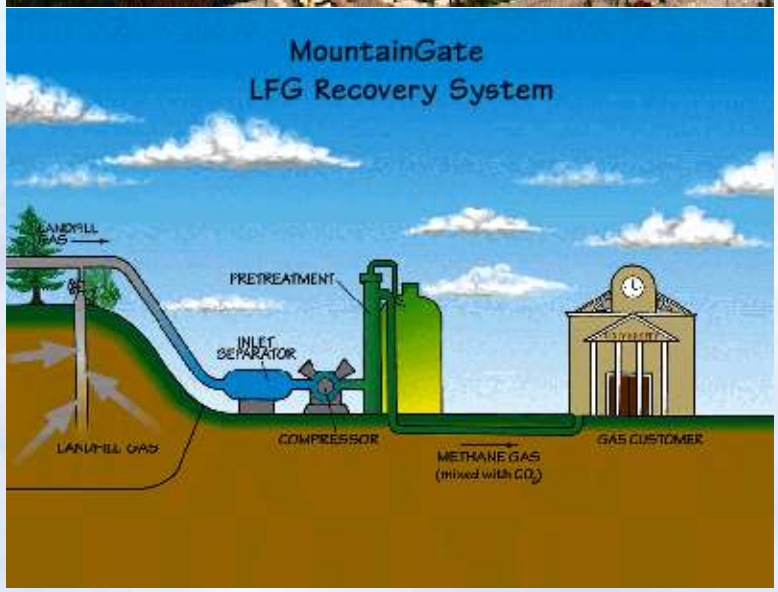
Campus S/R loop pipe: 12,000 ft

Benefits:

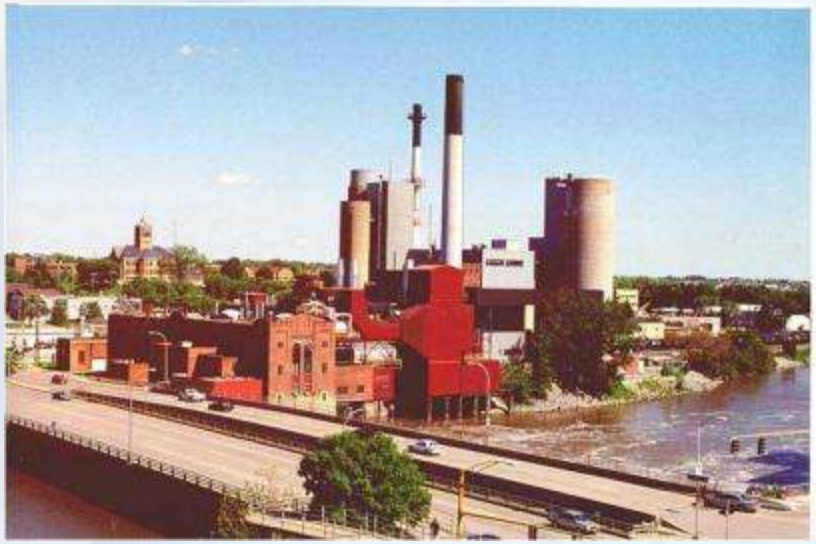
- **CO2 emissions cut 56 million #'s/yr**
- **Reduced cooling electricity by 87% - cutting 20 million kwh/yr**
- **Sulfur oxides cut 654,000 lbs/yr**
- **Nox reduced 55,000 lbs/yr**
- **40,000 lbs CFC eliminated**

UCLA – Landfill Gas for CHP

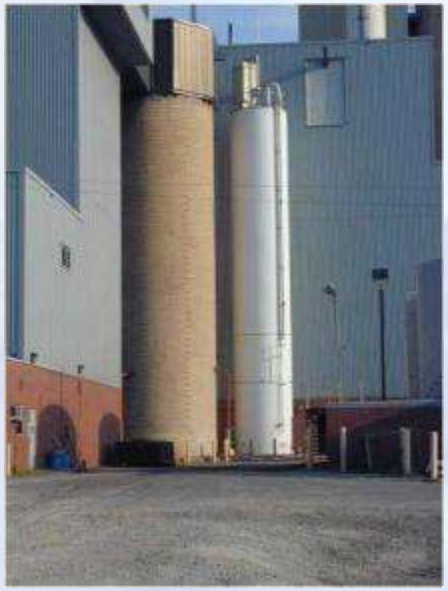
- 43 MW Combined Cycle CHP Facility
- 21,900 ton Cooling Plant
- Landfill gas for 30% of annual plant fuel – 3 mile pipeline
- Reduced emissions 34% and cut water use 70 million gal/year
- Eliminated 4,000,000 ft3 flareoff of LFG/day



University of Iowa – Biomass



- Oat hulls - byproduct of breakfast cereal
- Displace 60,000 tons coal annually
- Reduce emissions by nearly 50%



IDEA Industry/Legislative Activities

- USA Federal Energy Bill - EISA 2007
  - Secure Appropriations for $3.75 Billion Authorization for CHP/District Energy/Clean Energy
- Seeking Federal Tax Legislation in 2009
  - Five year MACRS depreciation – plant & pipe
  - Tax exempt financing eligible - plant & pipe
  - Production tax credit clean CHP
- "Greening the Capitol" – central energy plant
- IEA CHP/DHC Alliance to advance District Energy/CHP as key Climate Change Strategy
  - District Energy Summit, November 3, 2009 in Copenhagen, Denmark

Waxman-Markey Climate Draft

American Climate and Energy Security

- On May 21st, House Energy and Commerce Committee agreed 33 to 25 to report the American Clean Energy and Security Act of 2009 (H.R. 2454) to the House of Representatives
- Four titles:
  - New Energy technologies (RPS, CCS, Fuel Standard)
  - Energy Efficiency Standard (EERS; fuel economy,etc)
  - Cap and trade program
  - Consumer worker/industry assistance & adaptation
- Cap and trade provisions influenced by Dingell-Boucher draft; USCAP blueprint

Waxman-Markey Climate Draft

American Climate and Energy Security

- **Covers 85% of US GHG emissions**
- **Cap & trade target levels**
  - **3% below 2005 levels by 2012**
  - **17% below 2005 levels by 2020**
  - **83% below 2005 levels by 2050**
- **Allocation of free allowances (initial)**
    - **35% to electricity LDC's (regulated)**
    - **12% to "trade sensitive" industries (steel, aluminum, etc)**
    - **1 to 4% to refineries**
  - **Quantitative limits on offsets/"discount" of offsets**
  - **Preemption of state caps from 2012 to 2017**

Impacts on District Energy

- Currently cap & trade program only requires "covered entities" to hold allowances/offset credits
  - electric generators/large industrials emitting more than 25,000 metric tons /year – "downstream"
- District energy facilities not "covered entities" under current version
    - Electricity sources are defined to exclude cogeneration of steam & electricity, unless cognerator sells minimum quantity of electricity (1/3 of capacity and >25 MW)
    - Industrials sources include only manufacturing sector and natural gas processing/transportation

Impacts on District Energy

- Exception for district energy may not persist
  - IDEA pro-active assuming coverage
- If district energy facilities become covered entities:
  - Will need to hold allowances/offset credits each year
  - Use of fossil fuels (inc. generation) will generally become more costly
  - More efficient systems will have competitive advantage (because quantity of allowances needed per unit of energy will be lower)
- Upstream natural gas regulation is key

Renewable electricity and energy efficiency standard

- Electric utilities selling > 4,000,000 MWhrs
- Required to supply 20% of demand from combination of renewable and energy efficiency
  - 15% renewable; 5% efficiency
  - If State determines can’t meet renewable, lower to 12% and efficiency increase to 8%
- Important lever for district energy/CHP

Next Steps

- Voted out of Energy & Commerce Committee 33 to 25
- Ways & Means; Appropriations to follow
- Republicans have 400+ amendments
- Full House vote – Chair Pelosi signal
- Senate Climate/Energy version to follow
- Competing priority with Health Care
- Chair Boxer likely to bring vote
- Stay tuned!

Legislation vs Regulation

- April 18, EPA issued “endangerment ruling” on CO2 to regulate as hazardous material
- Supreme Court ruled 2 years ago to allow EPA to regulate CO2
- “Game-changer” to backstop Congress and force action
- Legislation is “preferable” to regulation

Federal Stimulus - ARRA

- IDEA secured $1.6 Billion line item in both Senate & House bills to Conference Committee
  - Deleted during late hour negotiations
- DOE - $106 Million Grants for District Energy/ CHP/ Waste Energy (announced today!)
  - "Shovel Ready" Projects, Institutional, Govt
- Clean Energy Development Bonds
- State Energy Program Funds
- Clean Energy Application Centers

Upcoming Events

IDEA 100TH Annual Conference & Trade Show
Hyatt Regency Crystal City, VA

June 28-July 1, 2009

District Energy Summit:
Leading the way to Copenhagen COP 15
Copenhagen, Denmark
November 3, 2009

Thank you

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Rob Thornton

rob.idea@districtenergy.org

+1 508-366-9339

www.districtenergy.org