



**Water Environment
Association**

*Preserving & Enhancing
Ohio's Water Environment*

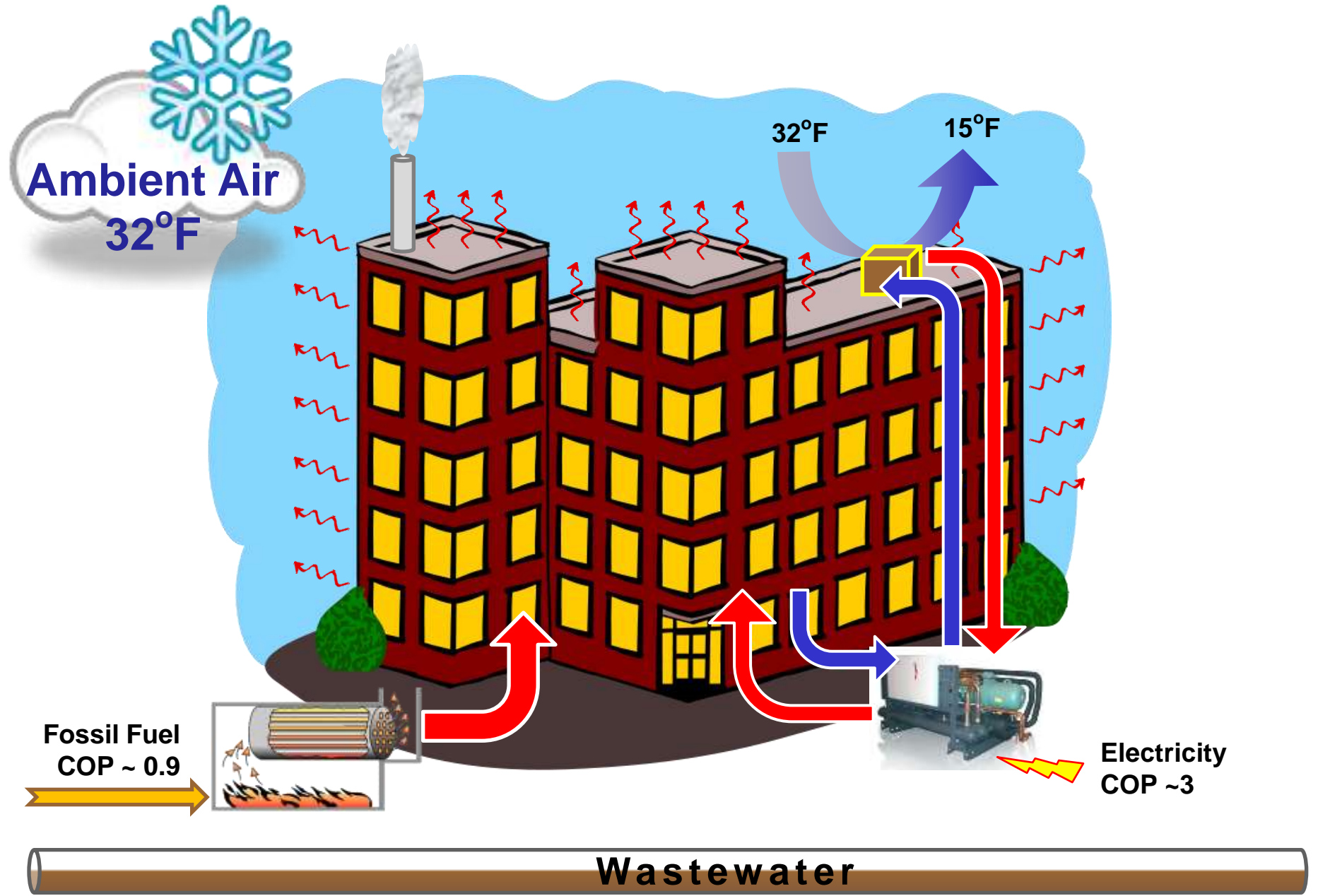


Extracting Energy from Wastewater to Heat and Cool Buildings

Energy Savings for Building Owners
and
New Income for Water Utilities

**Frank Scriver
Regional Sales Manager
Huber Technology, Inc.**

Winter - Conventional HVAC Solutions

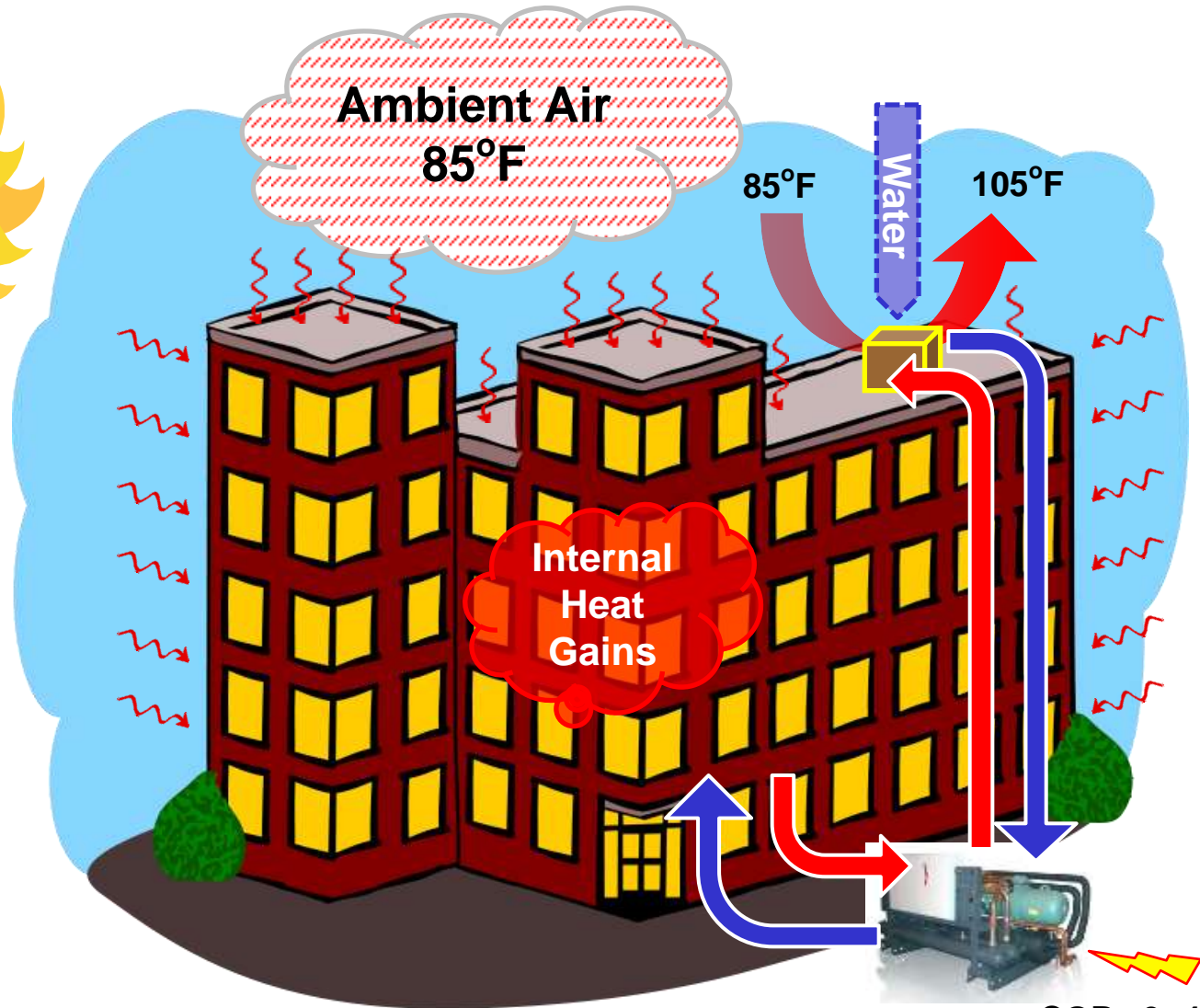


Fossil Fuel
COP ~ 0.9

Electricity
COP ~ 3

Wastewater

Summer – Conventional HVAC Solutions



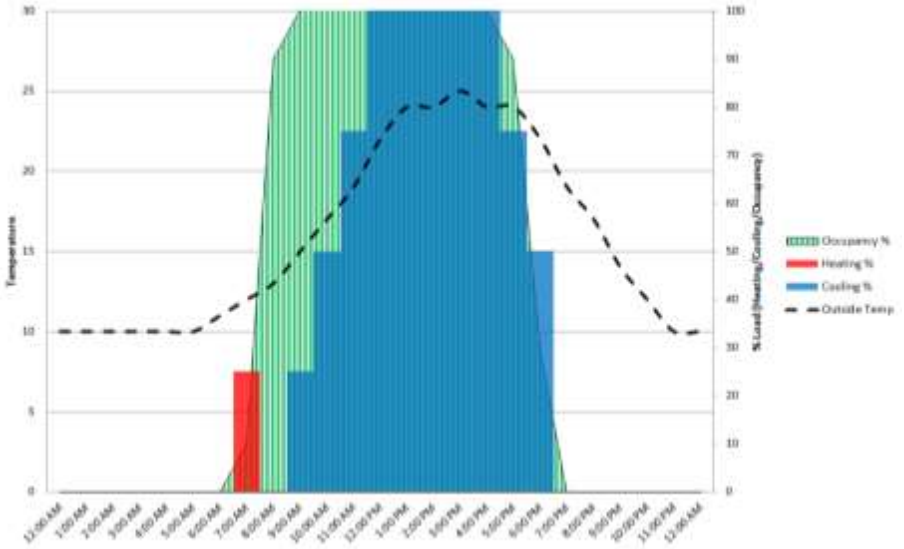
COP ~3-4
Electricity



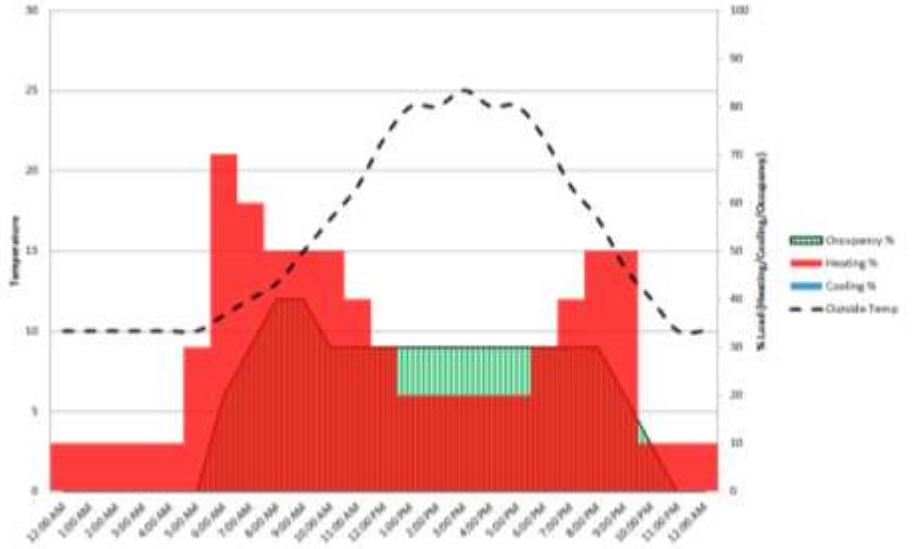
Wastewater

Different Buildings Use Energy Differently

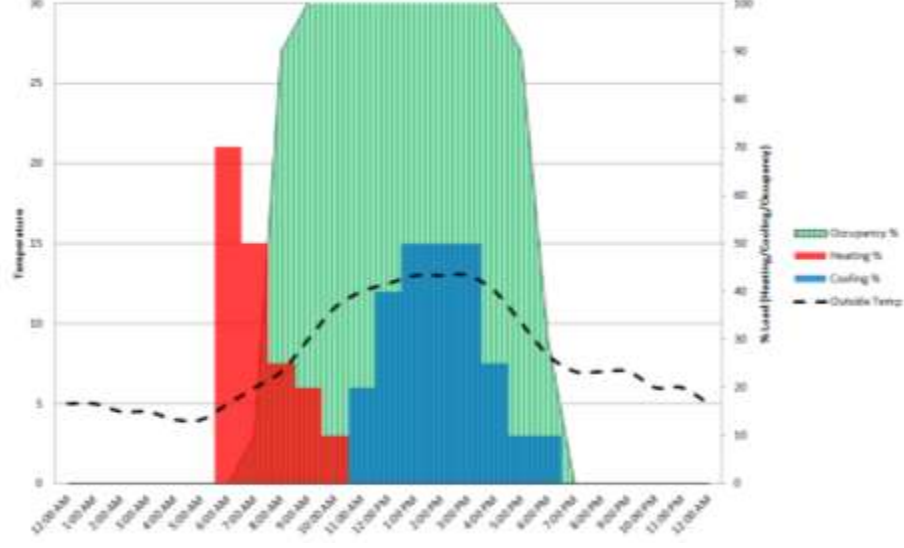
Typical Office Building Summer Energy Profile



Typical Leisure Centre Summer Energy Profile



Typical Office Building Winter Energy Profile



Typical Leisure Centre Winter Energy Profile



11 Story Office Building - London

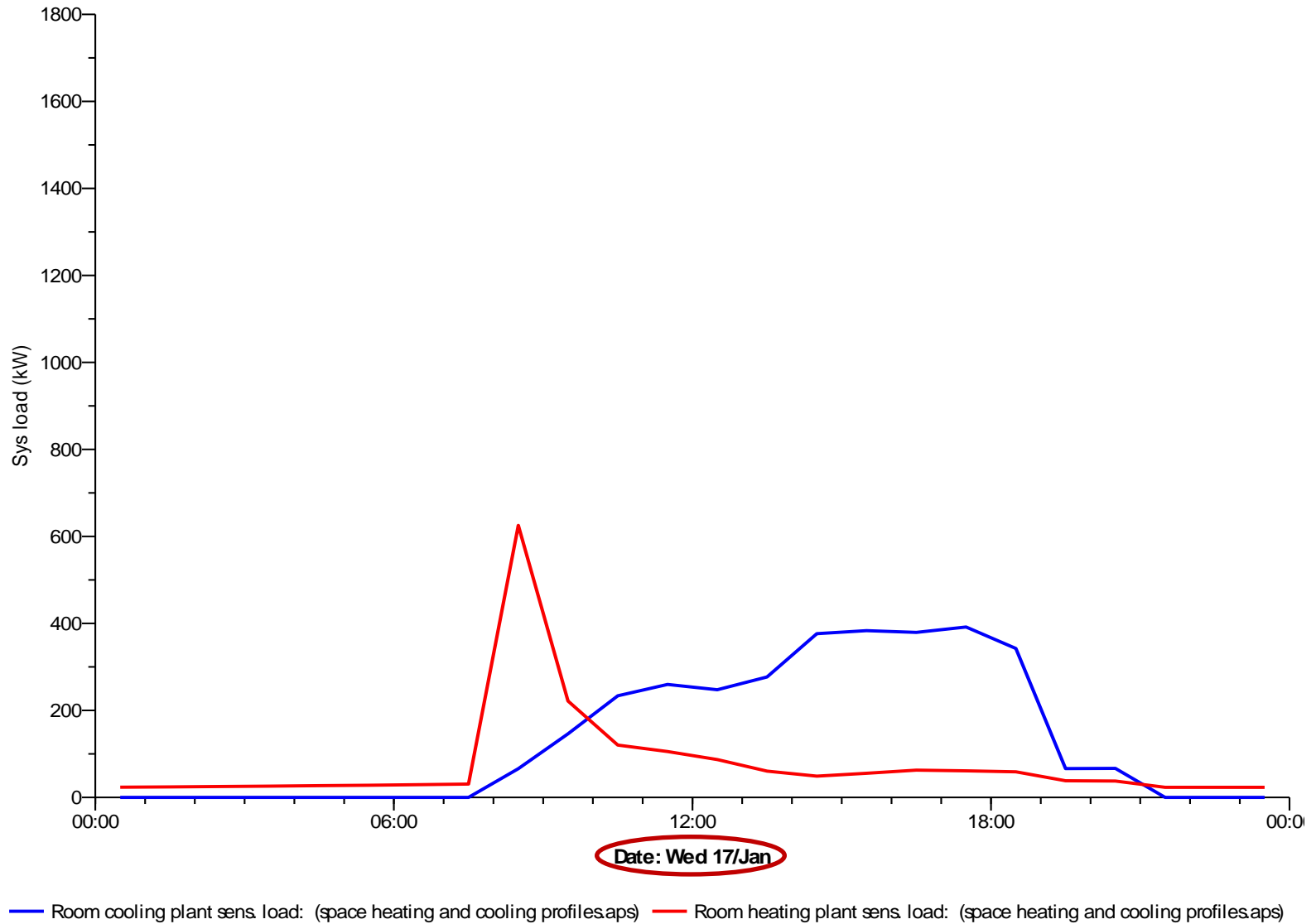
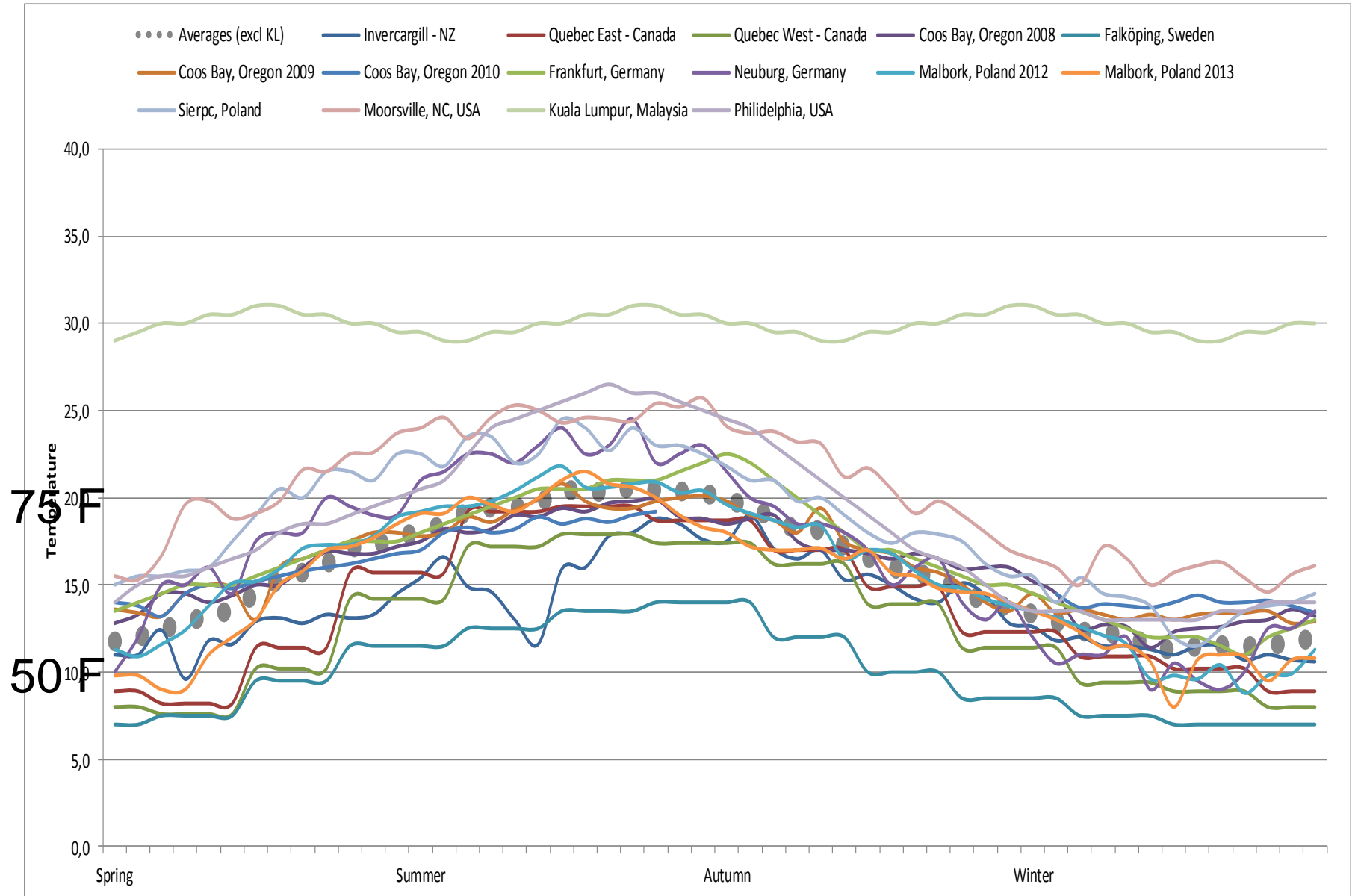


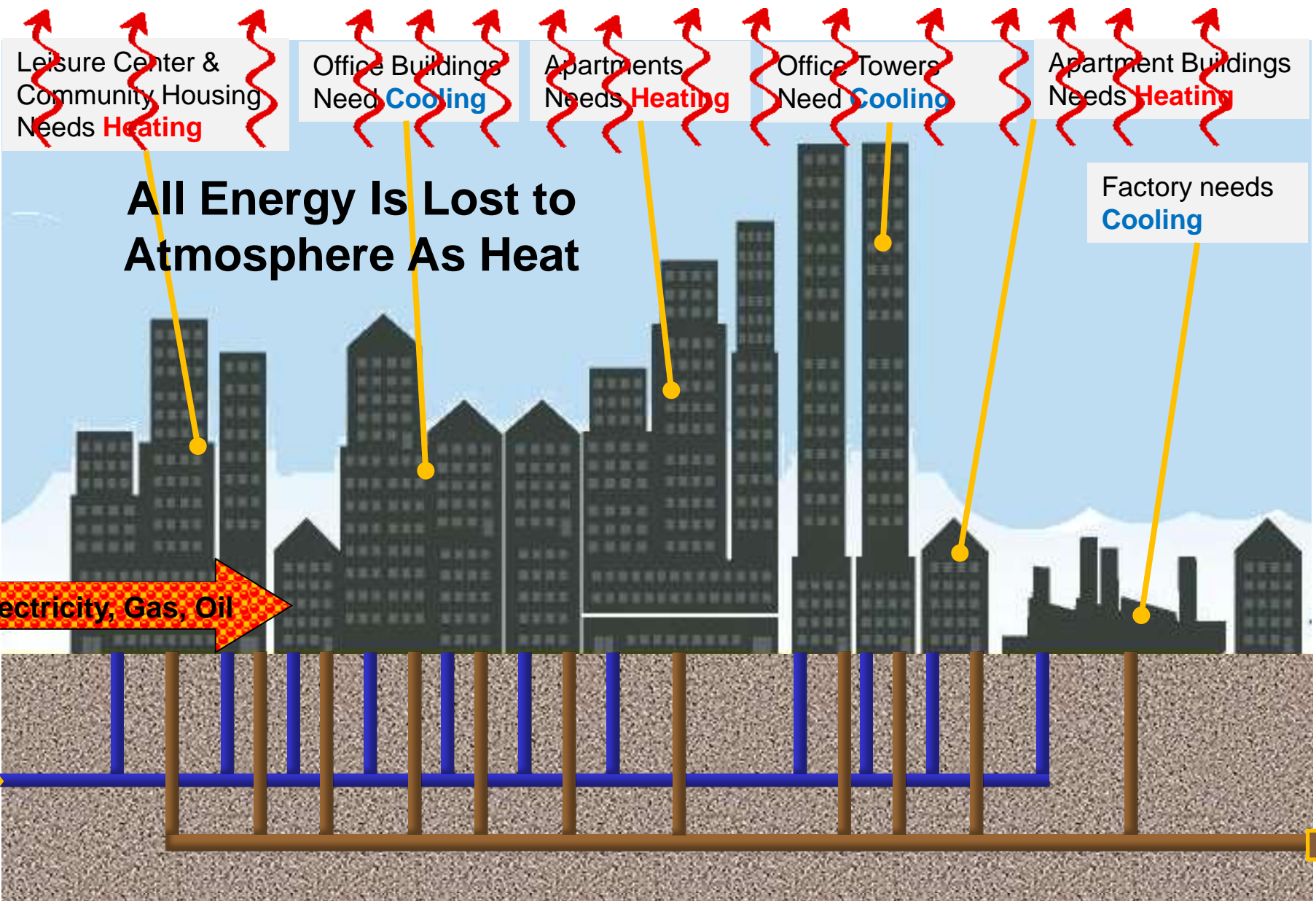
Chart data supplied by



Wastewater Temperatures



Typical City of Today - Energy



Leisure Center & Community Housing Needs Heating

Office Buildings Need Cooling

Apartments Needs Heating

Office Towers Need Cooling

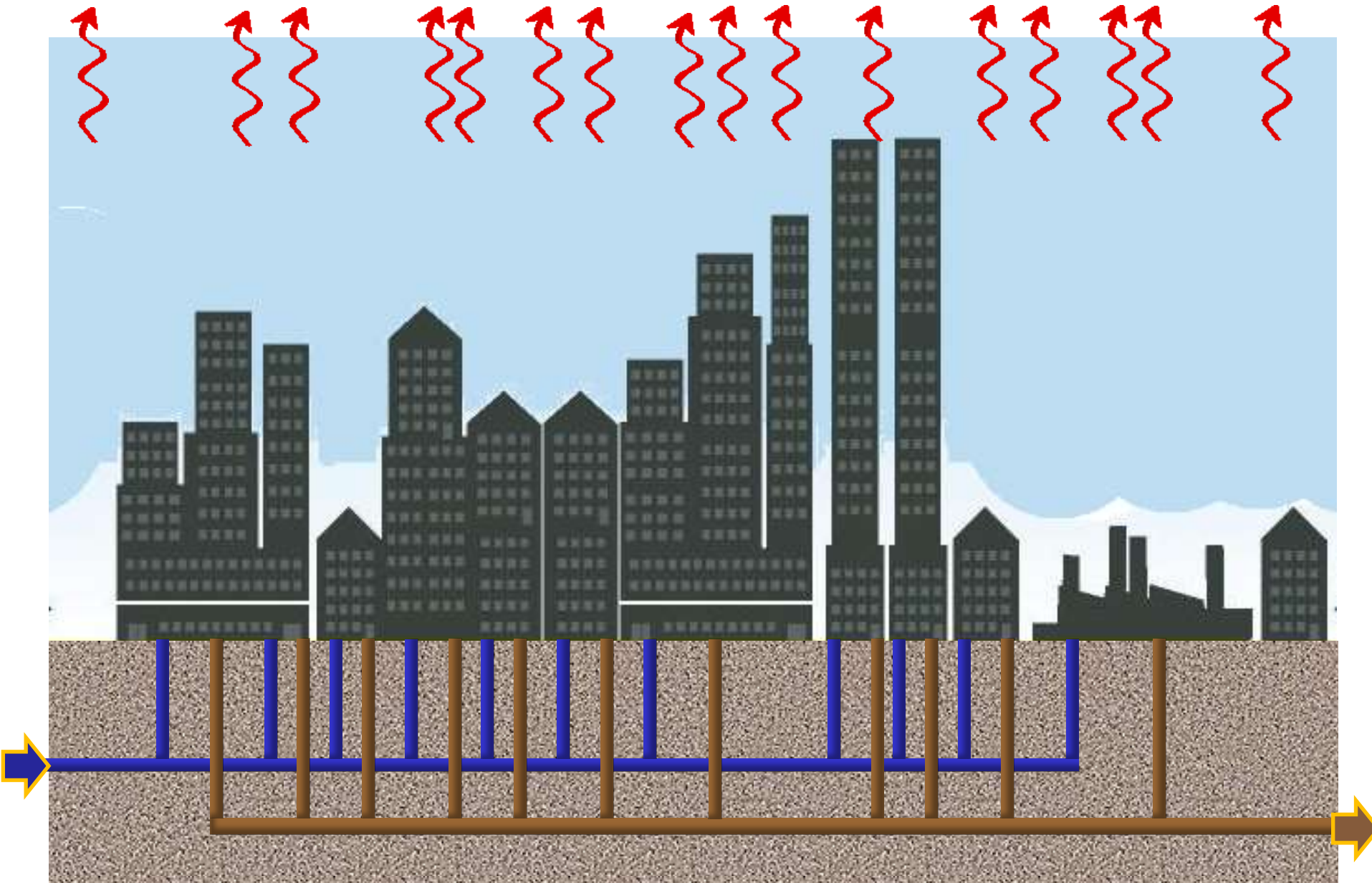
Apartment Buildings Needs Heating

Factory needs Cooling

All Energy Is Lost to Atmosphere As Heat

Electricity, Gas, Oil

The Idea – Capture Energy & Move Into Wastewater



Wastewater Has Neutral Temperatures

Winter
Ambient Air
32°F
Cp= 1.02

& Good Energy Properties

Summer
Ambient Air
85°F
Cp= 1.02

Target
Indoor Temp
70°F

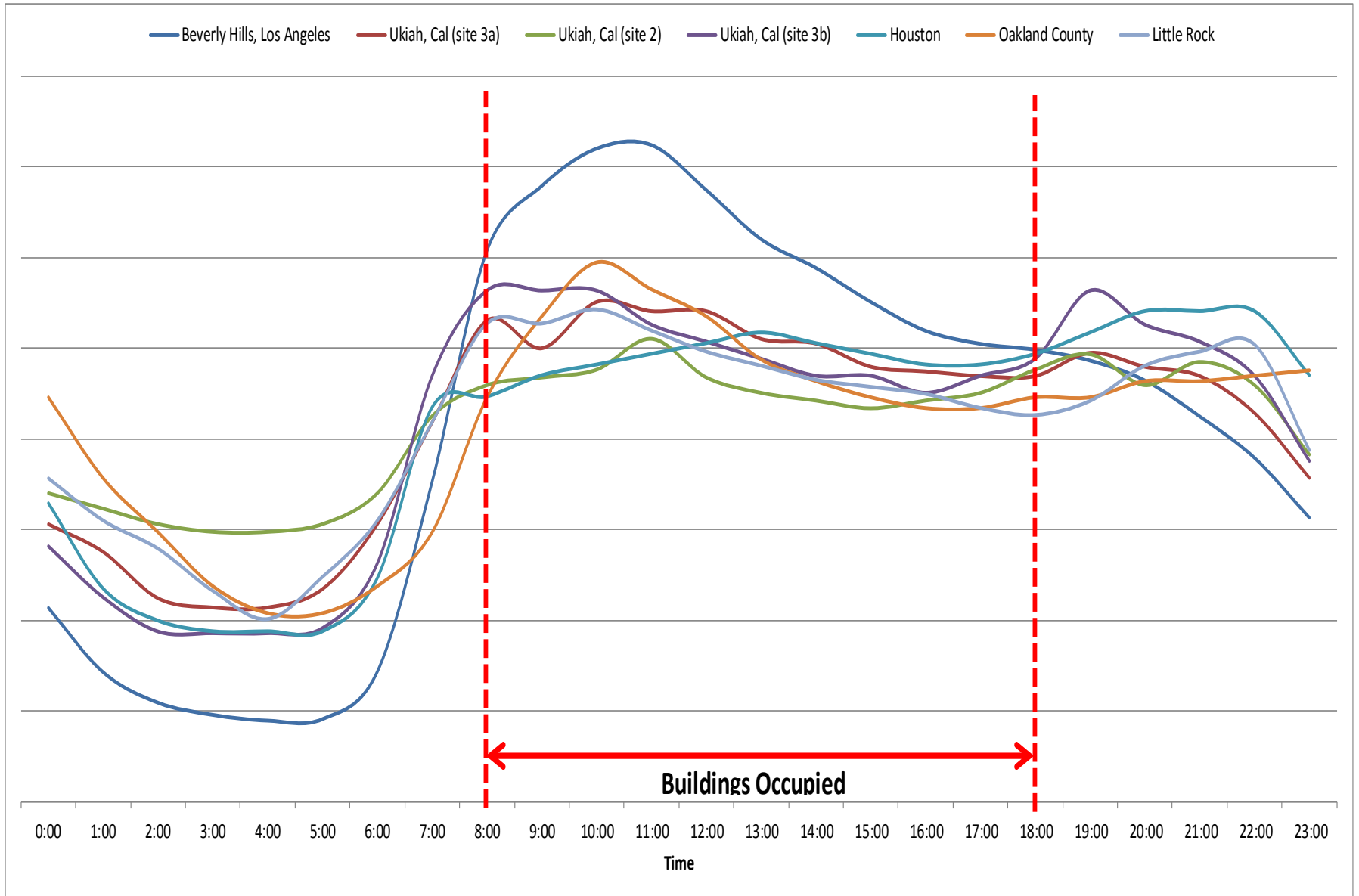
50°F-55°F
Cp = 4.2

55°F-60°F
Cp = 4.2

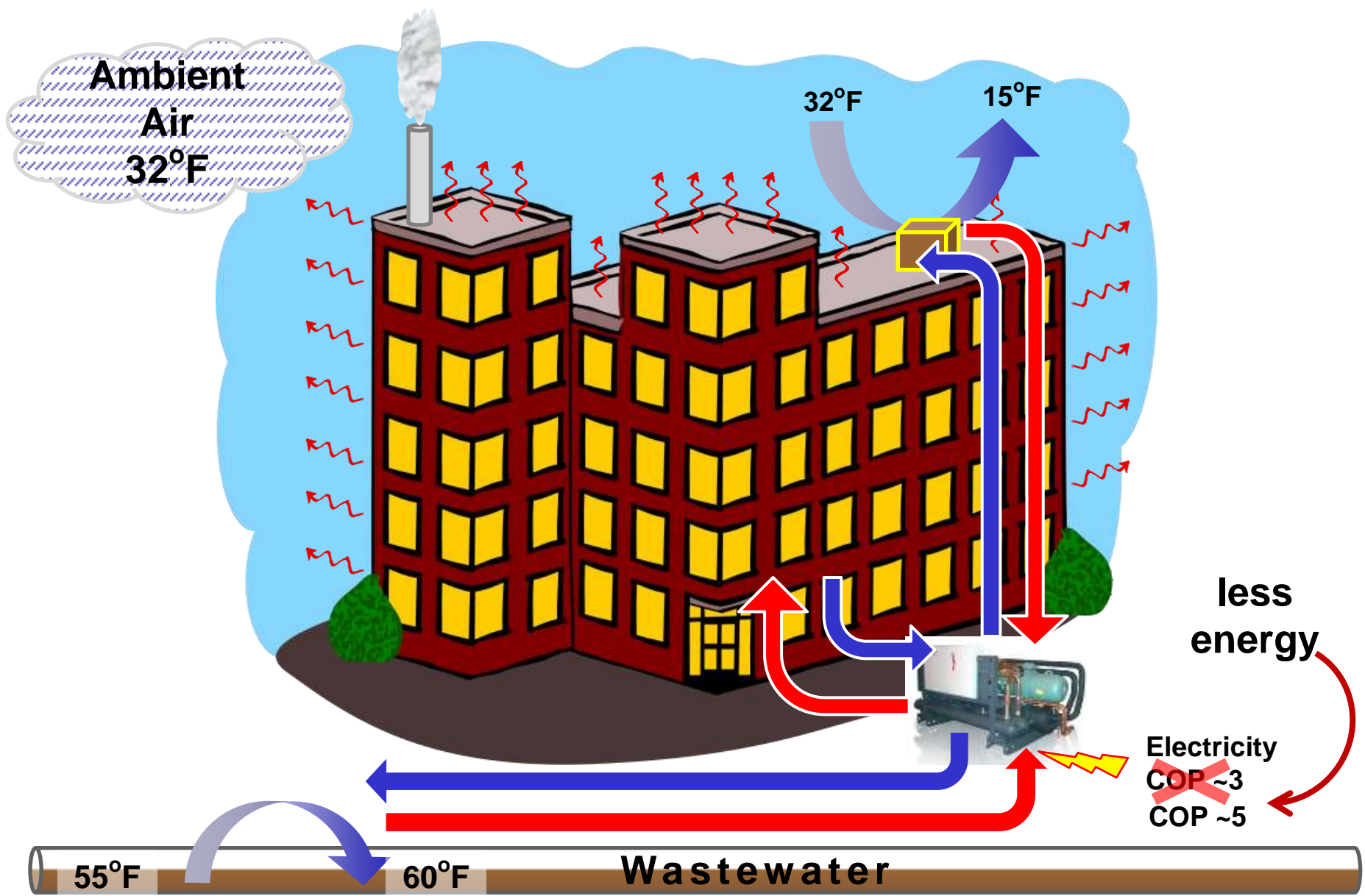
Wastewater



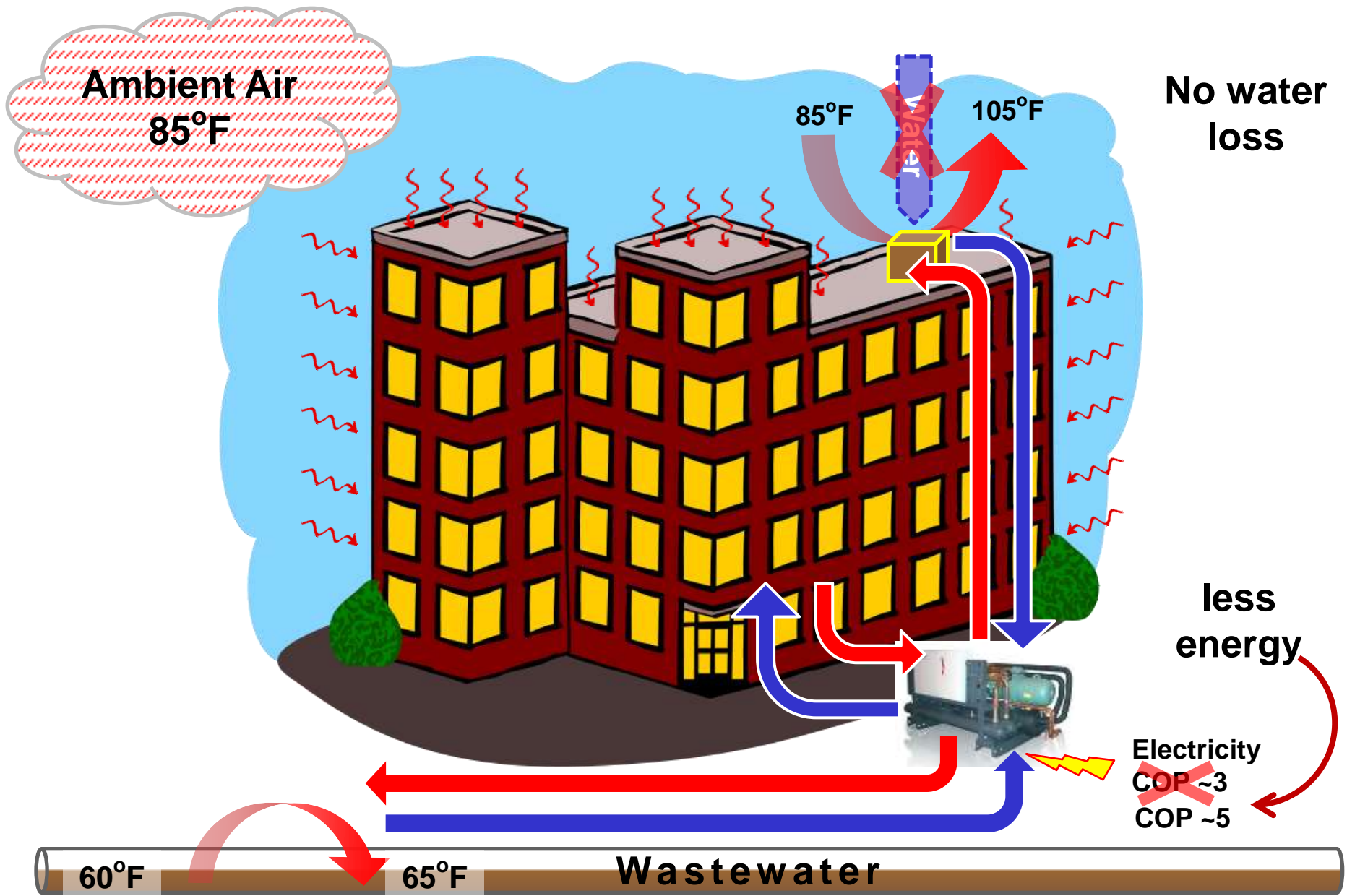
Wastewater Daily Flow Profiles



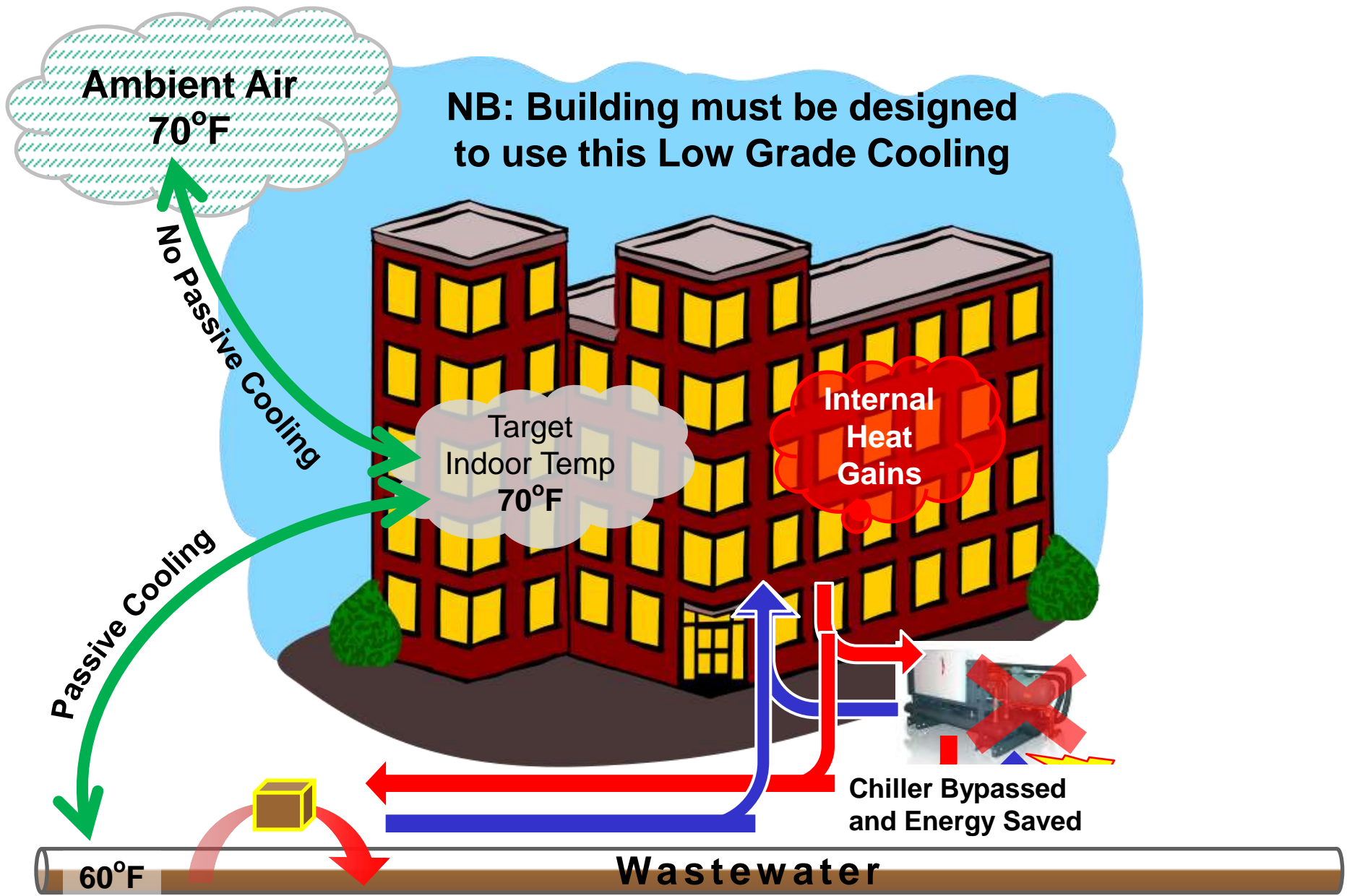
Winter Example



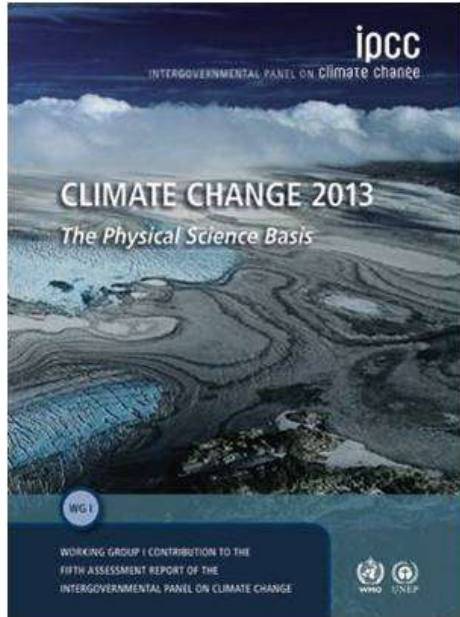
Summer Example



Shoulder Seasons (Spring/Autumn) Example



Many Things Coinciding = Now Is The Right Time

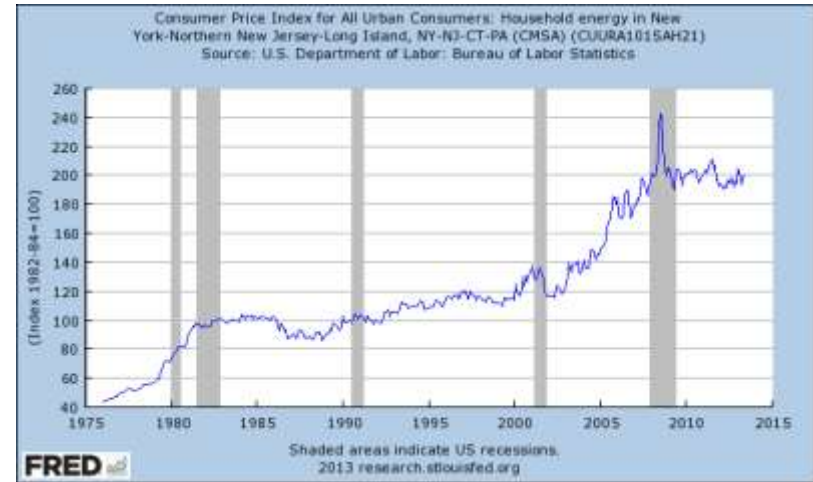


Climate Change +
G20 Agreement
on HFC's.

=

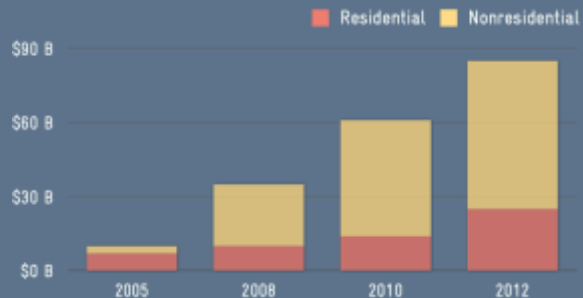
Climate Friendly
Solutions Must Be
Found

Rising Energy Prices



More Energy Efficient Buildings

GREEN BUILDING IS GROWING...



Source: Green Market Size, Harvey Bernstein, McGraw-Hill Construction, Outlook Executive Conference 2012

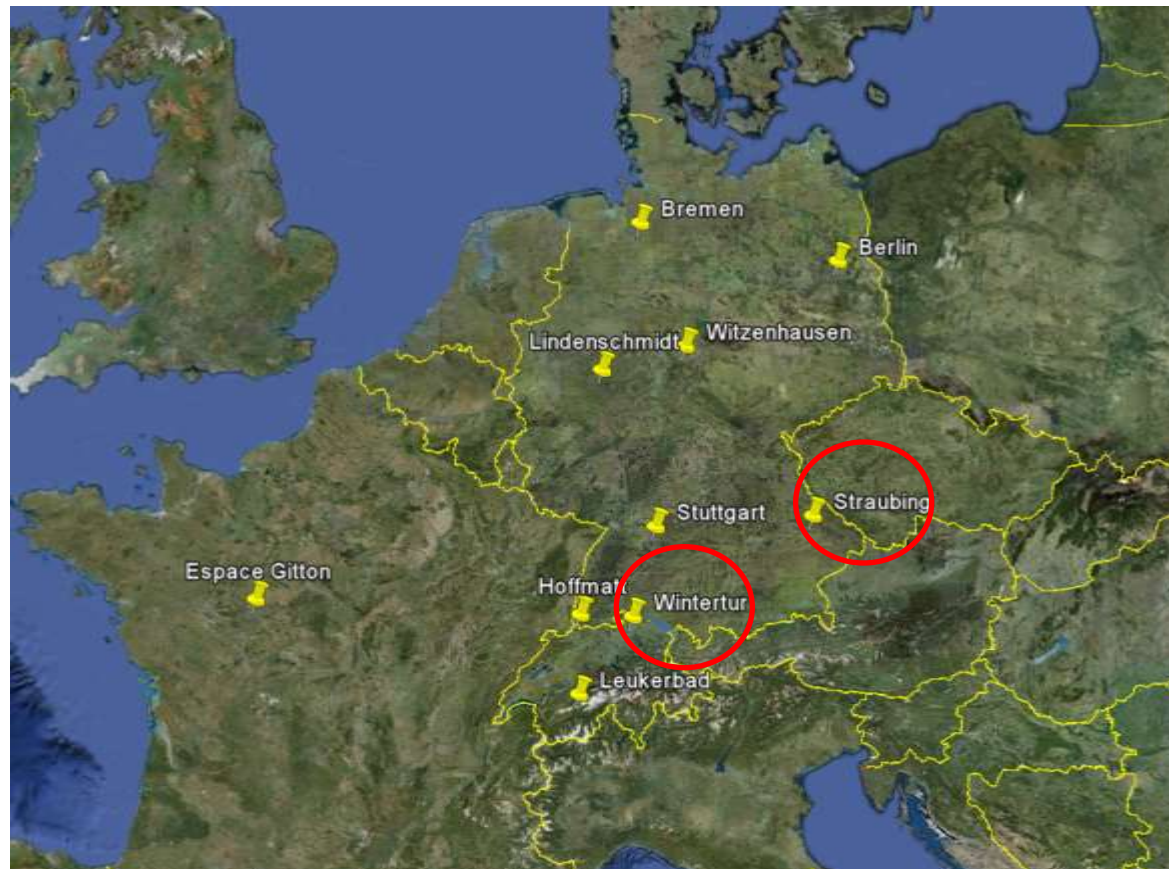
New Technology Available



Wastewater Energy Installations

- Worldwide ~400 – 500 systems installed
- China's Tianjin City, (pop 10 million) building code requires building designers to evaluate this system for all new developments.
- Some Projects Already Installed by HUBER Follow.....

HUBER Installations



Germany: 6
Switzerland: 3
France: 1

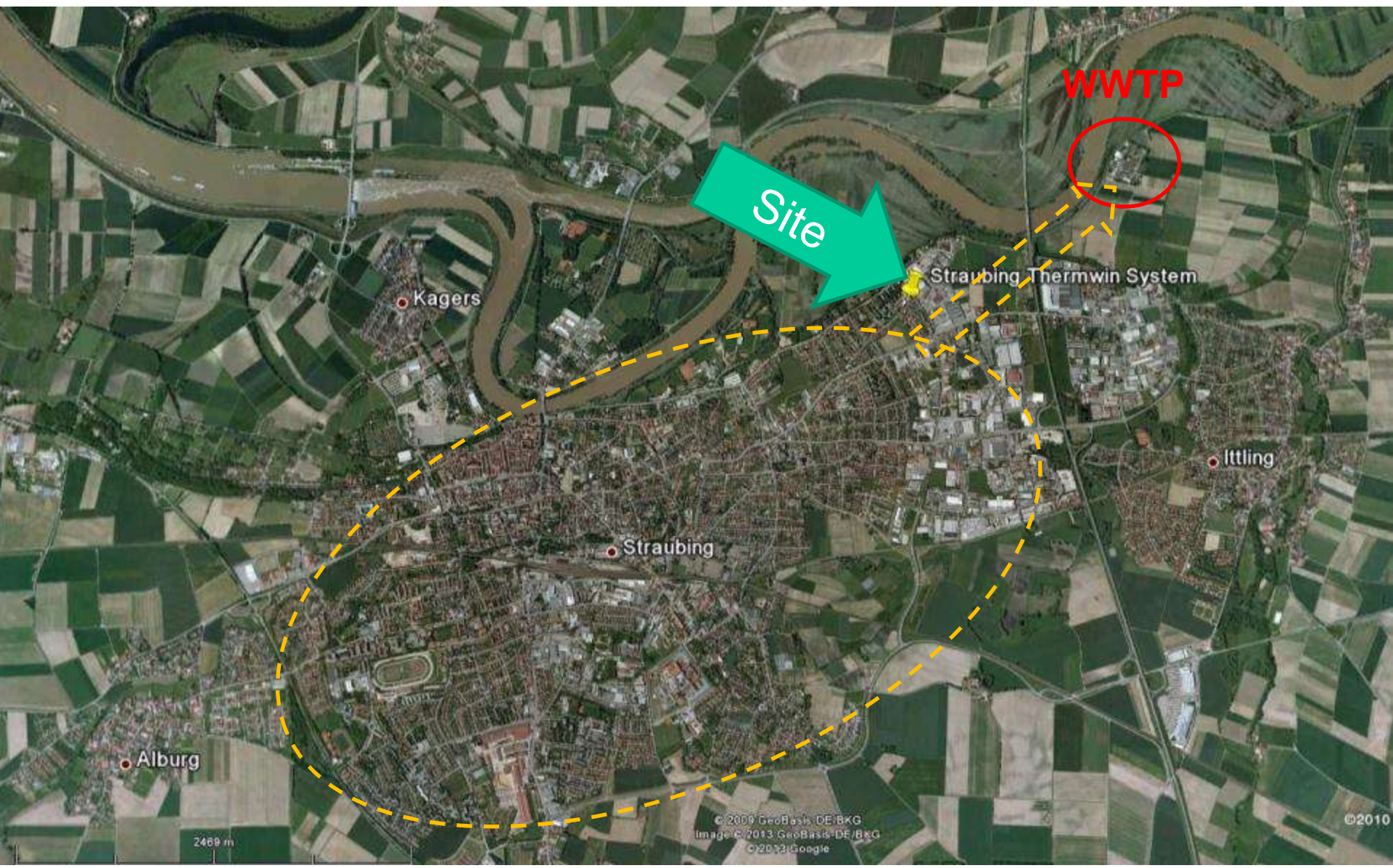
Canada: 1
(startup 3/2015)



Straubing – Germany



Straubing – Germany



Straubing - Germany

102 Apartments in Total, spread over 5 buildings
ThermWin system in operation since October 2010

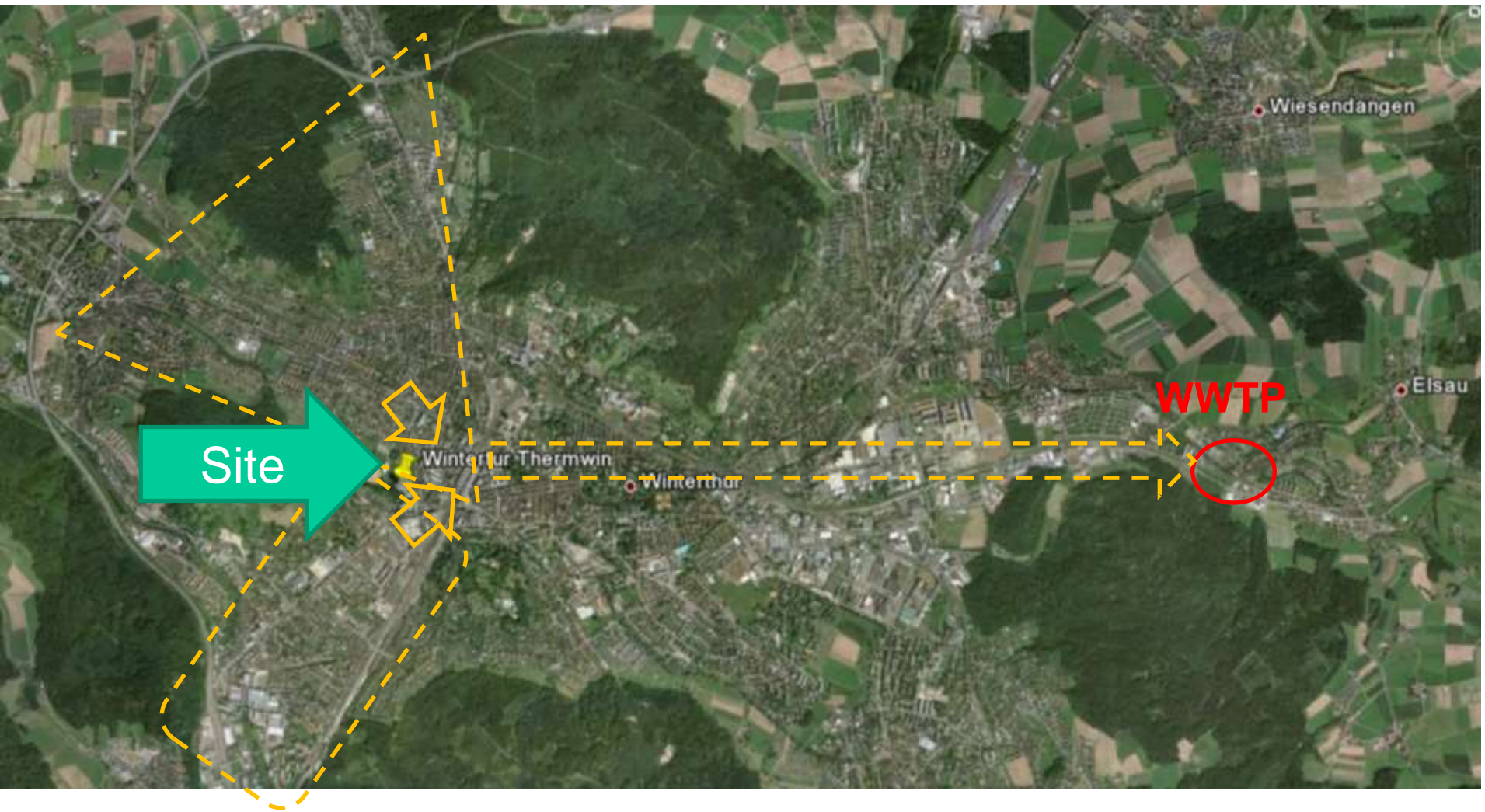




Winterthur – Switzerland



Winterthur – Switzerland



Winterthur - Switzerland



99m high with 28 levels.

The system provides 480kW of heating & 840kW of cooling.

Coefficient of Performance (COP) of approximately 5-6.

In operation since February 2011



The Untapped Potential

Example: New York City

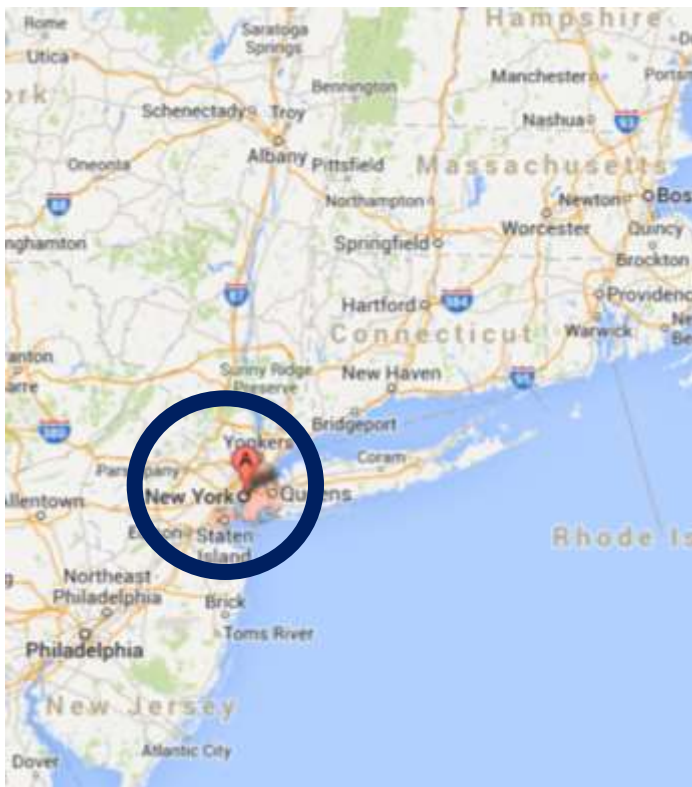
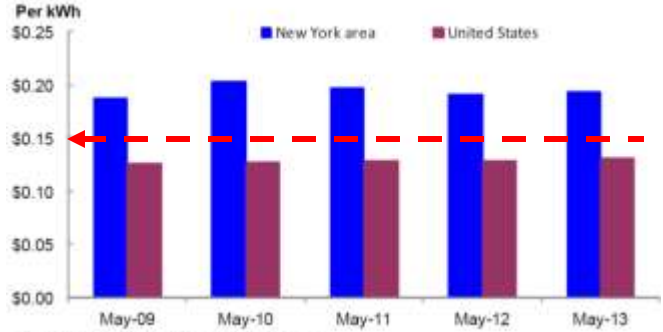


Chart 2. Average prices for electricity, New York-Northern New Jersey-Long Island and the United States, 2009-2013 (as of May)



\$0.15/kWh
(commercial users)

Source: U.S. Bureau of Labor Statistics

Chart 3. Average prices for utility (piped) gas, New York-Northern New Jersey-Long Island and the United States, 2009-2013 (as of May)



\$0.80/therm
(commercial users)
~ \$0.03/kWh

Source: U.S. Bureau of Labor Statistics

Daily Water Handled	Change Temp By:	Energy Released	% Commercial Buildings Energy	Value of Energy @Electricity @Gas
1,300 MGD	10°F	10,500 GWh/year	15%	\$1.6 Billion \$315 million

New York WWTP's

Water Pollution Control Plants		
Area No.	Location (North, South, East)	Capacity
		Mgd
①	North	
②	Bowery Bay	150
③	Hunts Point	200
④	Tallman Island	80
④	Wards Island	275
5	South	
6	Newtown Creek	310
7	North River	170
⑦	Oakwood Beach	40
8	Port Richmond	60
⑨	Red Hook	60
⑩	East	
11	26th Ward	85
⑫	Coney Island	110
⑫	Jamaica	100
13	Owls Head	120
14	Rockaway	45
Total		1805

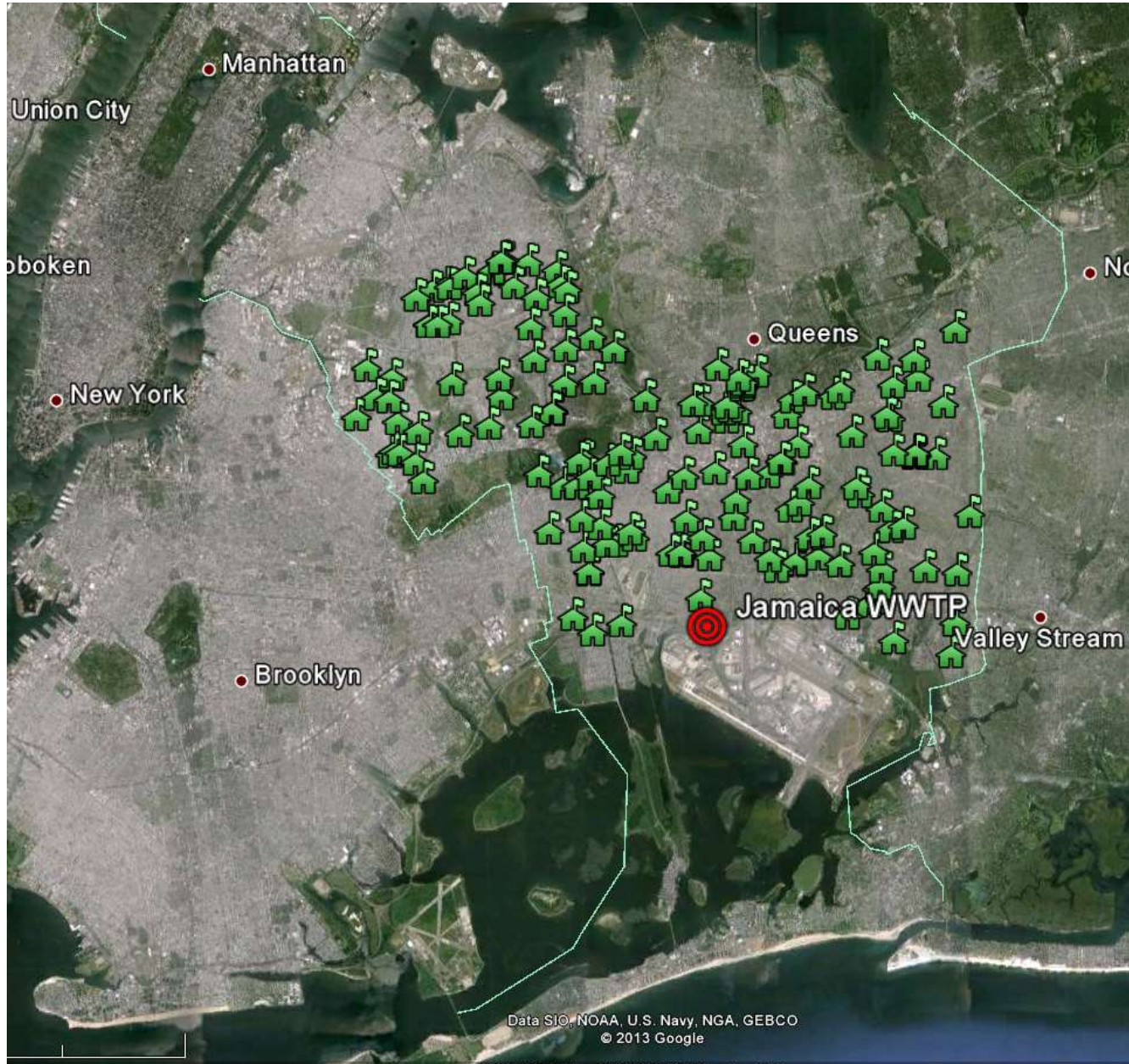
- Legend**
- W.P.C.P
 - Service Area Boundary
 - ① Service Area Number
 - Plant has Dewatering



100Mgd @
10°F temp
change
provides
60,000kW
energy

Jamaica WWTP

Schools in the Queens Borough



~160 schools in Queens are close(ish) to Jamaica WWTP within districts 24, 27, 28 & 29

60,000 kW is enough energy to heat and cool ~120-150 of these schools
That is an \$120 Million dollar PER YEAR opportunity for DEP

Implementation

Massachusetts on the leading edge



Department of Energy Resources (DOER)

- PON ON-ENE-2014-025 has grant money available for implementing this exact technology (@ 2 Grants still Available!)



- Barnstable has been awarded a grant to pilot the Huber ThermWin technology, with GHD as the engineering consultant.
- Replacing/ supplementing cooling towers on the City Hall cooling (Chillers) system
- Using water at a PS across the street
- Installation #1 in North America- Quebec City
- Will start up next month



The Good Points

1. In Developed Cities the Infrastructure is there.

Modifications required are relatively modest.

In Developing Cities, where infrastructure is not yet there, it should be easier than in Developed Cities & the cost penalty is likely to be relatively small.

2. The Water is there!

Water will flow irrespective of seasons/wind/sun.

3. The Value is Easy to Establish.

Energy prices are well known.

4. Customer Acceptance is Good.

Everyone expects to pay for energy!

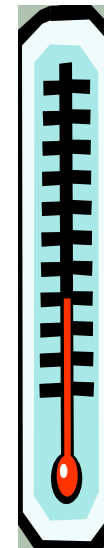
The Limitations

The Wastewater flow is one way.



The Energy available is variable. It is limited by available flows and acceptable temperature limits.

The heating energy available is relatively low grade (~60°F max).



Potential Opportunities- Municipal

➔ Heating and Cooling applications at WWTP

- ➔ Admin buildings/ comfort HVAC
- ➔ Biosolids drying
- ➔ Green Technology showcase

➔ Problem' Customers

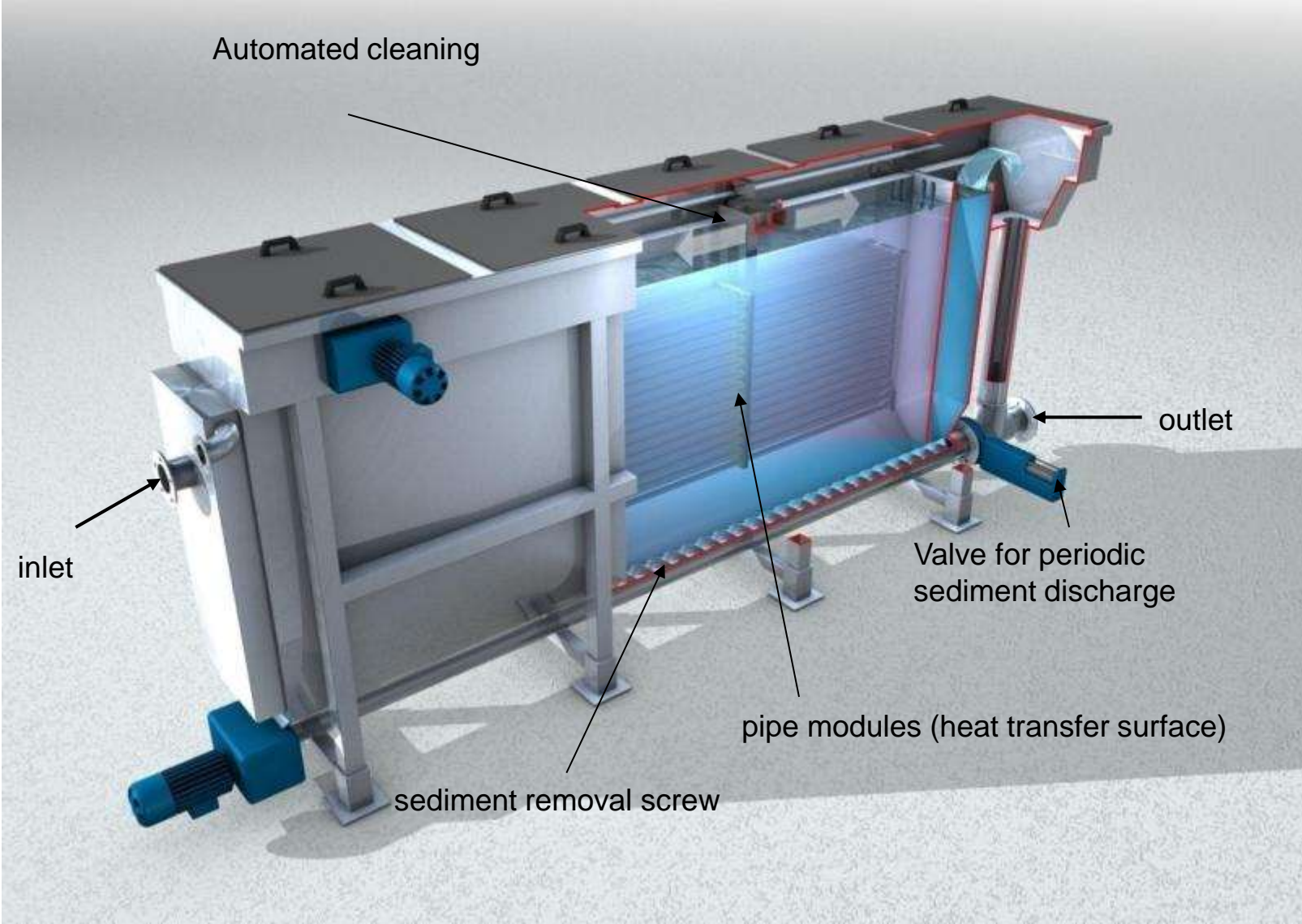
- ➔ Customers with hot waste water and/or must quench their waste water to meet temp limits

➔ Potential Revenue Stream

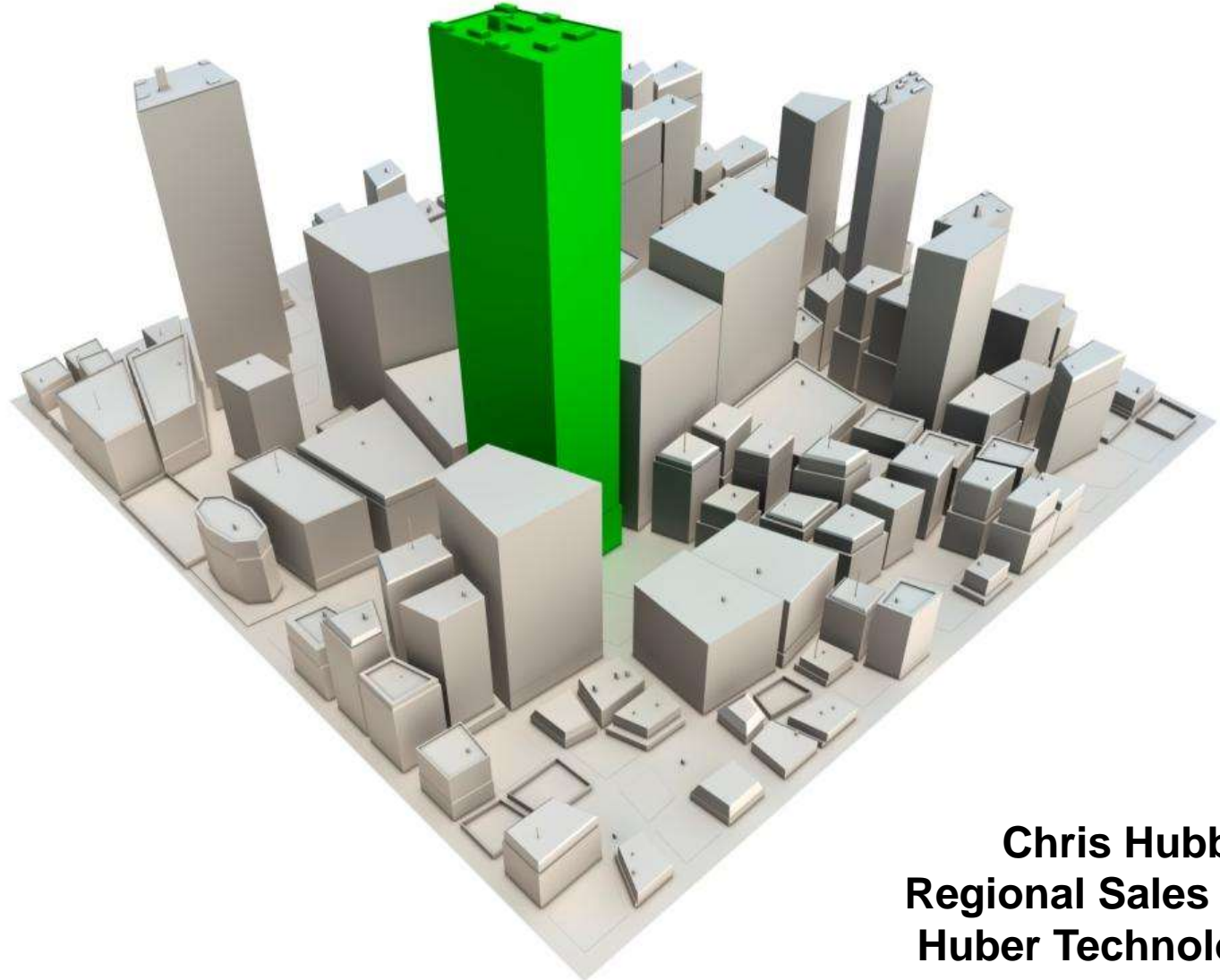
- ➔ Energy for heating and cooling, especially in a district system.
- ➔ Being explored by Washington DC, Boise, ID, others.

Wastewater Heat Exchanger

HUBER RoWin Heat Exchanger



Many Thanks & Questions?



Chris Hubbard
Regional Sales Manager
Huber Technology, Inc.