

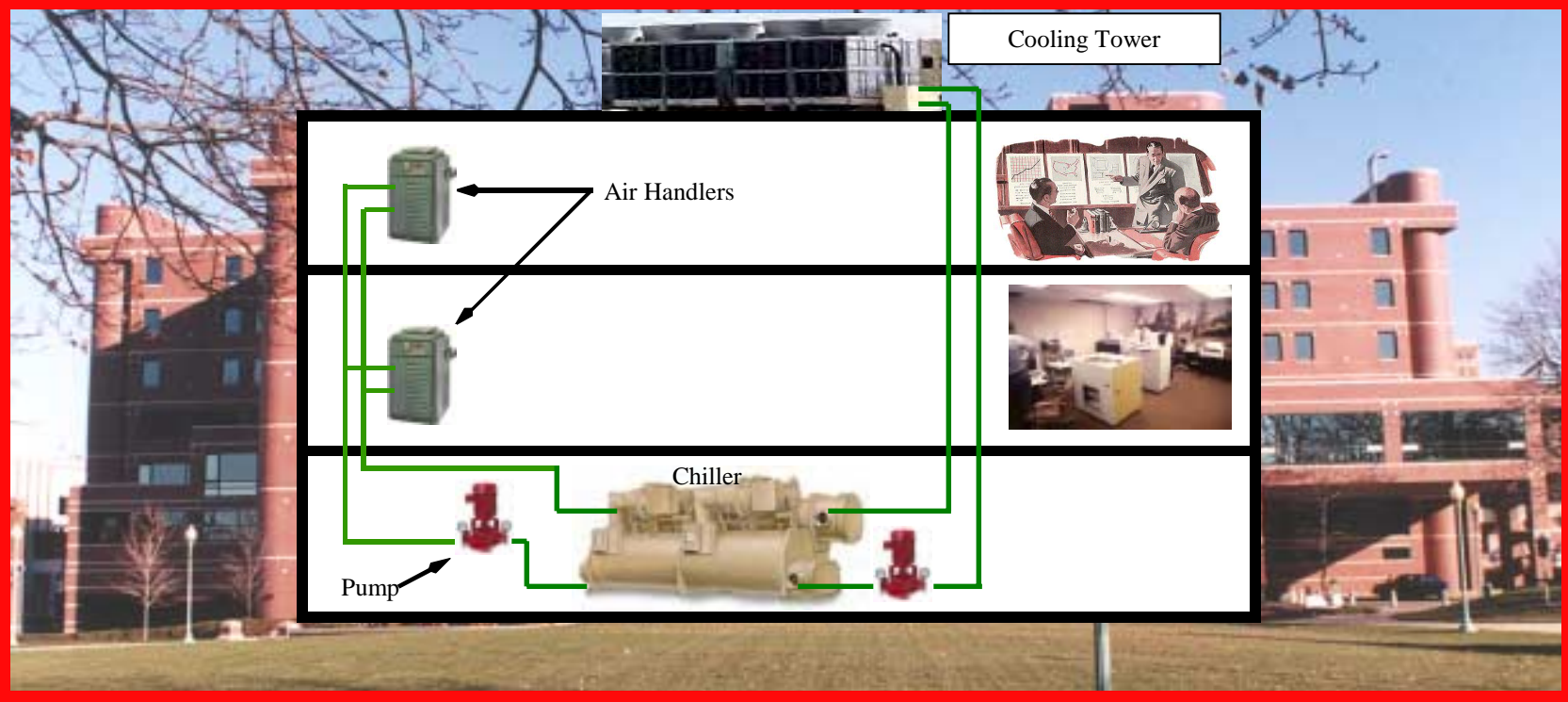
THERMAL

for District Heating & Cooling



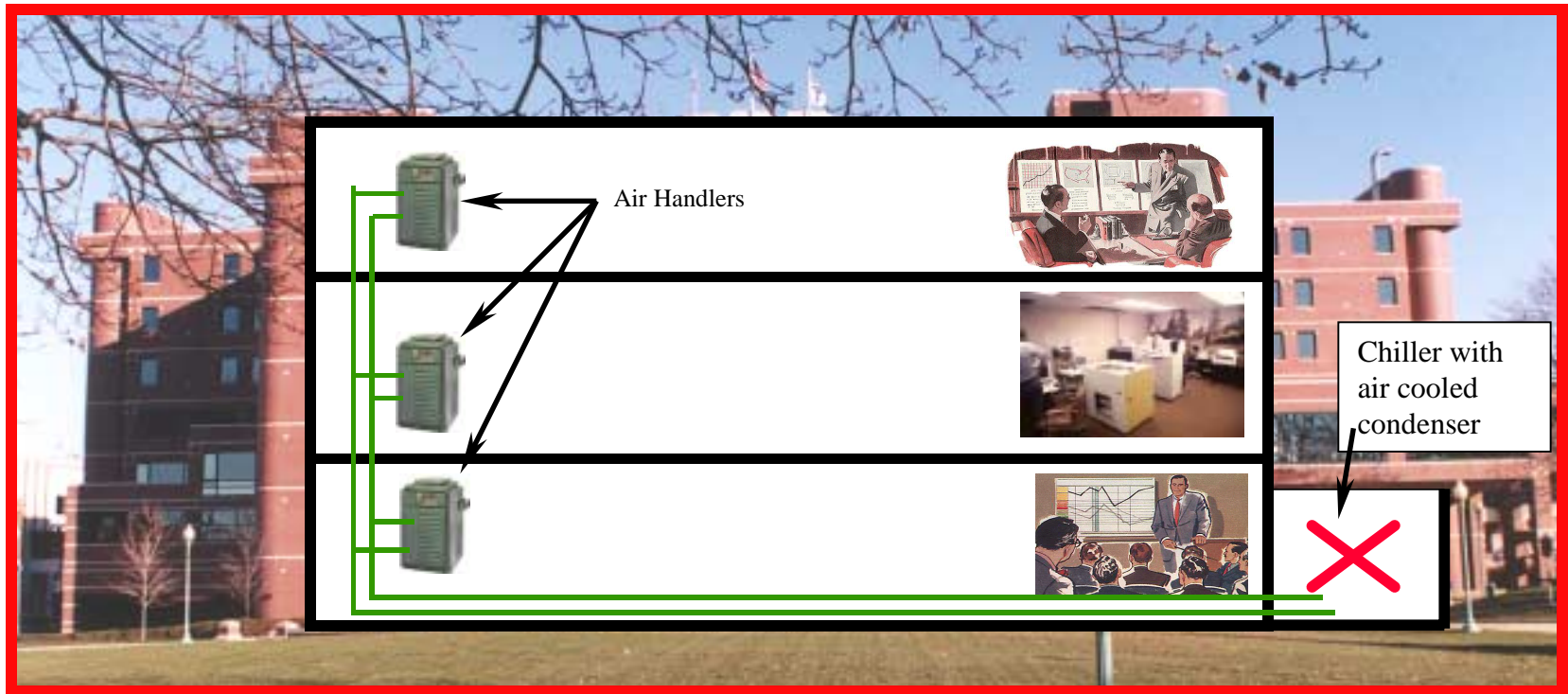


How Buildings Are Cooled With Conventional System





How Buildings Are Cooled With Conventional System (with air cooled condenser)



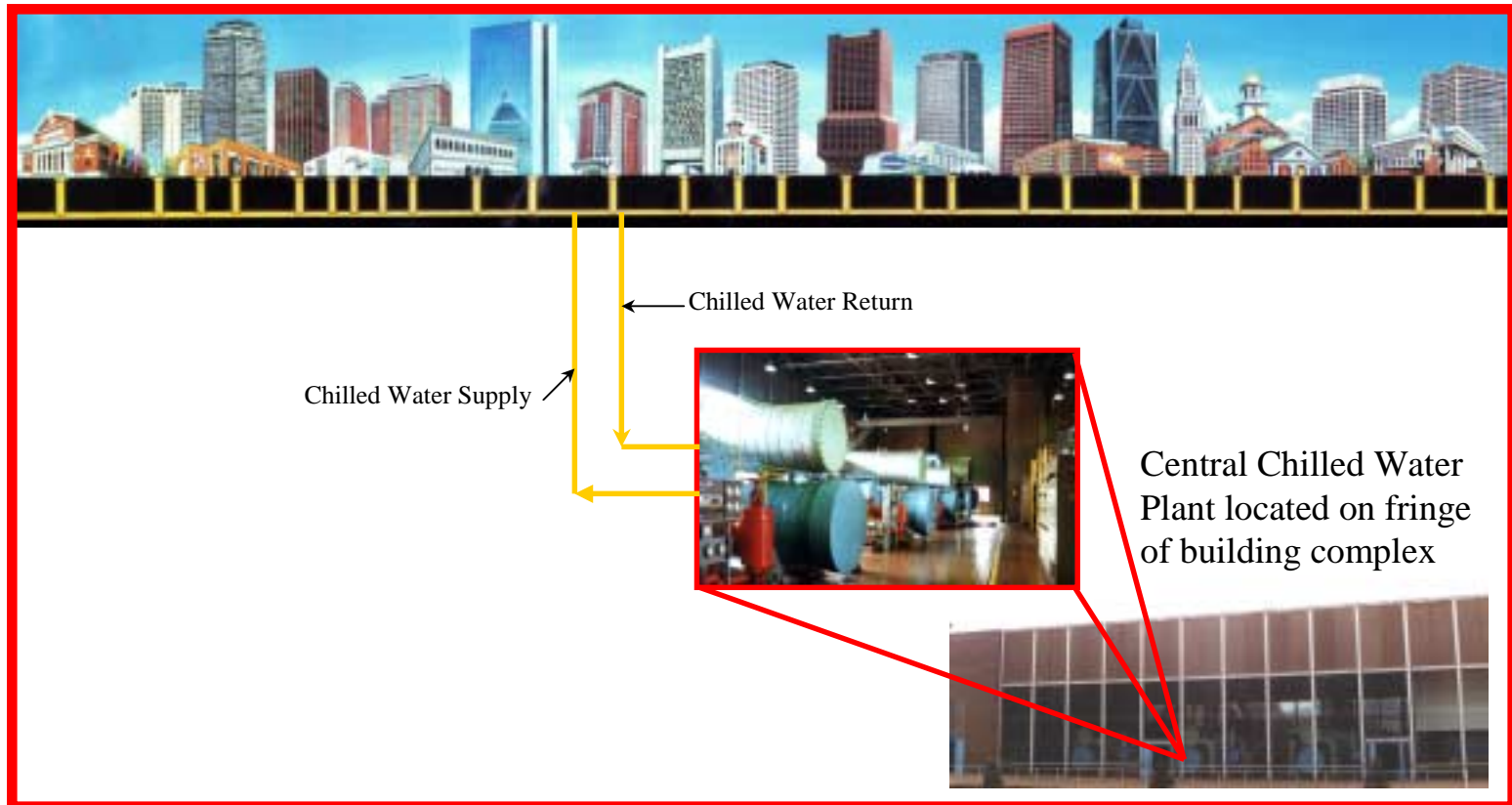


What Is District Cooling?

- District cooling provides chilled water to several buildings from a central chilled water plant.
- District cooling takes advantage of economies of scale.
- It is more economical for a larger central chilled water plant to operate than several smaller systems.
- They operate like district heating systems that have been heating most American cities for over 100 years, continuously in many cases.

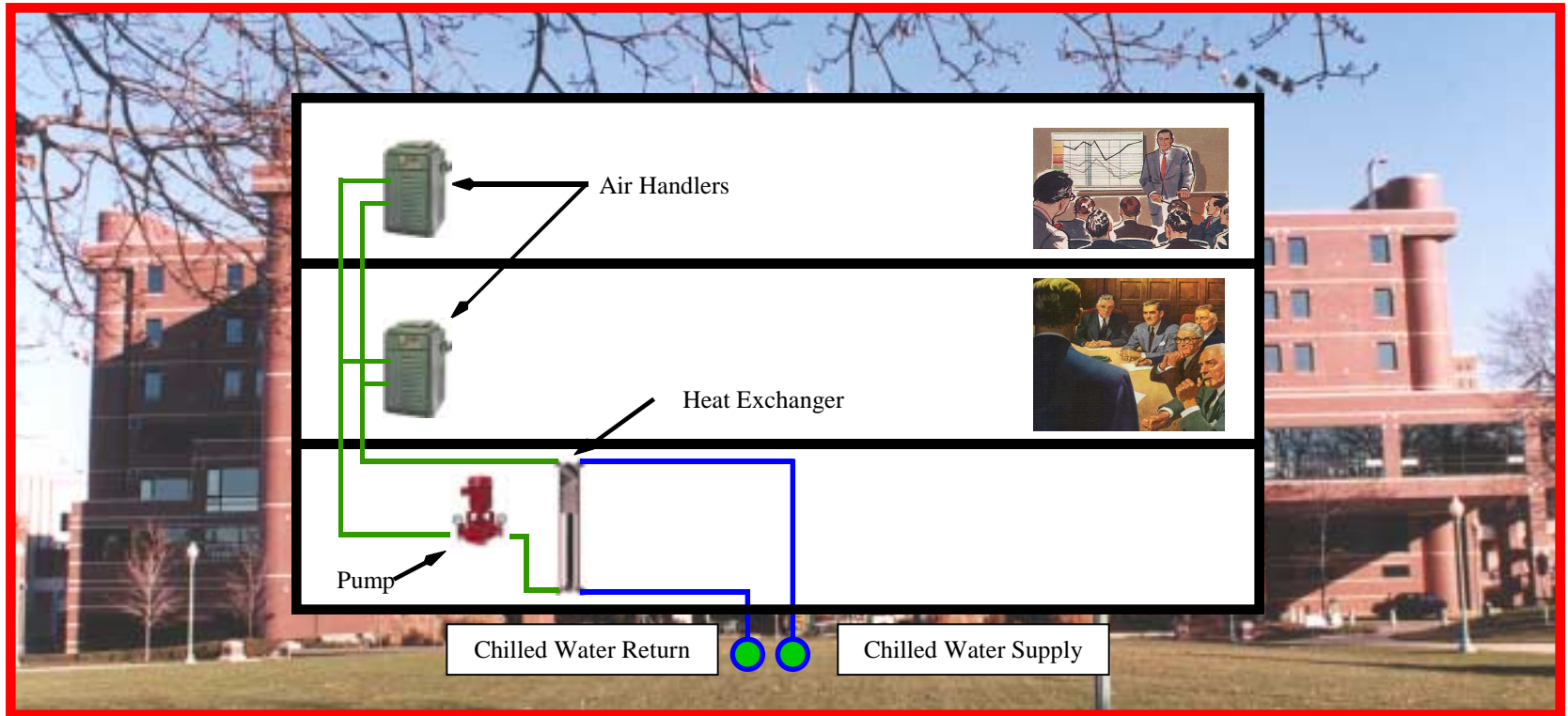


Central Chilled Water System





How Buildings Are Cooled With District Cooling





4,000 Ton Chiller



Typical Central Cooling Plant Chiller. They are industrial grade equipment that will last for 50 years.



70,000 lb./hr. Boiler

Typical District Cooling Systems have companion District Heating Systems. Many District Cooling Systems use steam driven chillers to avoid high electric demand charges.





Virginia Commonwealth University Central Plant

This is a District
Steam System
Thermal Ventures
operates for the
University.





Cities with District Cooling

- Akron, OH
- Atlantic City, NJ
- Baltimore, MD
- Boston, MA
- Century City, CA
- Chicago, IL
- Cincinnati, OH
- Cleveland, OH
- Dallas, TX
- Denver, CO
- Glendale, CA
- Harrisburg, PA
- Hartford, CT
- Houston, TX
- Huntington Beach, CA
- Indianapolis, IN
- Kansas City, KS
- Las Vegas, NV



Cities with District Cooling

- Lincoln, NE
- Los Angeles, CA
- Miami, FL
- Milwaukee, WI
- Minn., MN
- Nashville, TN
- New Orleans, LA
- Oklahoma City, OK
- Omaha, NE
- Orlando, FL
- Pittsburgh, PA
- Phoenix, AZ
- Sacramento, CA
- San Antonio, TX
- San Diego, CA
- Santa Ana, CA
- St. Paul, MN
- Trenton, NJ



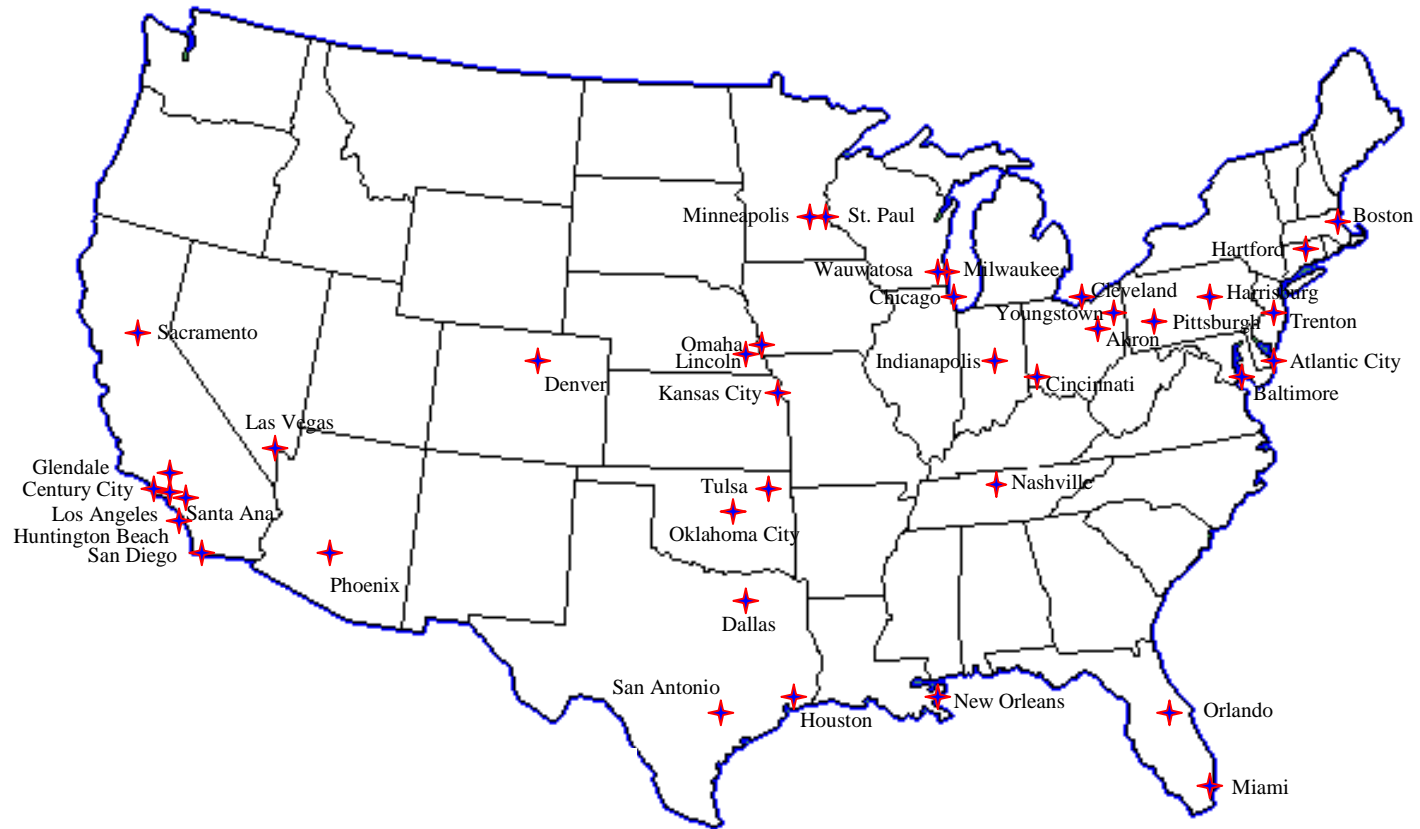
Cities with District Cooling

- Tulsa, OK
- Wauwatosa, WI
- Youngstown, OH

(Note: Most College Campuses have District Cooling Systems)



Cities with Commercial District Cooling Systems





Growth of District Cooling in Selected Cities

1960's

City	Year	Capacity (000's Tons)	
		Initial	Current
Hartford	1962	3.0	35.0
Pittsburgh	1963	6.0	12.0
Century City	1967	2.0	27.8
San Antonio	1968	8.0	14.4
Omaha	1969	3.7	24.5

1980's

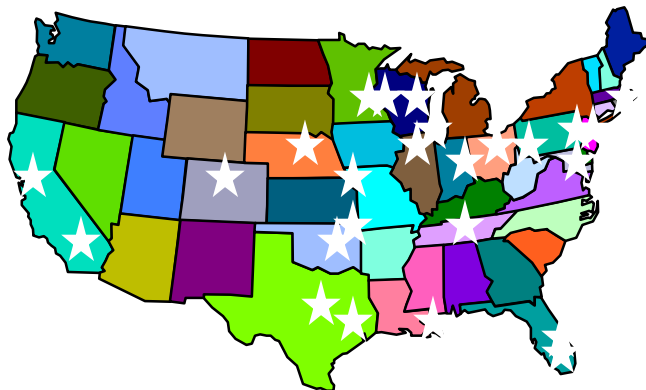
City	Year	Capacity (000's Tons)	
		Initial	Current
Tulsa	1985	0.9	15.5
Trenton	1988	7.8	7.8
Dade County	1989	2.5	6.0

1970's

City	Year	Capacity (000's Tons)	
		Initial	Current
Minneapolis	1972	6.0	35.0
Commerce City	1972	1.1	10.5
Nashville	1974	7.4	18.9

1990's & 2000's

City	Year	Capacity (000's Tons)	
		Initial	Current
Indianapolis	1990	2.4	42.1
St. Paul	1993	3.4	15.8
UTT-Chicago	1995	5.0	50.0
Trigen-Chicago	1996	12.2	19.9
Atlantic City	1997	2.7	49.0
Baltimore	1997	10.0	18.0
Denver	1998	4.0	12.0
Windsor	1998	2.3	3.2
Boston	1999	4.5	6.0
Houston	1999	17.0	17.0
Miami	1999	4.0	4.0
New Orleans	2000	12.0	12.0





Benefits Of District Cooling

(New Construction)

- Eliminates capital investment for chillers, cooling towers, pumps, etc.
- Can reduce new building costs by up to 5%.
- No surprises ~ financial requirements are predictable.
- You pay only for the cooling you use.
- Minimal space requirements ~ better use can be found for space “freed up”.
- District cooling allows customers to use bulk purchase of utilities and fuel to reduce costs.
- A group of buildings can use the peak load diversity to economic advantage.



Benefits Of District Cooling

(Continued)

- Reduces chemical handling, storage and emergency preparedness requirements.
- Eliminates refrigerant worries.
- Improves flexibility ~ building needs can go up or down without the need to change chiller capacity.
- District cooling is available all year long ~ no need for seasonal change over.
- Skill level of maintenance staff can be reduced.
- Eliminates maintenance headaches.



Benefits Of District Cooling (Continued)

- Reduces repair costs and system downtime.
- Know and manage actual cooling costs.
- Provides reliability, comfort and convenience.
- Reduced electric demand.
- Professional operation with energy experts that keep costs low with fuel and energy diversity.
- Technologies can be used in a central plant not practical for a single building.



Chillers and the CFC Problem

(Existing Buildings)

- Most older buildings have chillers with CFC's.
- Production of CFC's banned in December of 1995.
- CFC's are partially responsible for depleting the ozone layer and global warming.
- CFC regulations require technicians to have certification and specialized training.

CFC ~ Chlorofluorocarbon is a refrigerant that when released to the atmosphere destroys the ozone layer and therefore is banned by the USEPA.



Chillers and the CFC Problem

(Continued)

- Building owners that operate their own chillers accept the risk of accidental CFC release.
- The EPA can impose fines for the release of CFC's.
- The transport industry is competing for the remaining stock of CFC. Supply and demand will continue to force up the price.



District Cooling vs. In-House Chillers

How much money could you be saving?

Customer _____ Phone _____

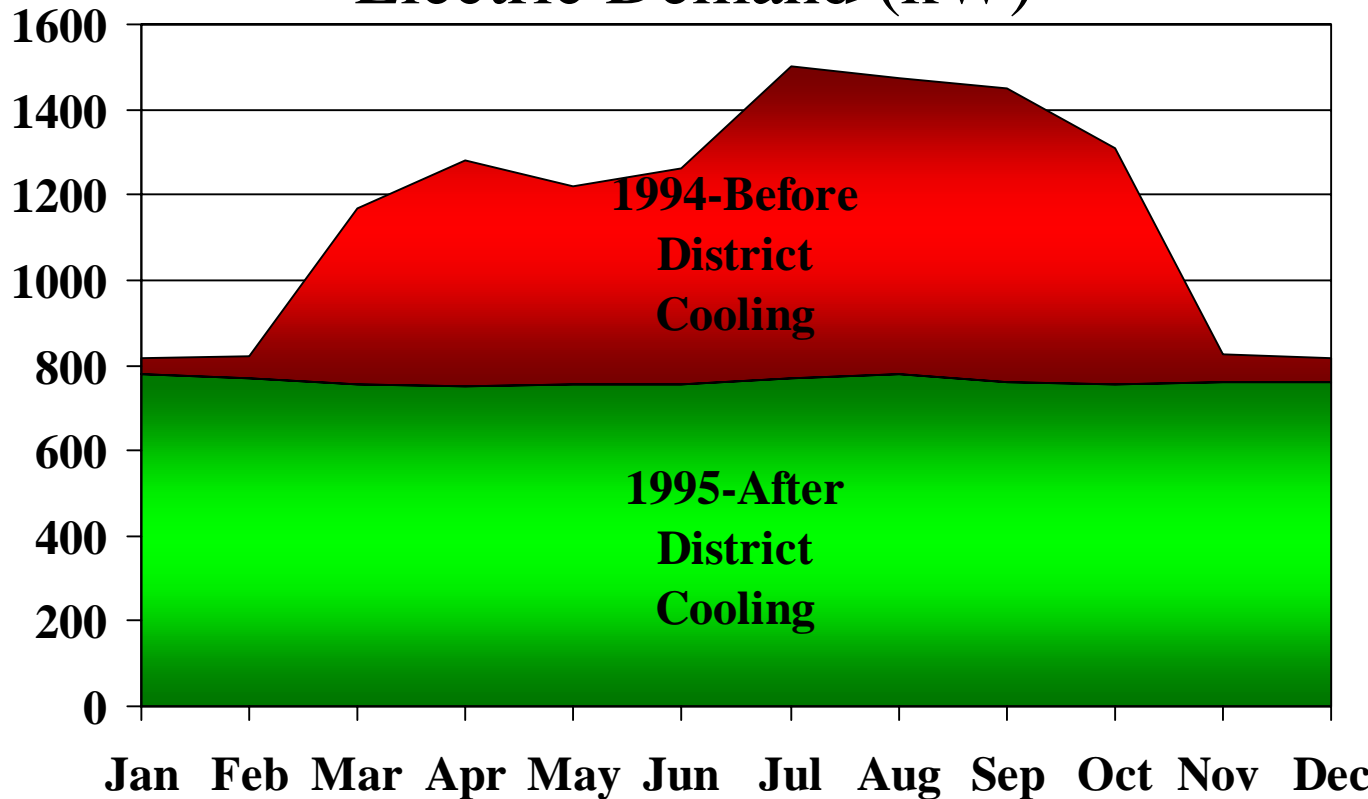
Building _____

Annual Chilled Water Usage _____

	Self Generating Costs	Thermal Ventures District Cooling
1. Electrical Energy	\$ _____	\$ -0-
2. Operating Labor	\$ _____	\$ -0-
3. Maintenance	\$ _____	\$ -0-
4. Parts & Refrigerant	\$ _____	\$ -0-
5. Insurance	\$ _____	\$ -0-
6. Water Make Up	\$ _____	\$ -0-
7. Water Treatment	\$ _____	\$ -0-
8. Renewal (Capital Costs)	\$ _____	\$ -0-
9. Administrative & General	\$ _____	\$ -0-
10. Depreciation	\$ _____	\$ -0-
11. Equipment Space Allocation	\$ _____	\$ -0-
12. Opportunity Cost (Core Business)	\$ _____	\$ -0-
13. Purchased Chilled Water	\$ -0-	\$ _____ /Year
14. Total Annual Costs	\$ _____ /Year	\$ _____ /Year
15. Unit Cost	\$ _____ /Ton-Hr.	\$ _____ /Ton-Hr.
16. THERMAL VENTURES SAVINGS		\$ _____ /Ton-Hr.
17. ANNUAL SAVINGS		\$ _____ /Year



Cuyahoga Savings Center Electric Demand (kW)



District Cooling reduces the cost of electricity for the building by shedding poor “load factor” and “on peak” demand charges.



Conclusion

- District cooling is a sound alternate to self generation of chilled water.
- The benefits for district cooling have generated demand throughout the United States.
 - There are over 40 operating systems and approximately 30 systems under review.



Conclusion

(Continued)

- Electric deregulation has improved the merits of district cooling because electricity for chillers will no longer be subsidized by other electric users.
- District cooling allows asset owners to focus their time, energy, dollars and space on their core business.
- District cooling historically saves building owners money on both upfront capital costs and ongoing operating costs while enjoying improved reliability possible with a district energy plant that typically employs redundant systems not practical in a typical in building system.



Why outsource your thermal energy needs?

Improve focus on your core mission ~ Reduce and control your operating costs

Free your resources for other tasks ~ Reduce capital obligations

Gain access to expertise

For complete information on the benefits of district cooling

please call Derek Northall

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