

Three Technologies that Could be a Game Changer

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Technologies that can make a real difference

On-Site Sources of Water Save Both Energy and Water

The Cooling Tower Conundrum – Are there other ways to be both energy and water efficient

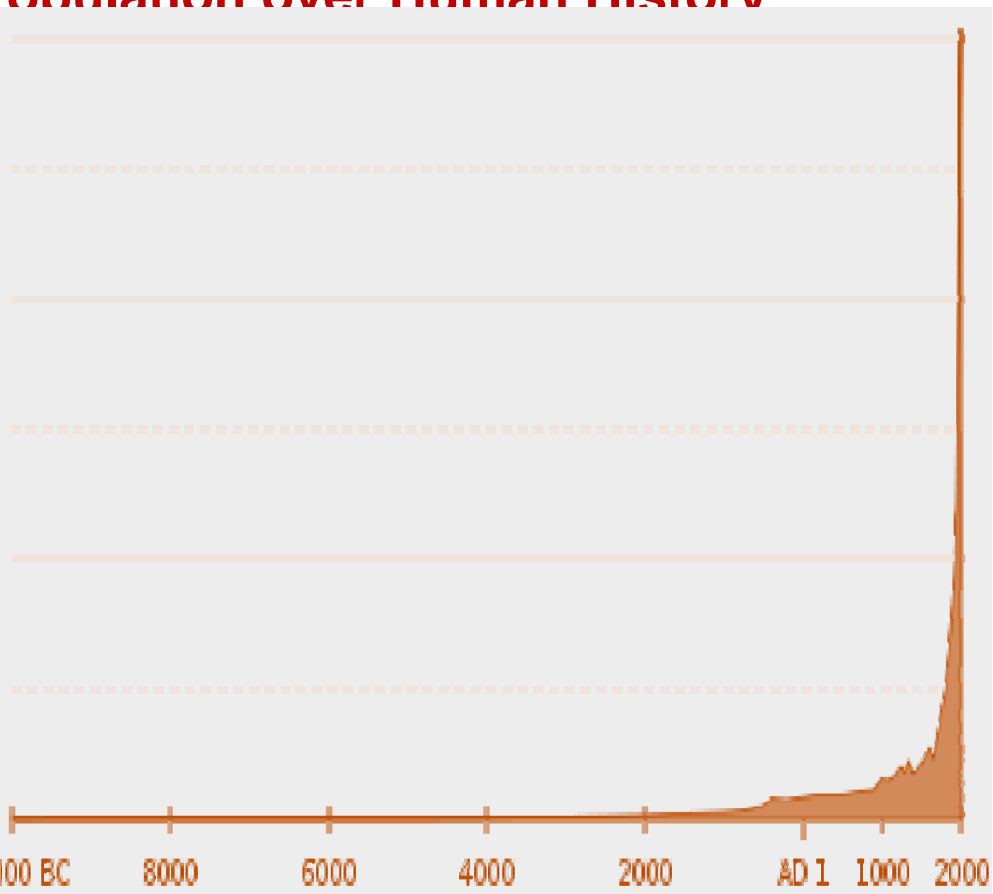
The *DIPPER WELL*. Finally something new!

What is driving this innovation?

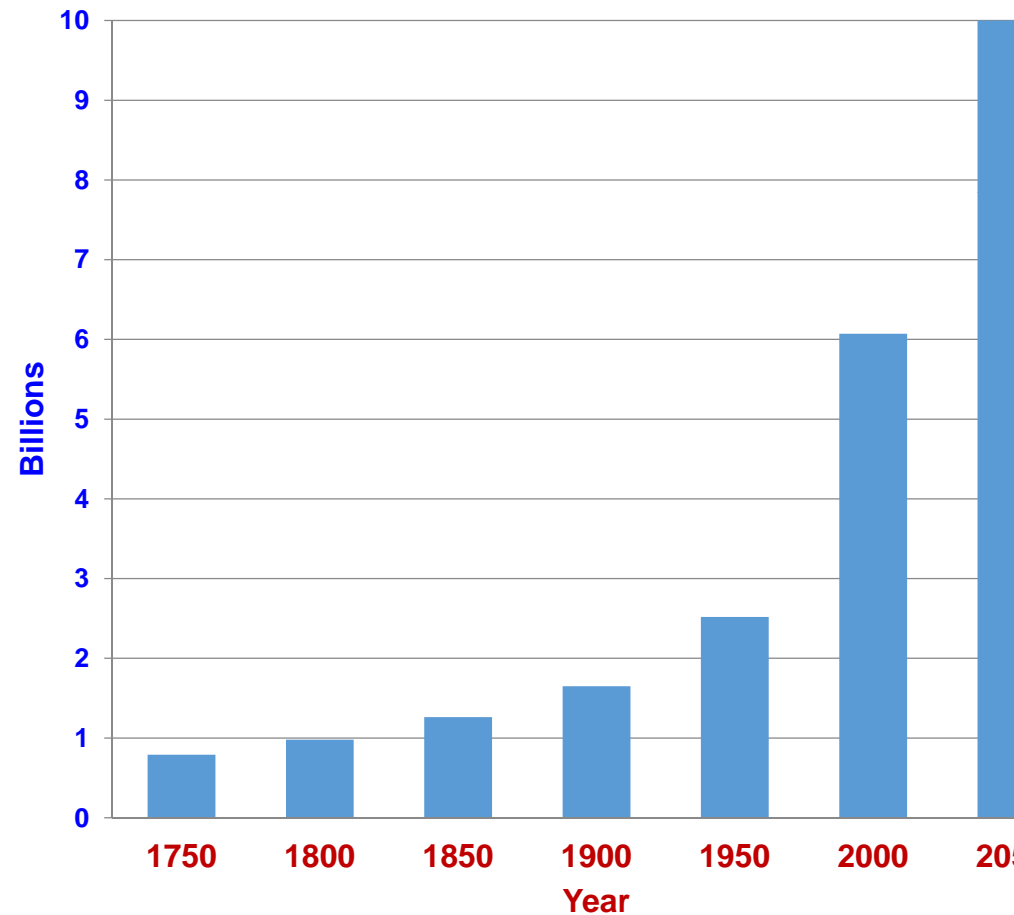
World Population

And All Need Water!

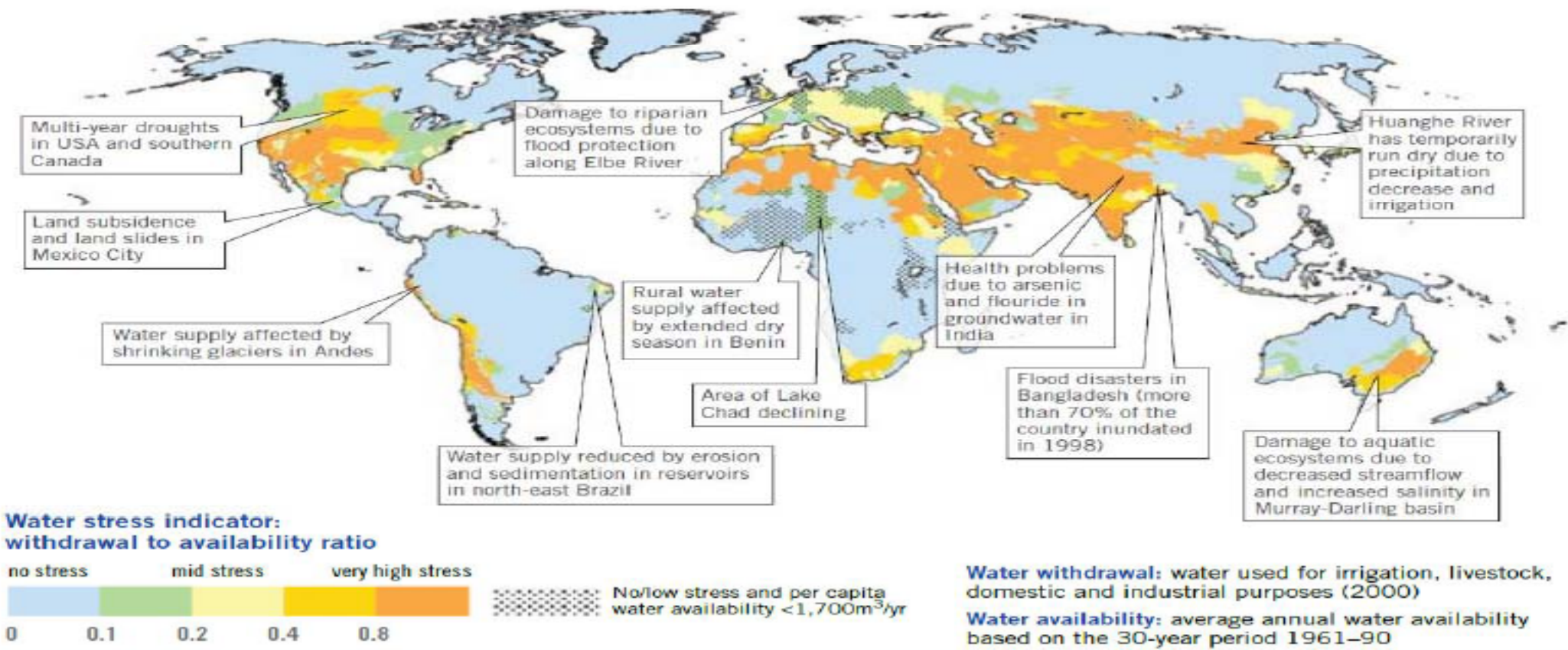
Population over Human History



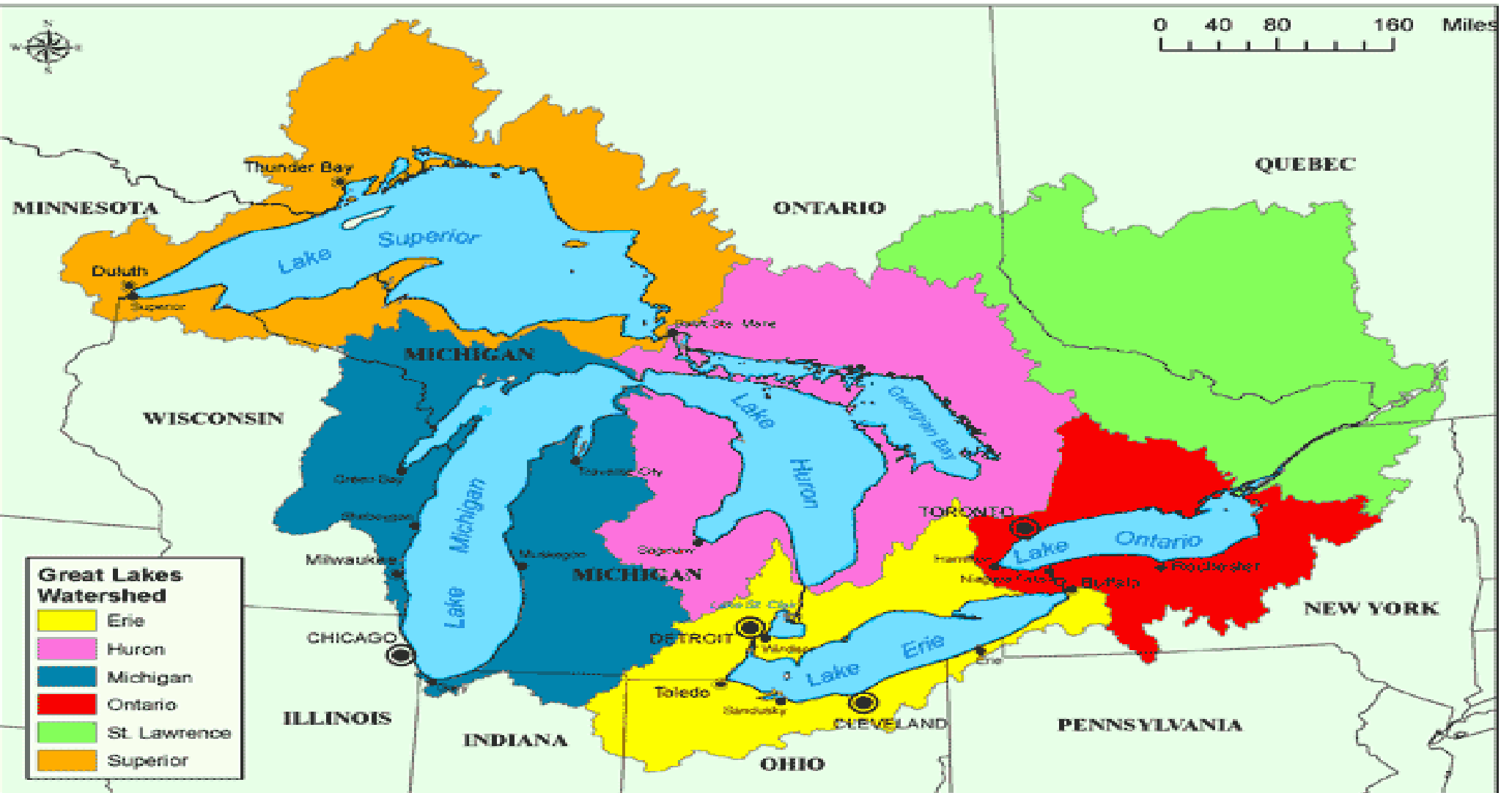
World Population since 1750



GLOBAL WATER SUPPLY STRESS RISK IS GROWING IN POPULATED REGIONS



Even in Chicago, the Mayor Wants to Double Water Rates!



Long-term trends in consumer prices (CPI) for utilities

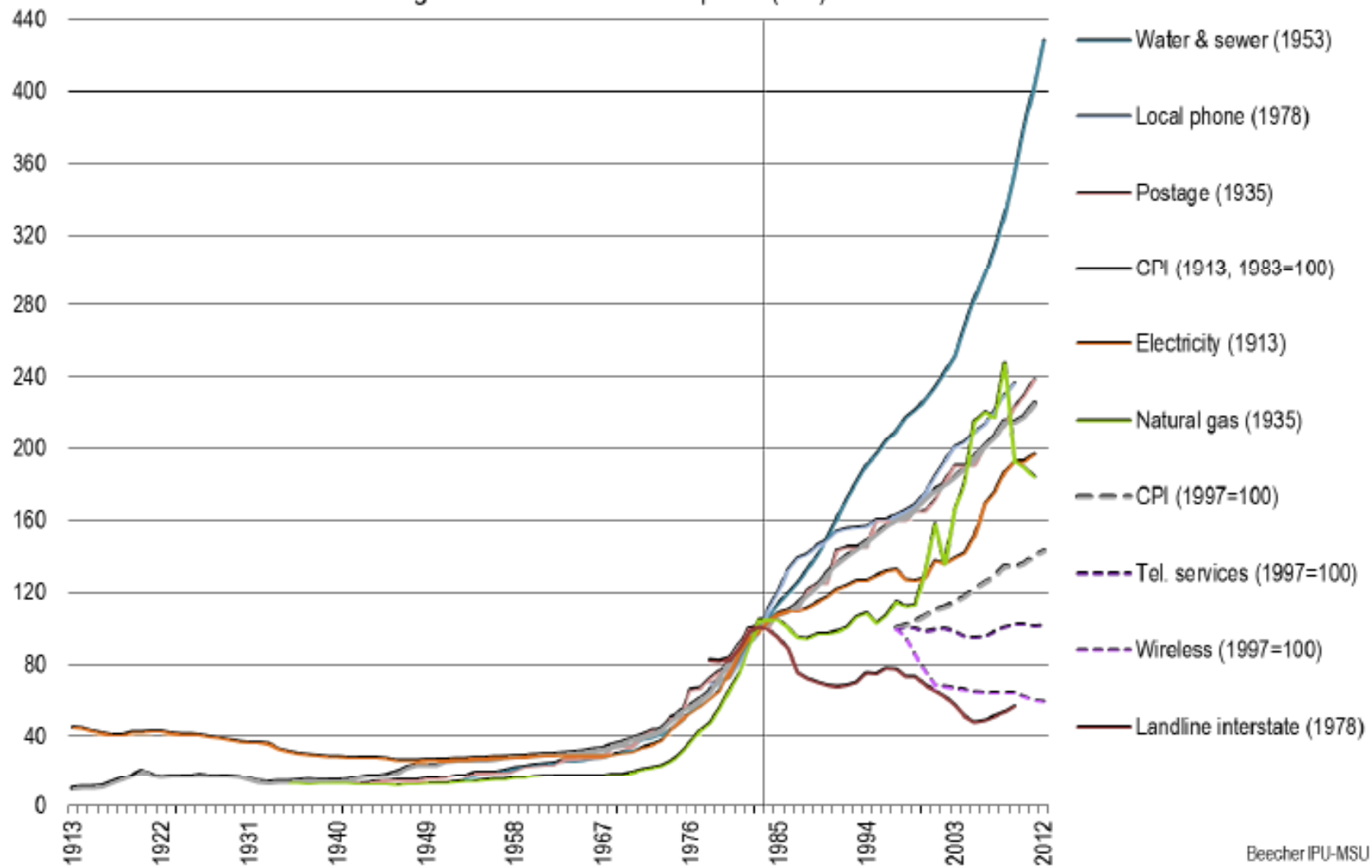


Exhibit 1. Long-term trends in the Consumer Price Index (CPI) for utilities (1913-2012).

The index is set to 100 for 1982-1984 except for telephone and wireless services, where the index is set to 100 for 1997. Date () indicates start of series.

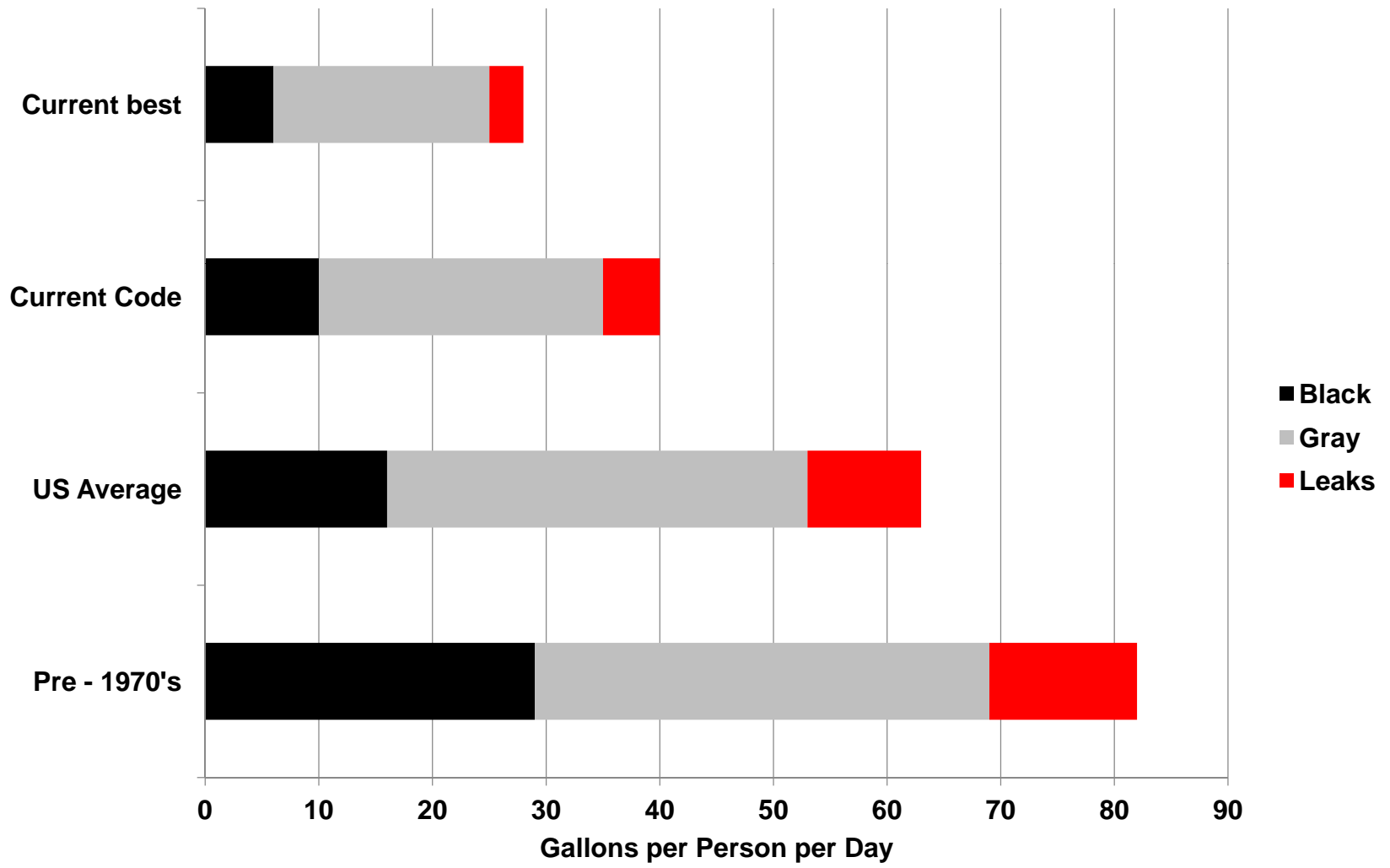
Cost to Flush a Toilet at Current Inflation Rate of 5.85%

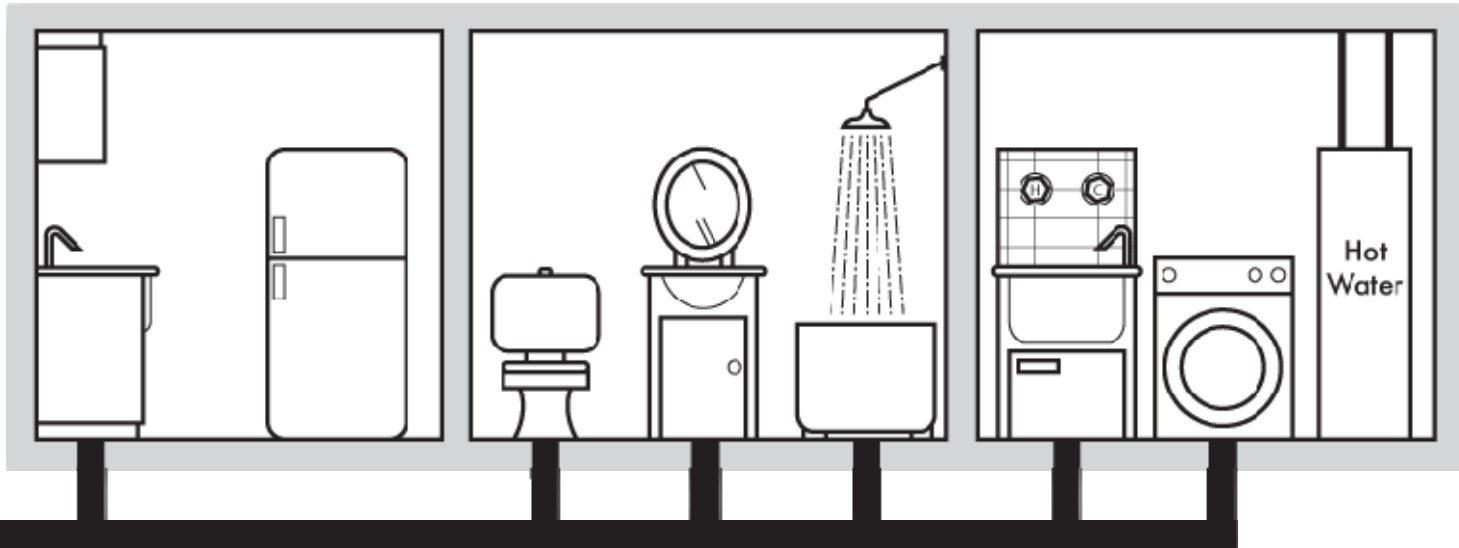
Gallons per Flush	Cents per Flush in 2014	Cents per Flu in 2034
5	4.9	15.4
3.5	3.4	10.8
1.6	1.6	4.9
1.28	1.2	4.0

On-Site Sources
**More than Gray Water
and Rain Water**

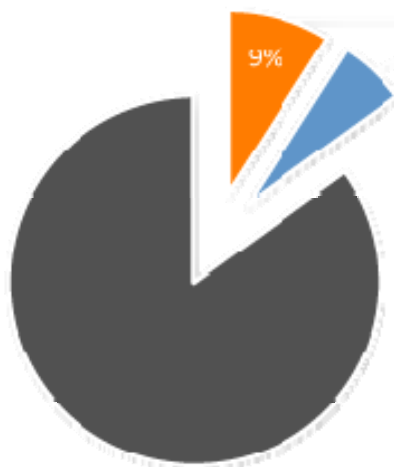
Estimated Indoor Home Use

(Hoffman, 2010)





Water and Heat, down the drain...



The Water-Energy Nexus
15% of US carbon emissions

- Residential Water Heating
- Water - Other
- Other Sources

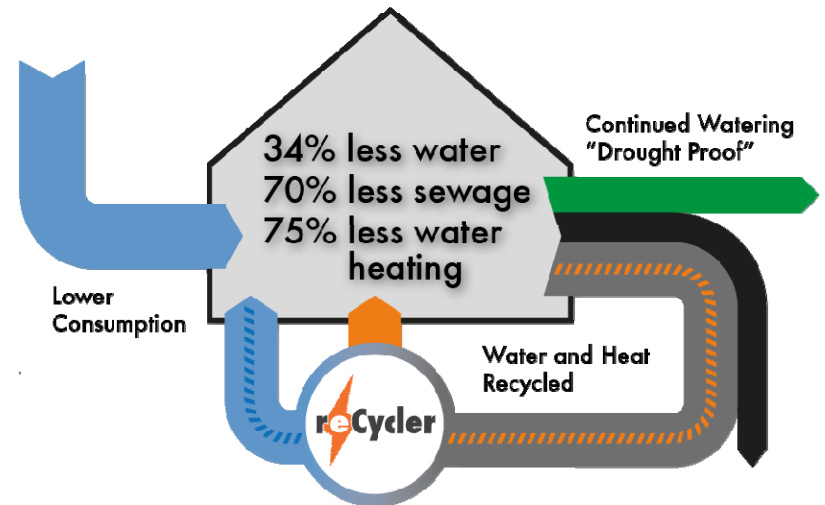
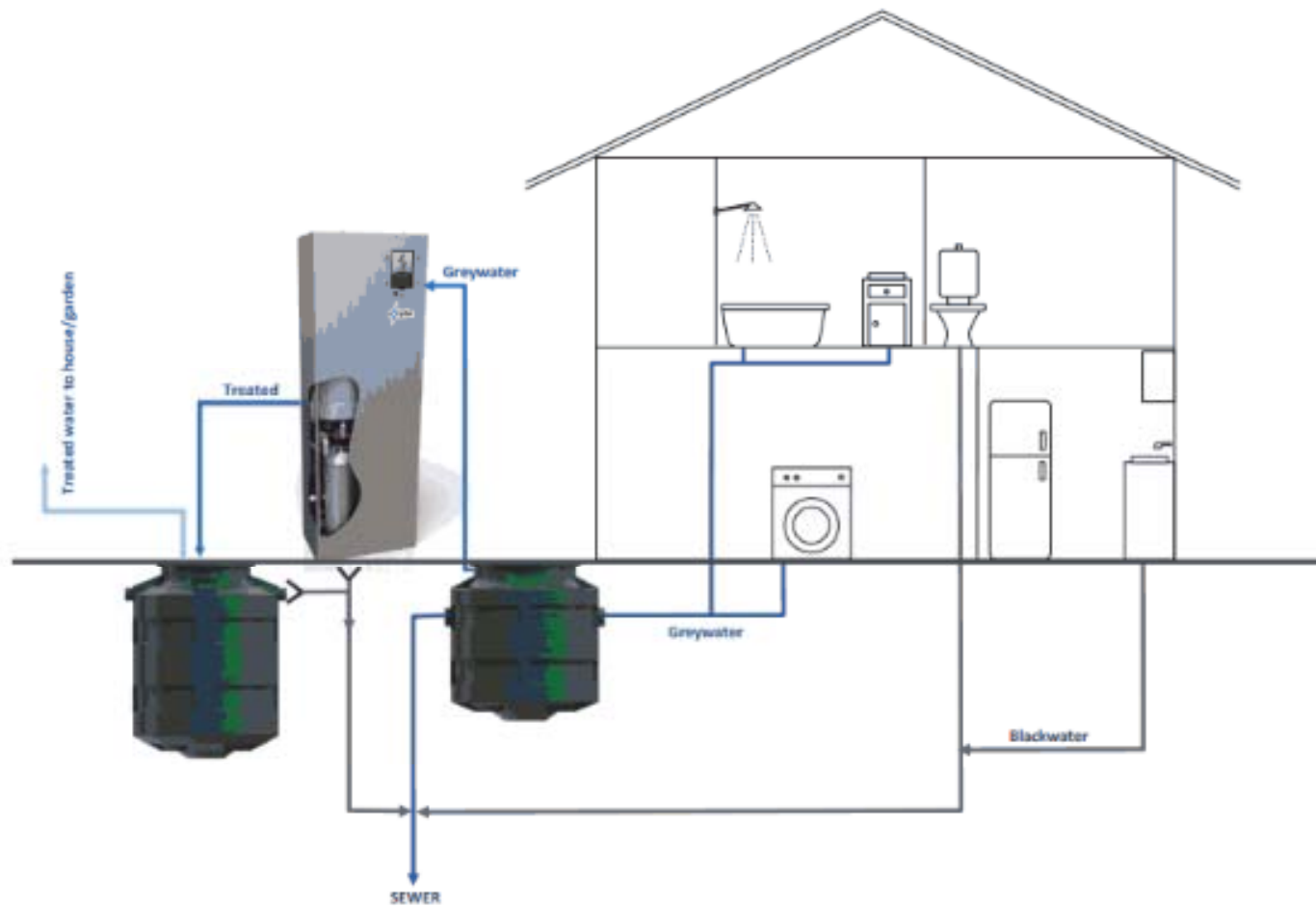


Diagram of Nexus System



On-Site Reuse and Sources are the Next Big Push

- Rainwater harvesting
- Storm water harvesting
- Air conditioner condensate
- Swimming pool filter backwash
- Cooling tower blowdown
- RO & NF reject water
- Gray water
- On-site wastewater systems
- Foundation drain water
- Others??????





Cook+Fox Architect

New Bank of America Tower in Manhattan

This LEED Platinum project collects rainwater, gray-water foundation drain water and A/C condensate water for reuse in toilet flushing and cooling tower makeup.

On-site Non-potable Water Use

Guide for the collection, treatment,
and reuse of alternate water supplies
in San Francisco



Examples of Urban On-Site Reuse

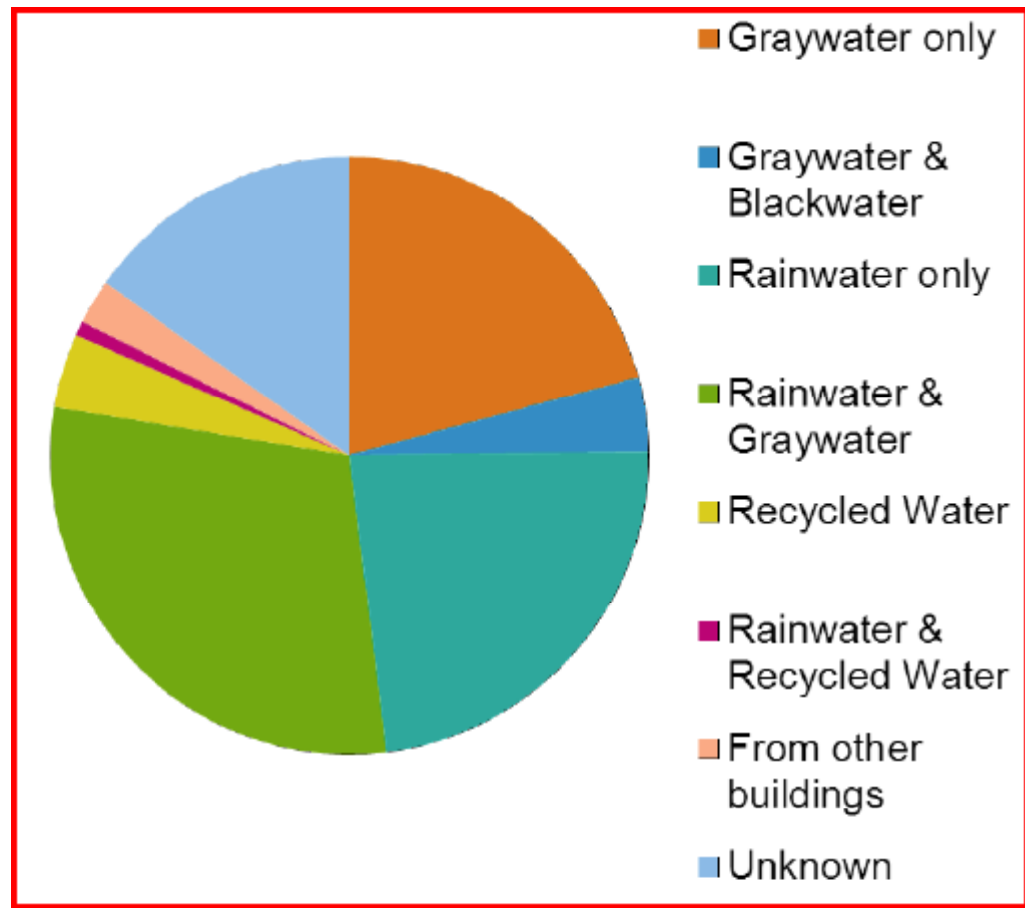
Solaire, Battery Park NYC
65% Reduction in Potable Water



Dock Side Green – Victoria Canada
65% Reduction in Potable Water



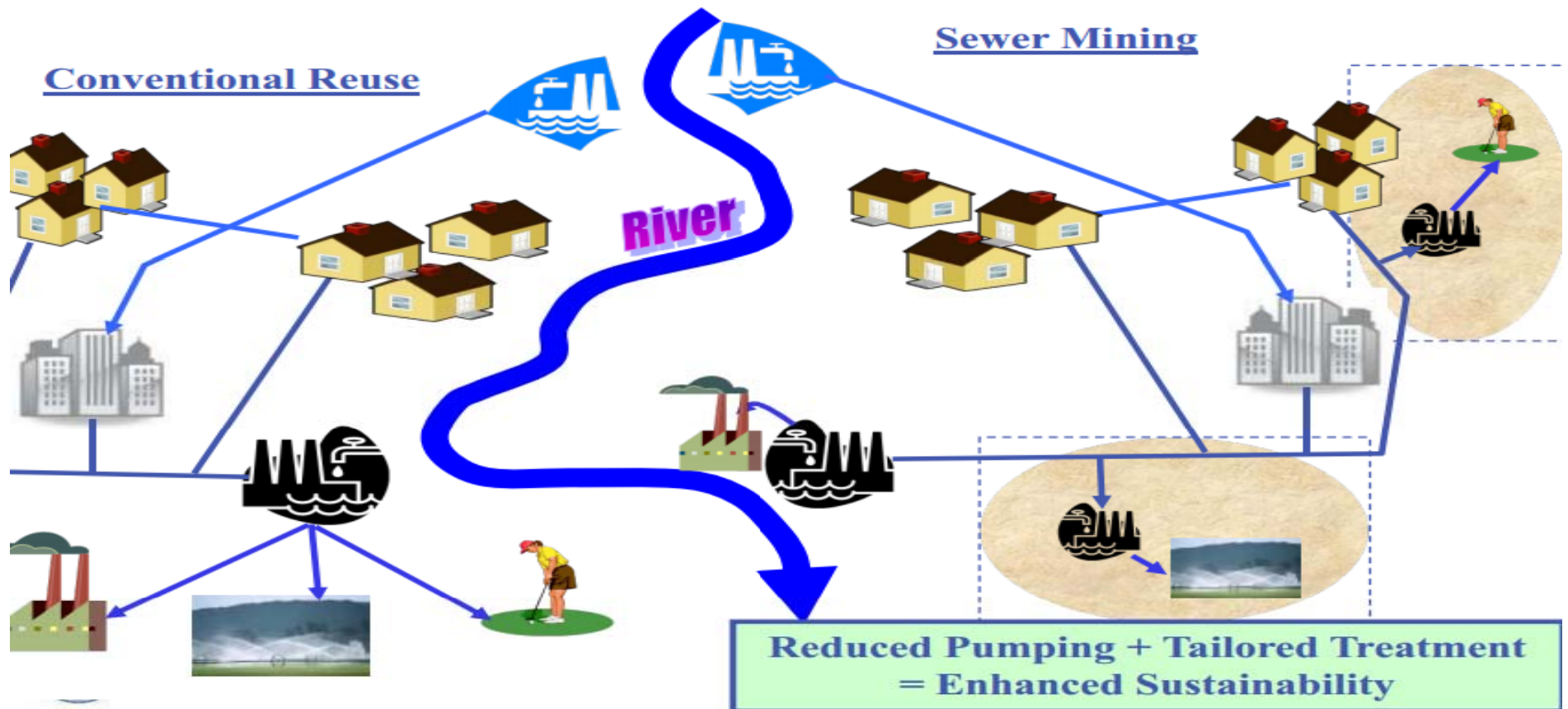
60% of non-potable water demand in Tokyo is met by recycled water



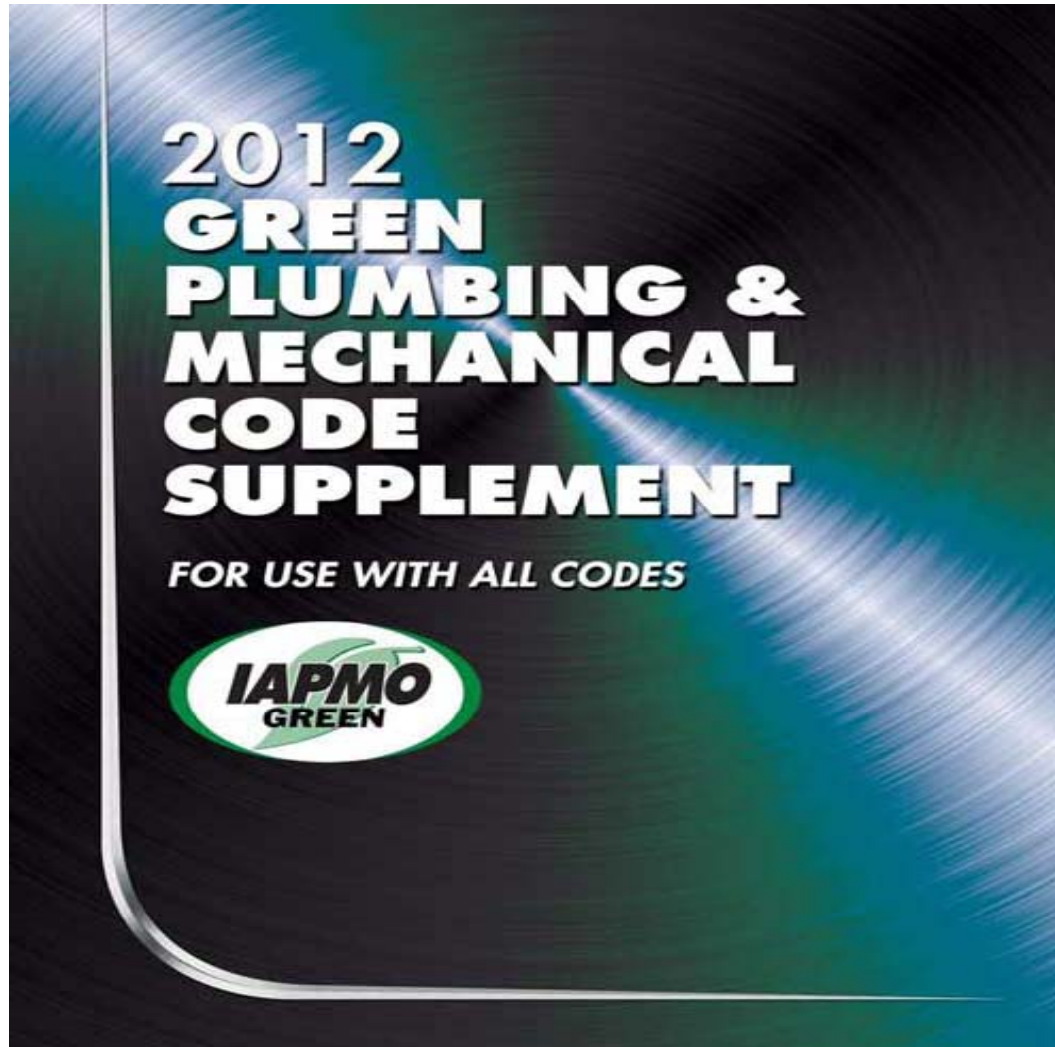
Sewer Mining

Source: Chris Allen –GE Water

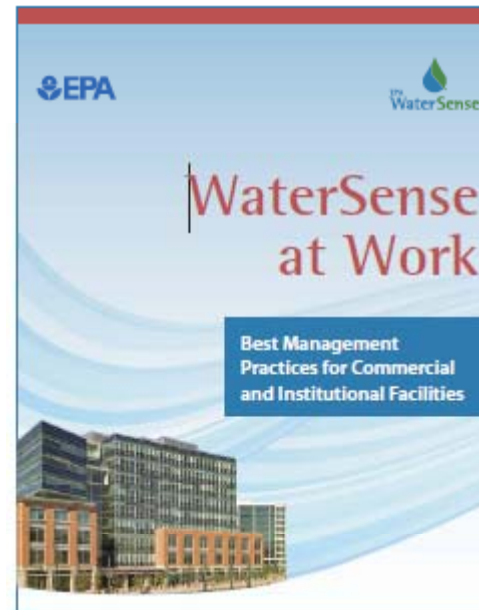
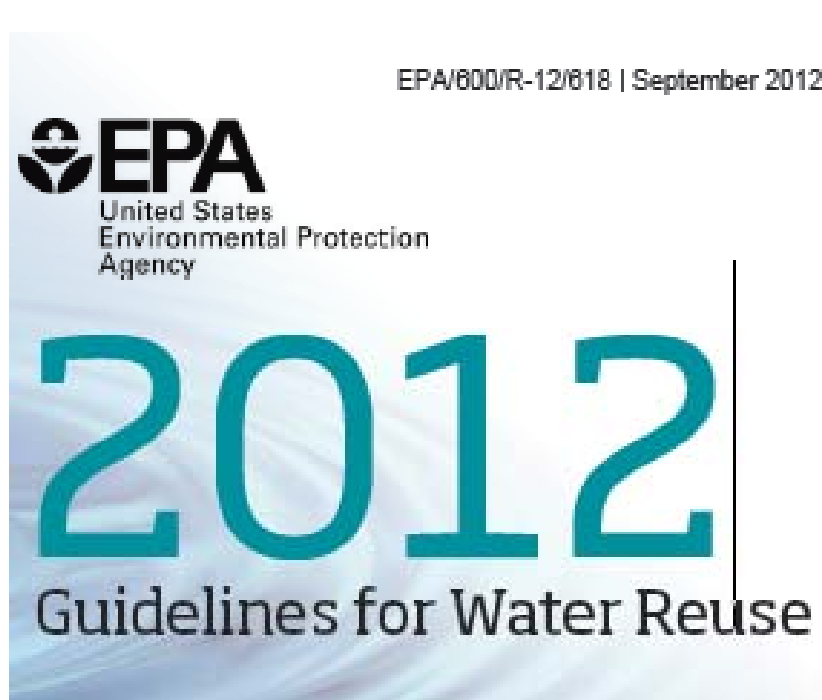
Sewer Mining vs. Conventional Reuse



Guiding Forces



Publications to be aware of



NSF/ANSI STANDARD 350
FOR WATER REUSE TREATMENT SYSTEMS



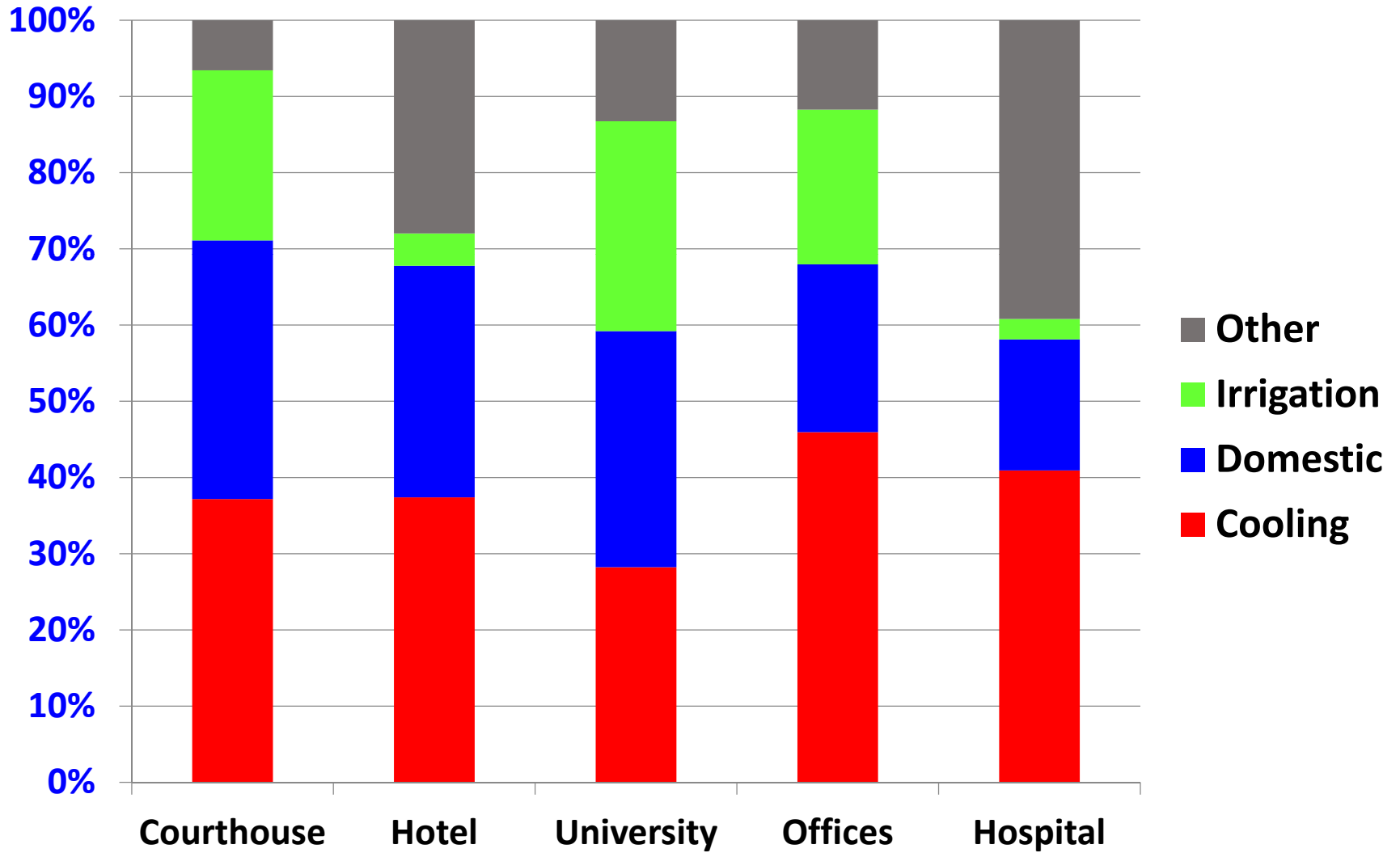
Cooling Towers

The purpose of a cooling tower is to get
rid of

unwanted energy!

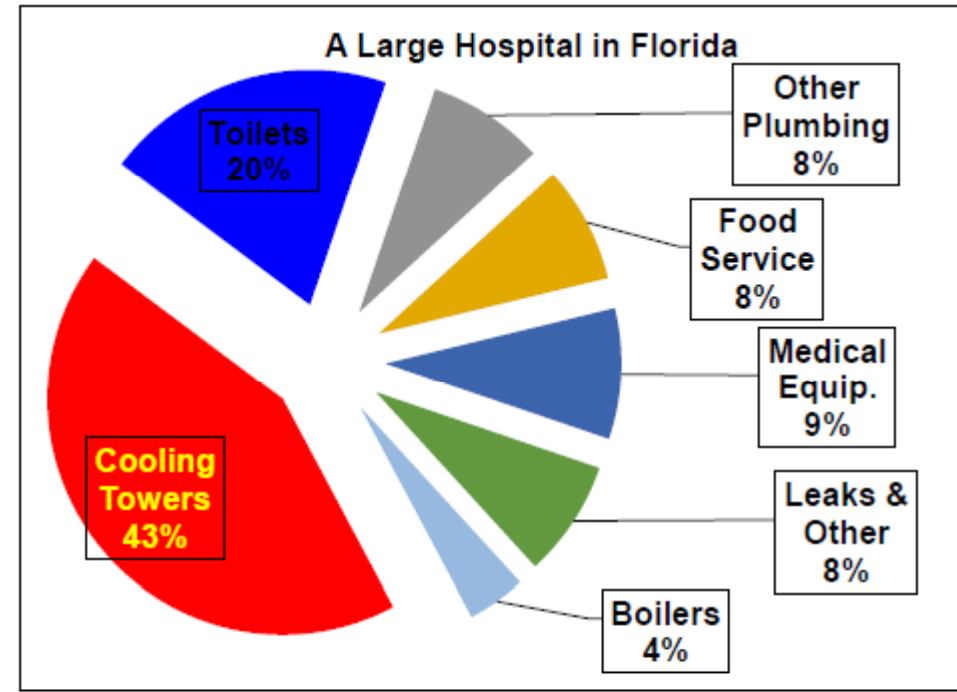
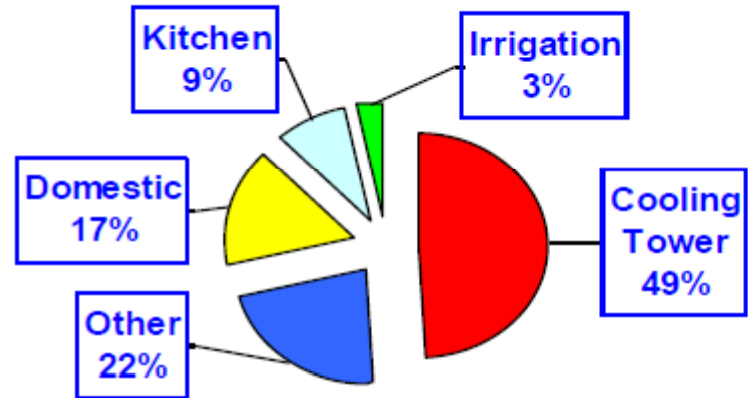
Summary of Audits of 30 Large Down Town Facilities with Cooling Towers in Downtown Fort Worth Texas

Water Management, Inc.

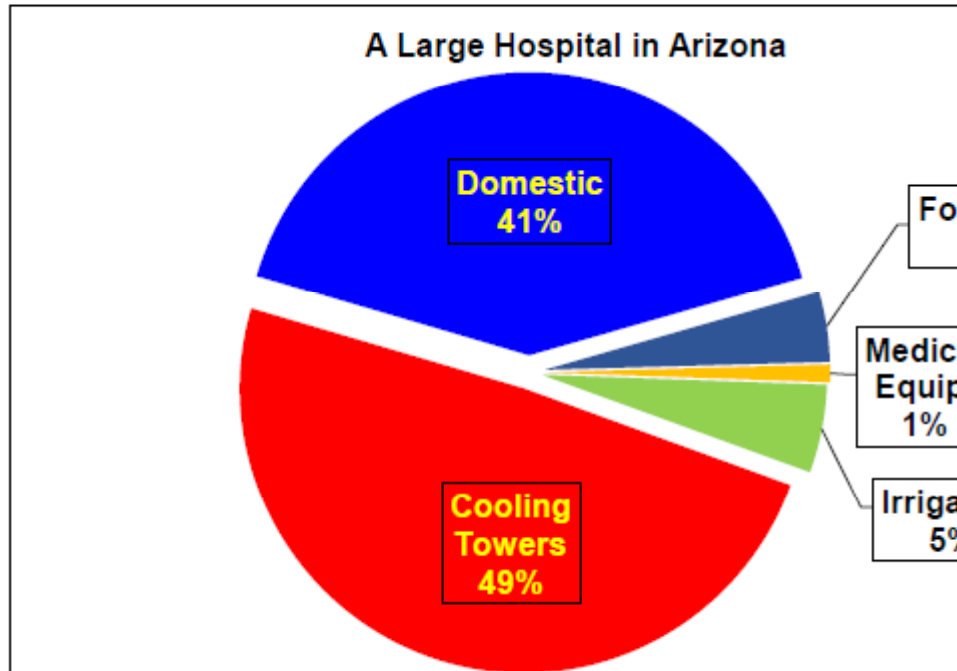
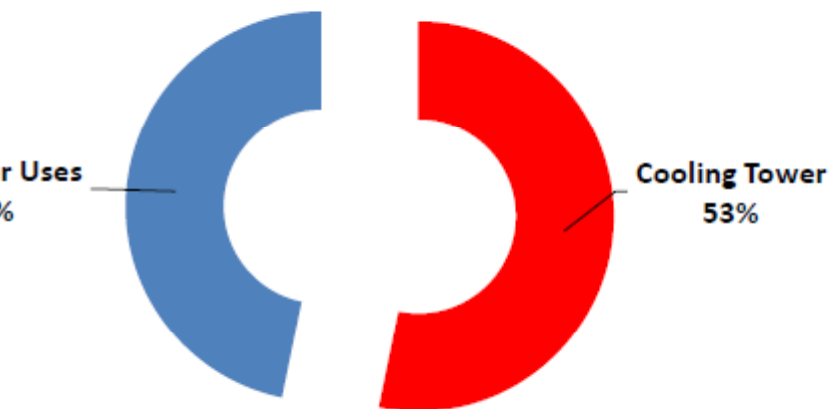


Grocery Store Water Use in California

Pacific Institute



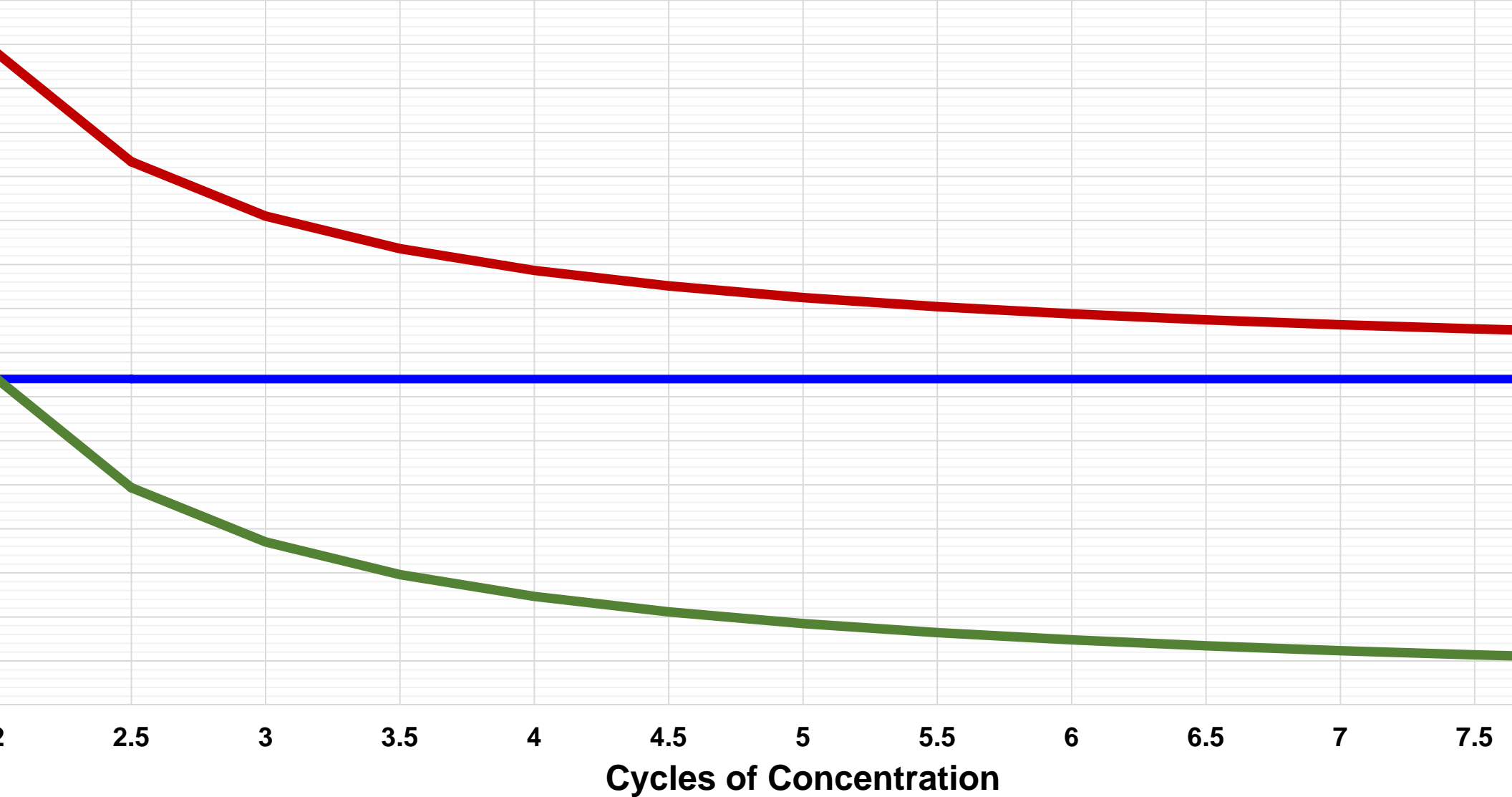
Eleven Office Buildings in Austin, Texas



Manhattan

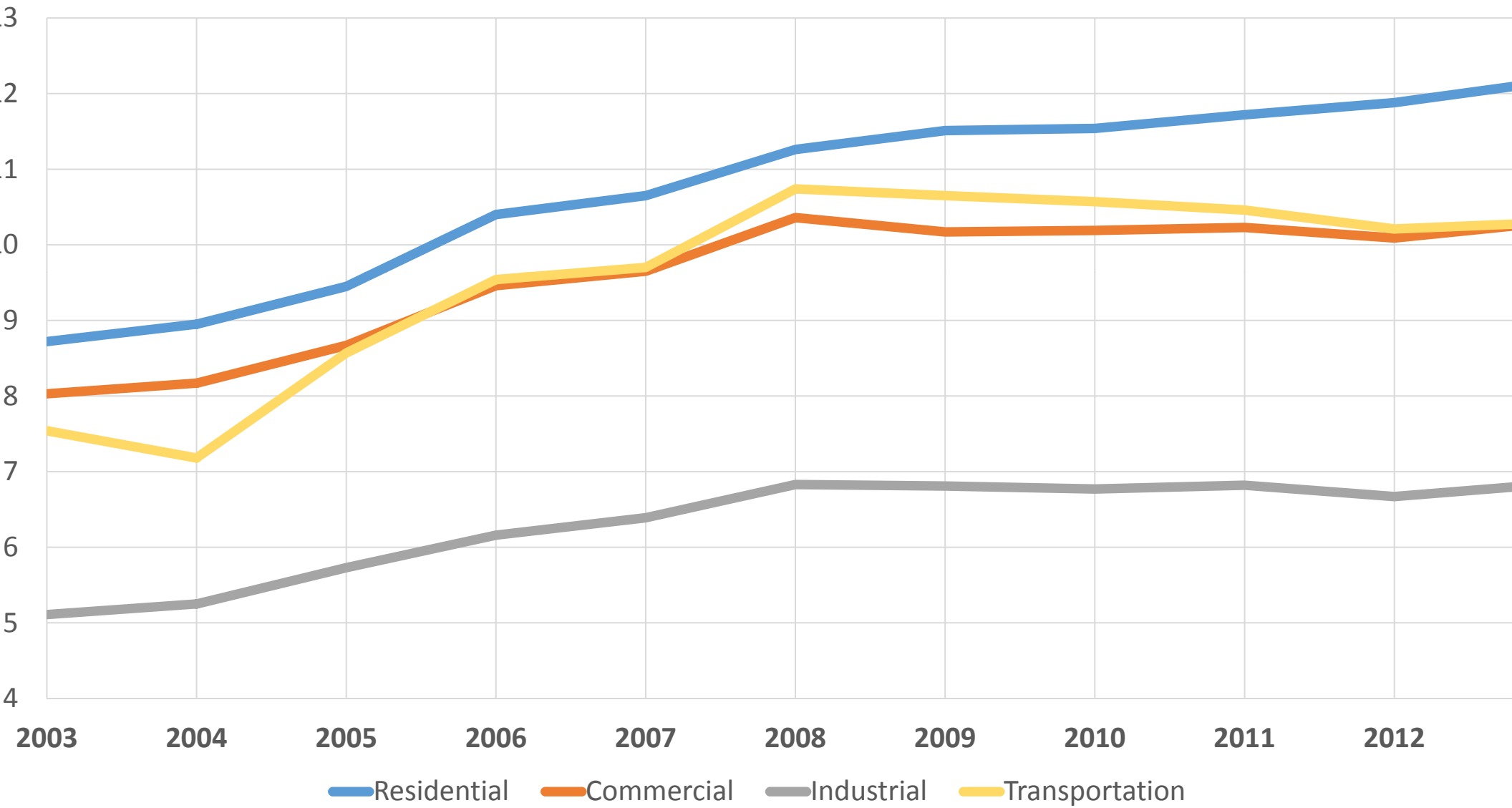


Make Up, Blowdown and Evaporation vs. Cycles of Concentration



National Average Electricity Prices

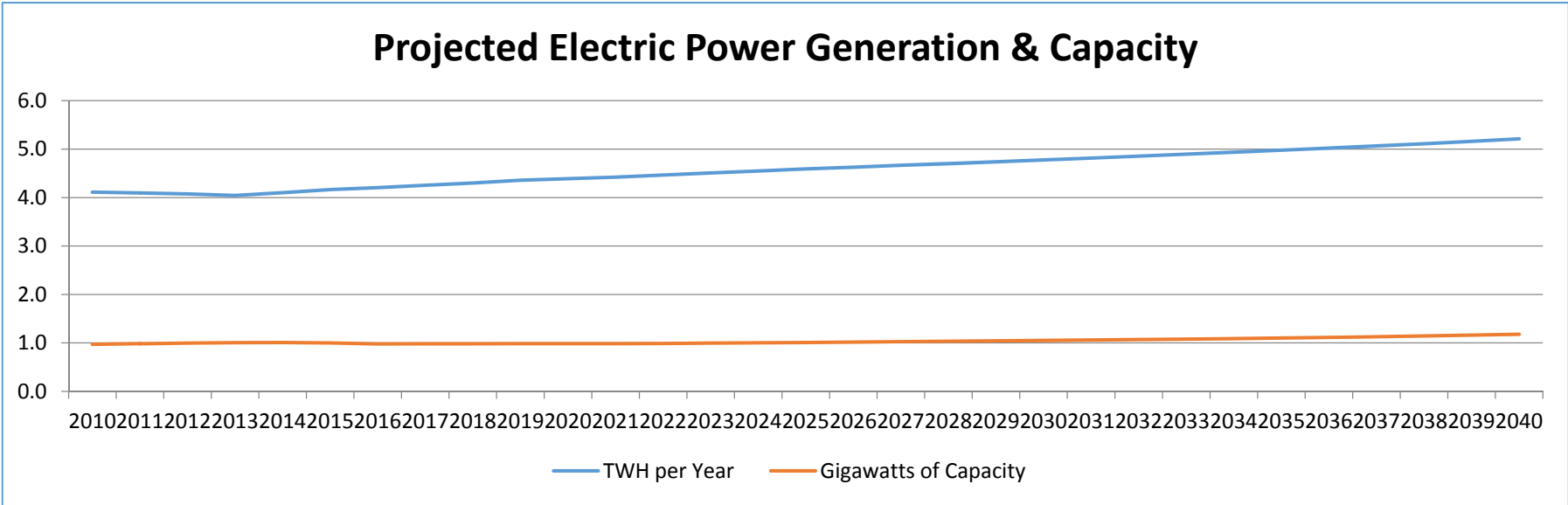
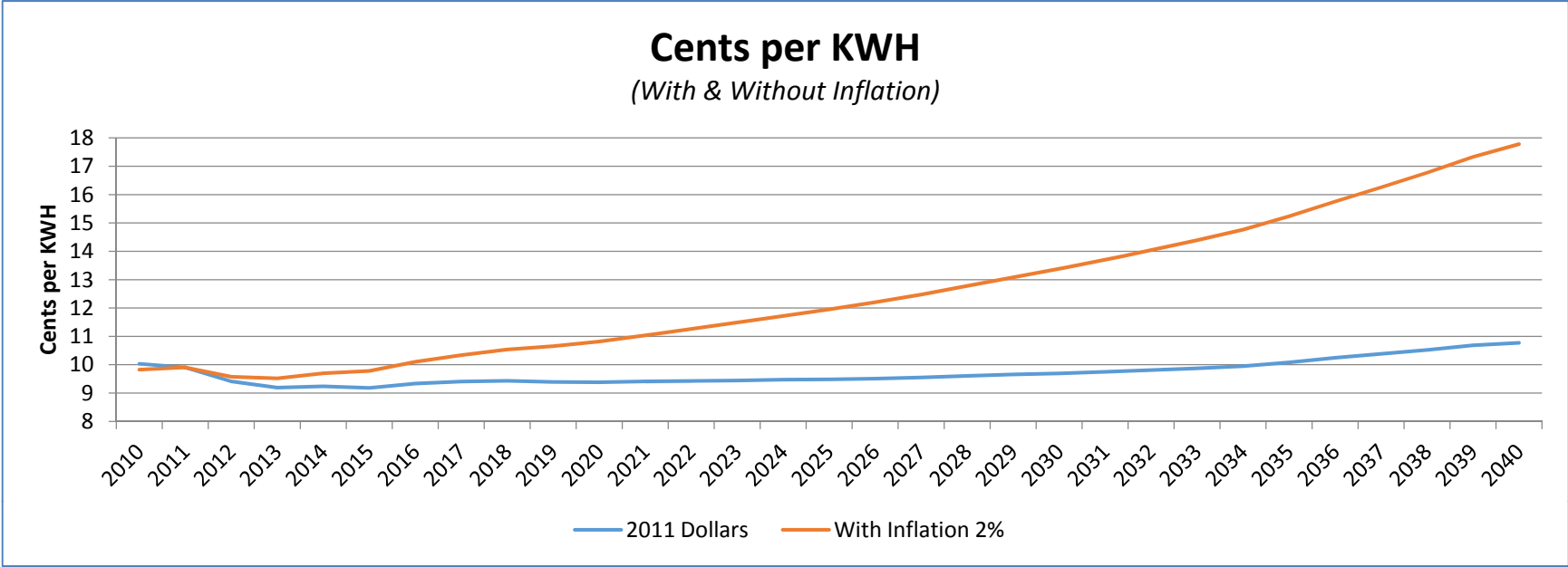
(Energy Information Administration)



Savings With Cooling Tower

Energy savings
0.3 to 0.4 kWh/Ton-Hr

Equal to about
3.0 to 4.0 cents
in most markets



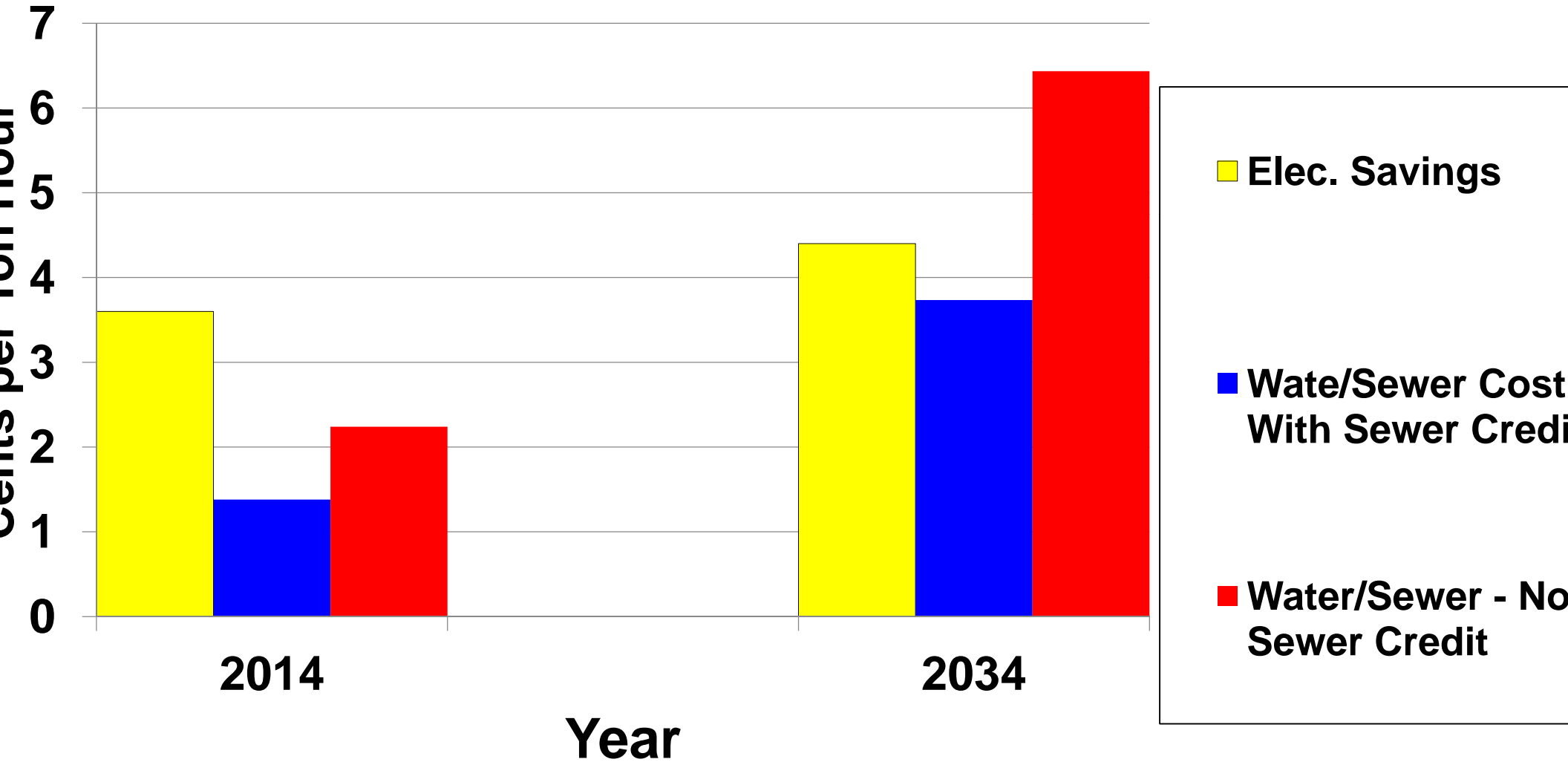
Other Water Associated Cost of Tower Operation

Cost Factor	Cents per Ton Hour			
	At 2.0 gal./Ton-hour	lowest	Median	Highest
Water Treatment (Chemical and other)		0.1	0.2	0.9
Labor & Other		0	0.1	0.1
TOTAL		0.1	0.3	1.0

Cost to Flush a Toilet at Current Inflation Rate of 5.85%

Gallons per Flush	Cents per Flush in 2014	Cents per Flu in 2034
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1.28	1.2	4.0

Cooling Tower Energy and Water/Sewer Cost per Ton Hour



Water Use by 750 Ton System

Water use on peak day at 2.5 gallons per ton hour & 75% capacity=
33,750 gallons

Water use annually at 2.5 gallons per ton hour & 20% capacity=
3,285,000 gallons

Energy Recovery in Canada and Switzerland

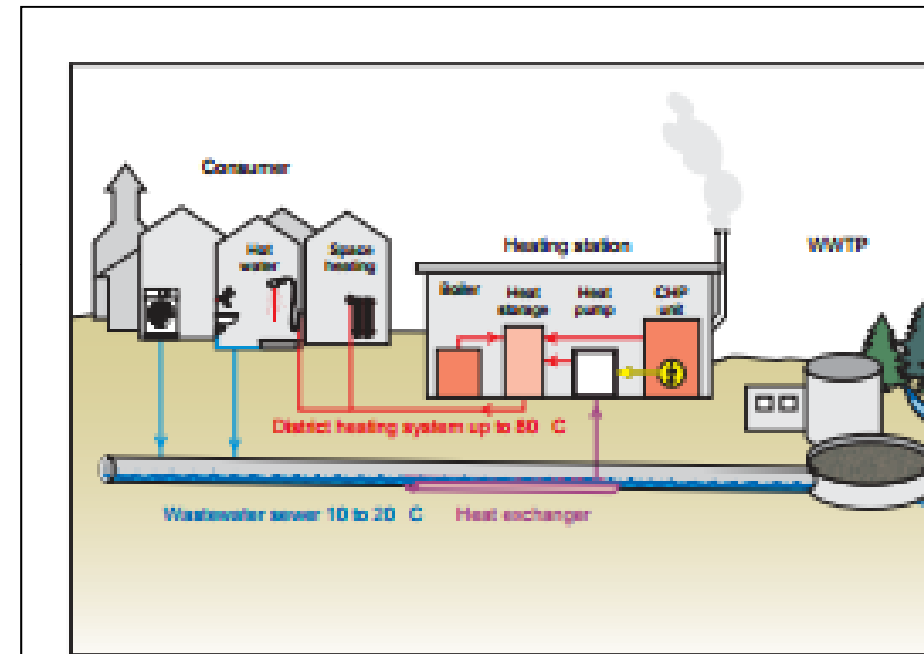
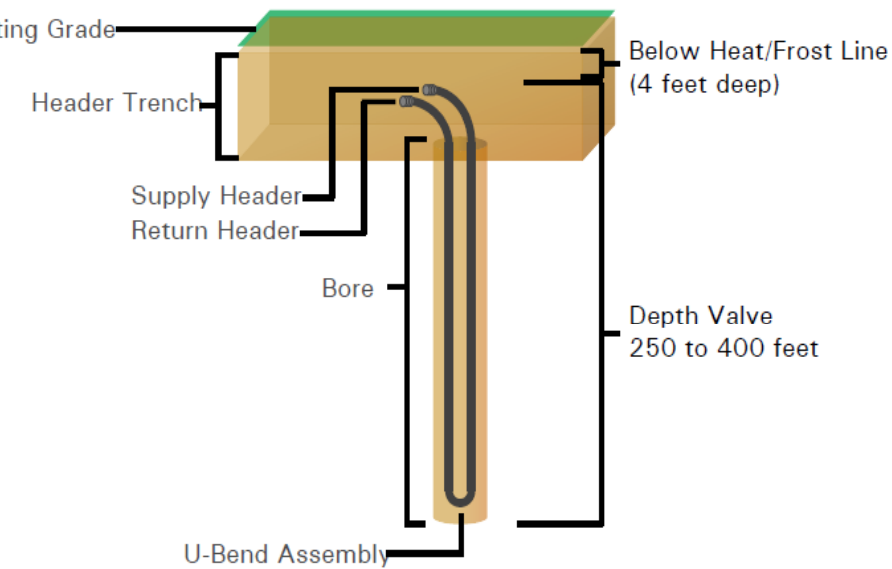


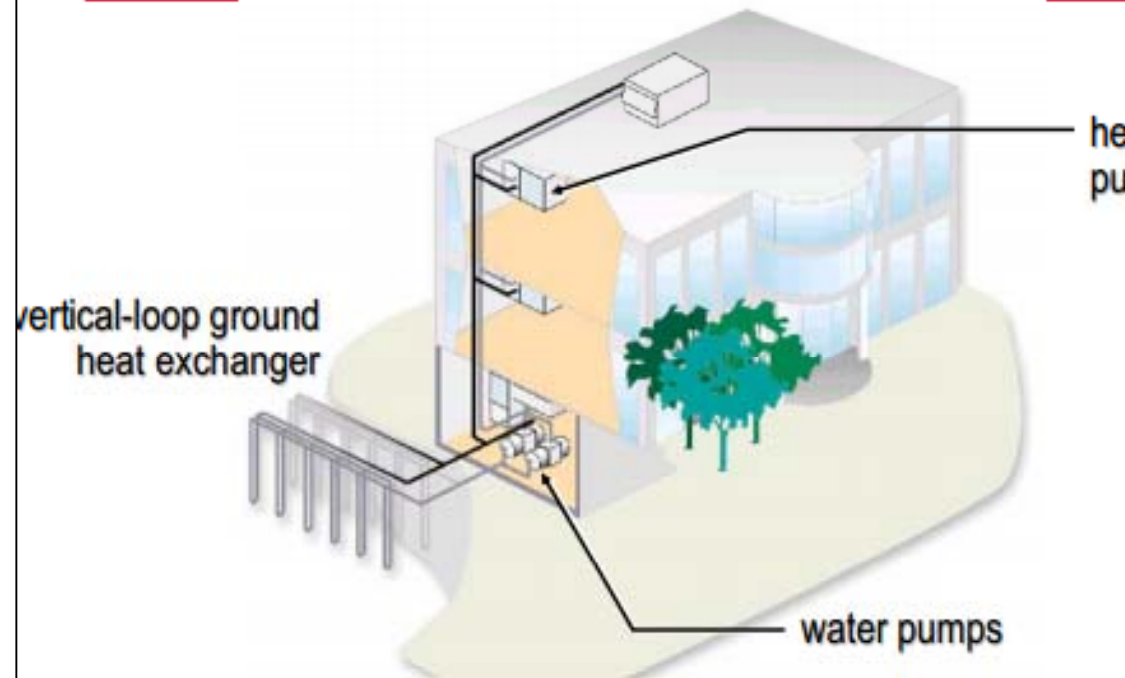
Figure 5: Using wastewater heat by means of gutter heat exchangers (SwissEnergy 2008)

Geothermal (Ground Source) Heat Pumps

IS GEOTHERMAL WORK? WELL BORE

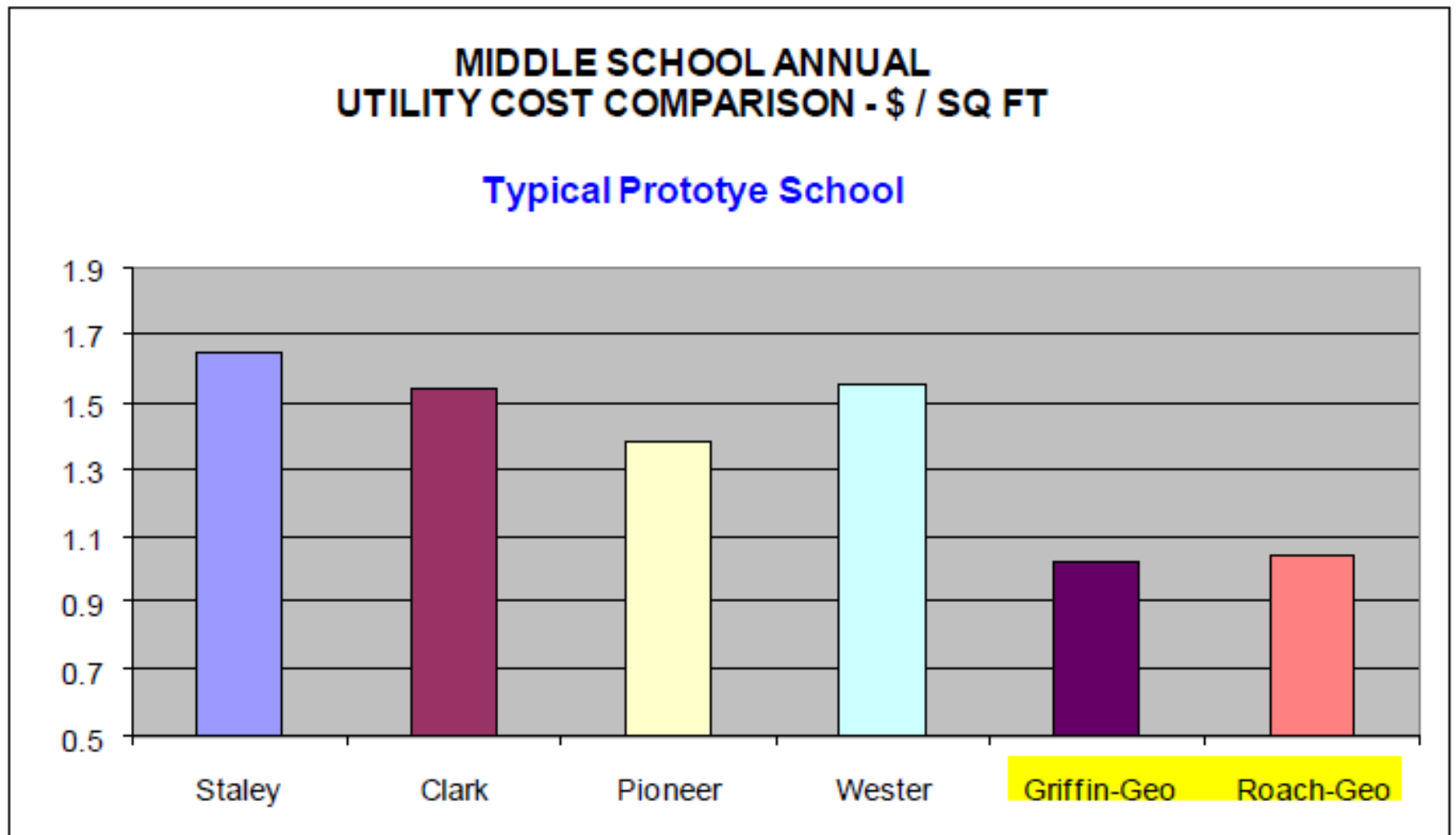


Ground-Coupled System



FRISCO ISD MIDDLE SCHOOLS COMPARISON – YEAR 2005-2006

School- Staley – Water Source Heat Pumps w/Tower and Boiler
Schools – Clark thru Wester are Chilled/Heating Water Systems
Schools – Griffin and Roach are Geothermal Heat Pump Systems



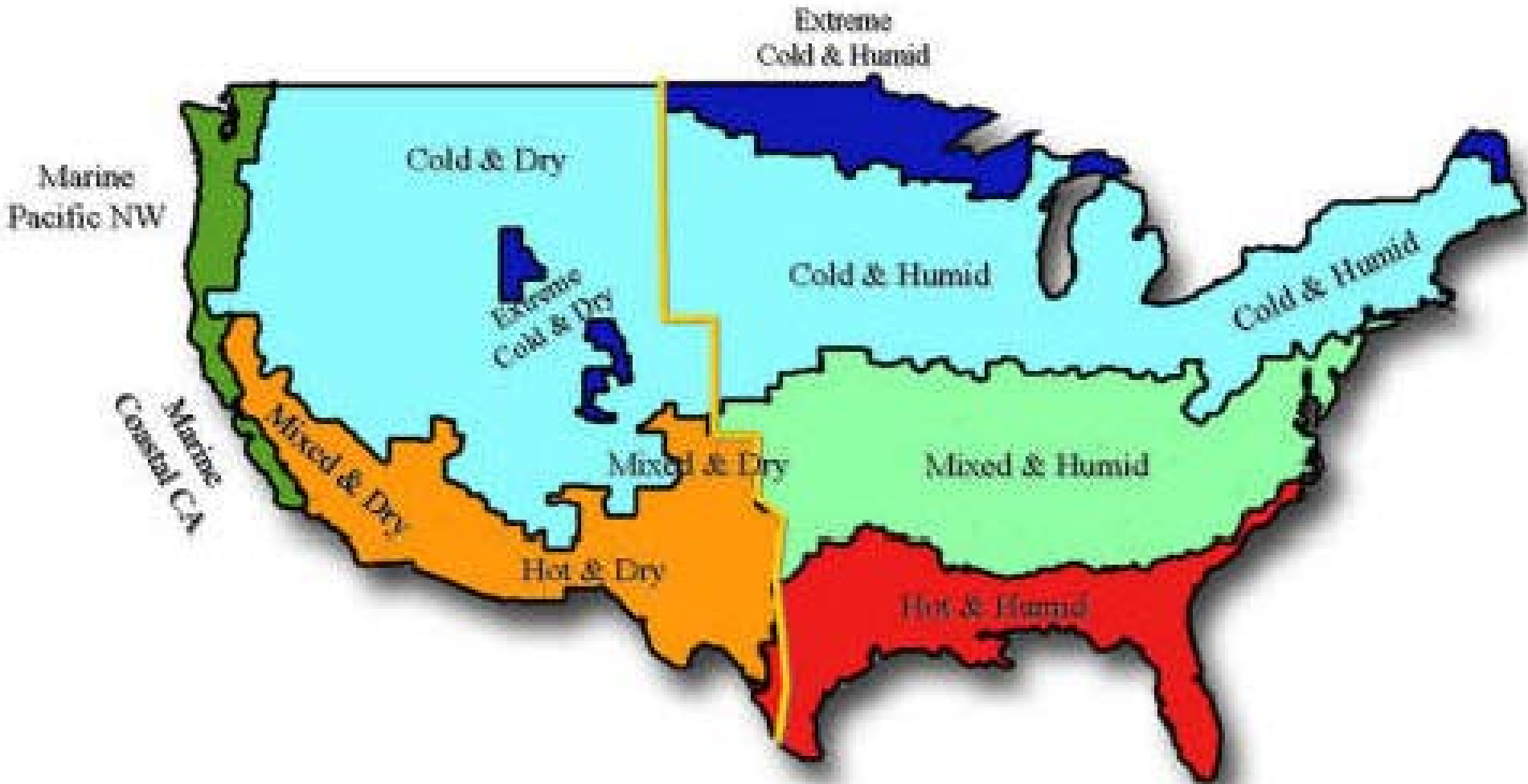
RISCO ISD SCHOOLS MECHANICAL COST COMPARISON

CAMPUS	YEAR BID	SQ FT	MECH COST*	\$/ SF
Bright Elementary	2001	71,860	\$968,922	\$13.48
Spears Elementary	2002	74,555	\$970,621	\$13.56
Riddle Elementary – Geo	2003	72,848	\$981,284	\$13.47
Pink Elementary – Geo	2004	76,000	\$1,054,261	\$13.87
Pioneer Middle	2001	137,245	\$1,676,435	\$12.21
Wester Middle	2001	137,245	\$1,676,435	\$12.21
Griffin Middle – Geo	2002	138,651	\$1,679,000	\$12.11
Roach Middle – Geo	2004	138,650	\$1,709,000	\$12.33

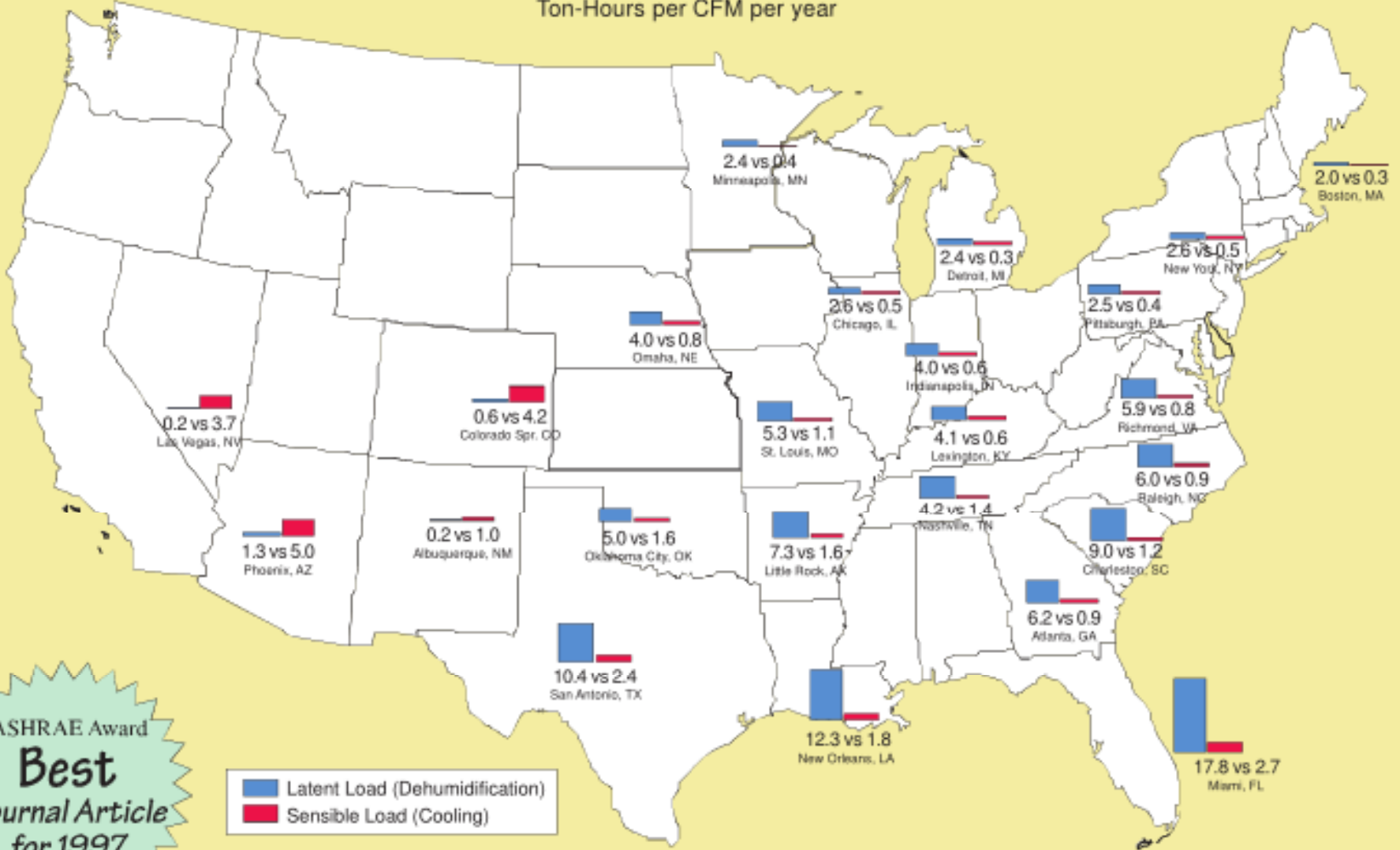
- Includes Controls and Condensate Drains / Costs are not adjusted for inflation or escalation
- 2006 Costs are \$15 to \$16 per square foot

Dehumidification and cooling loads from ventilation air

[L.G. III Harriman](#), [D. Plager](#), [D. Kosar](#)
[Energy Engineering](#) 06/1999; 96(6).



Annual Ventilation Loads Ton-Hours per CFM per year

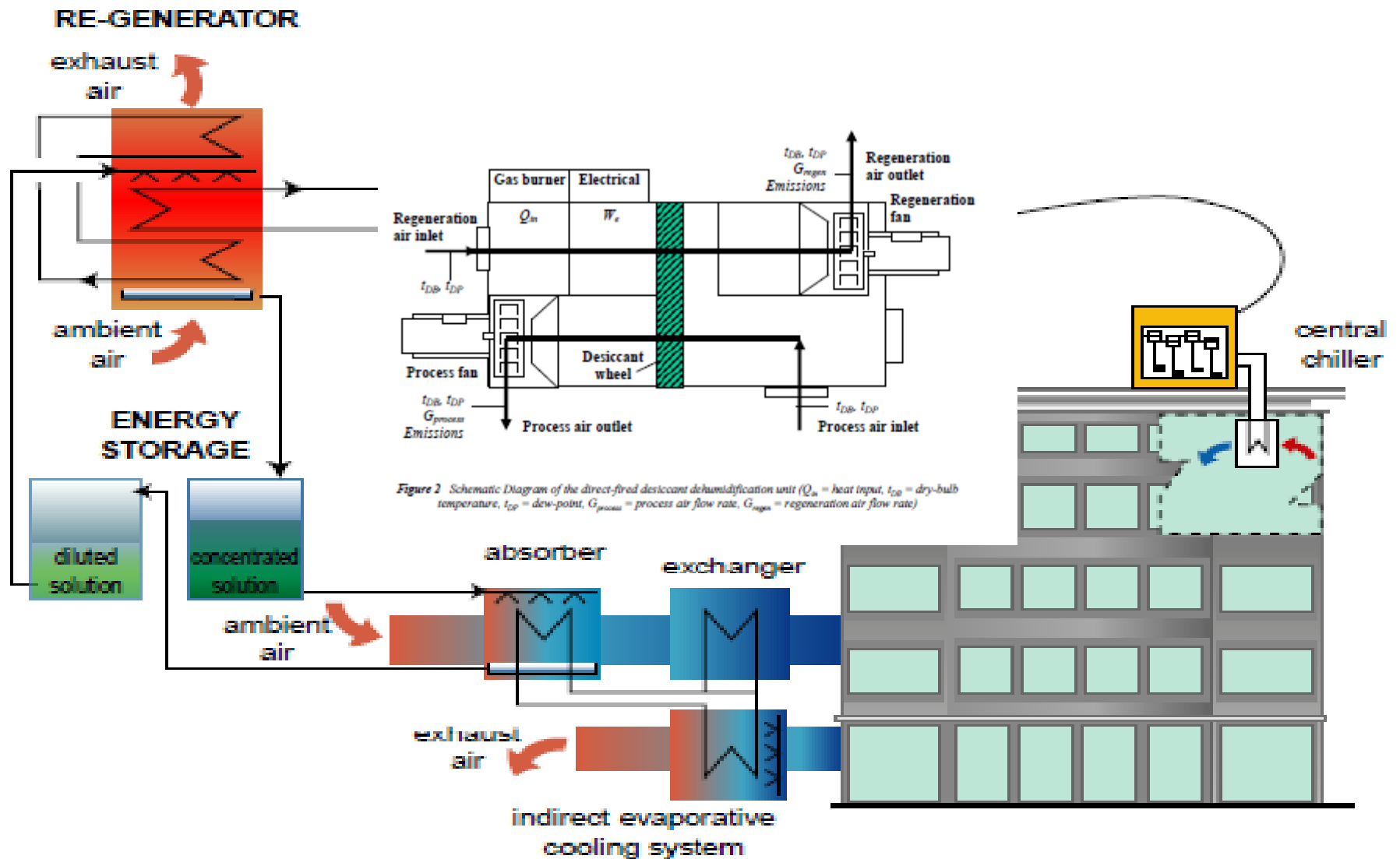


ASHRAE Award
Best
Journal Article
for 1997

■ Latent Load (Dehumidification)
■ Sensible Load (Cooling)

Fig. 1: Map of Ventilation Load Indexes (VLI) for selected continental U.S. locations

L-DCS Powered By Co-generation Plant





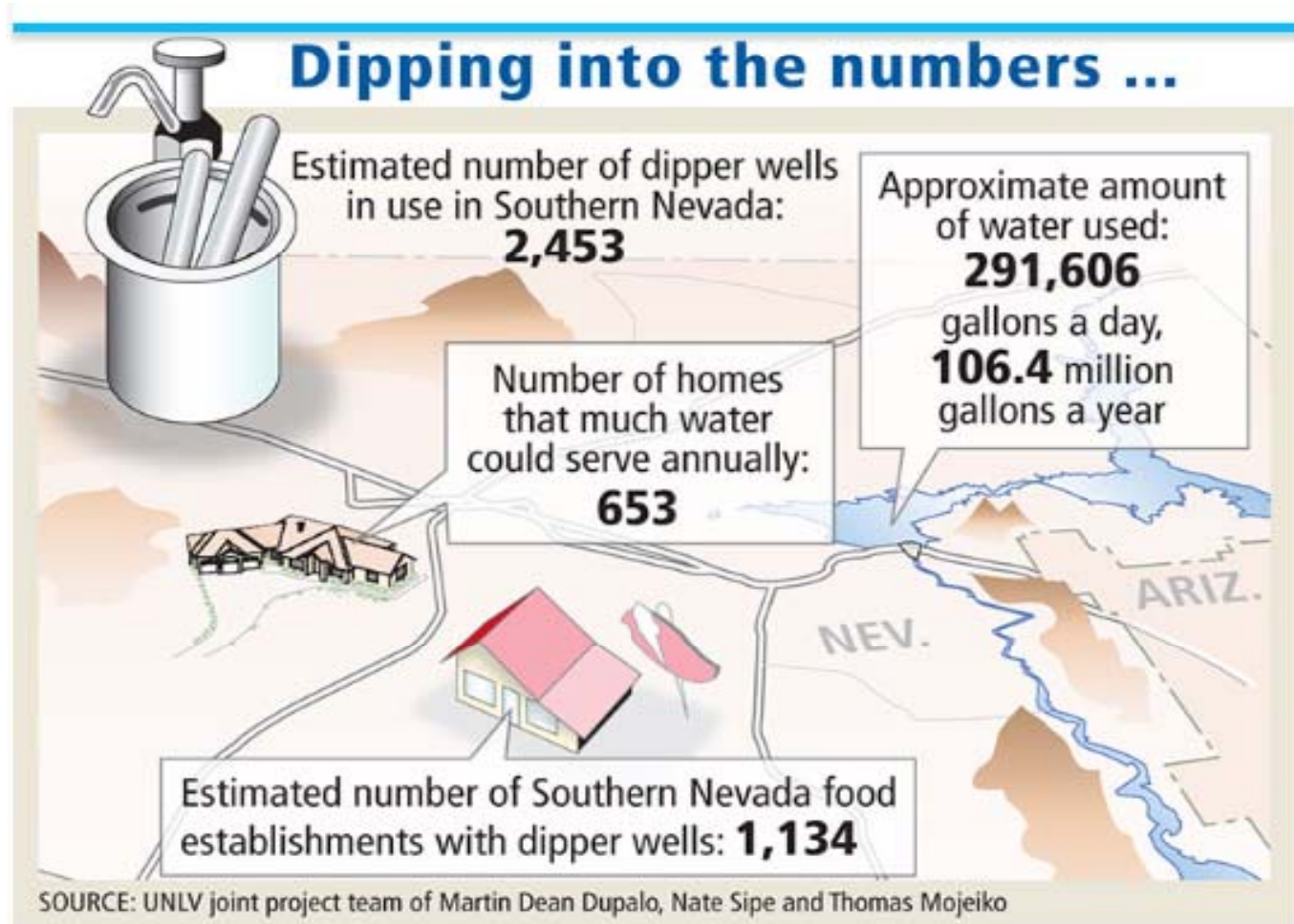
YE OLD DIPPER WELL FORM WAY BACK WHEN?



[6 Million Gallons of Water Down the Drain Everyday-Starbucks](#)

A Recent Study by University of Nevada – Las Vegas

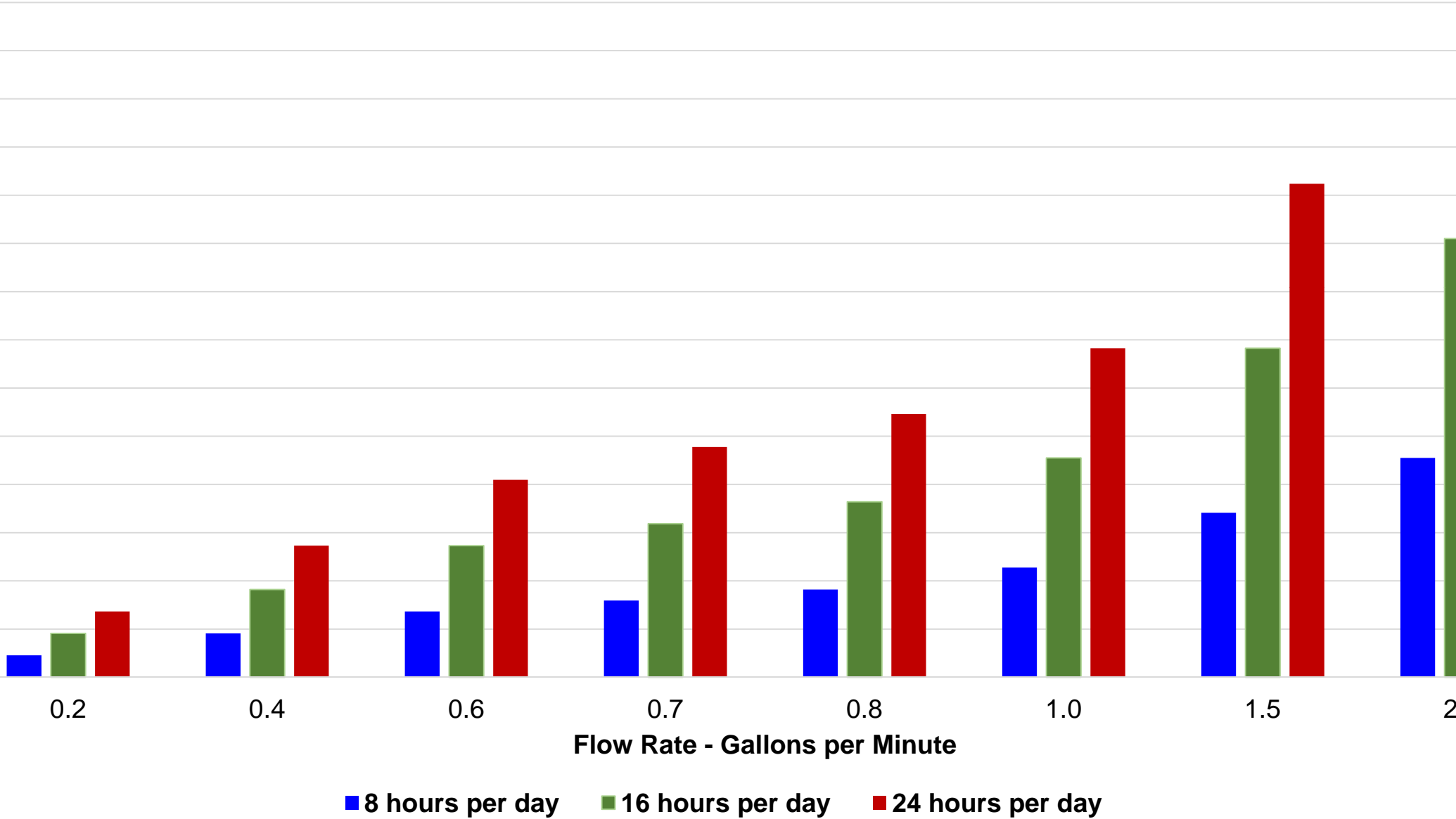
<http://www.reviewjournal.com/news/unlv-professor-targets-wasteful-dipper-wells>



MIKE JOHNSON/LAS VEGAS REVIEW-JOURNAL

GRAPHIC BY MIKE JOHNSON

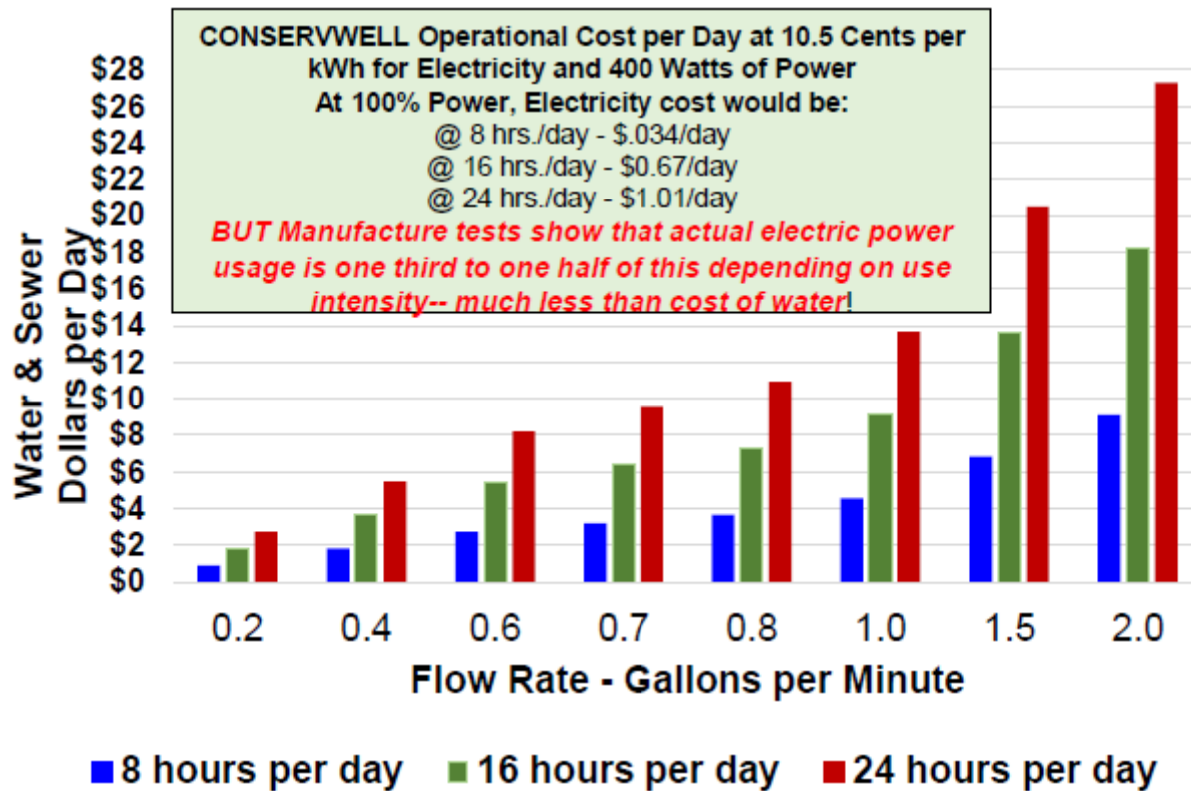
Cost per Day for Conventional Dipper Well Operation at National Average Water and Sewer Costs or \$9.48 Per Thousand Gallons



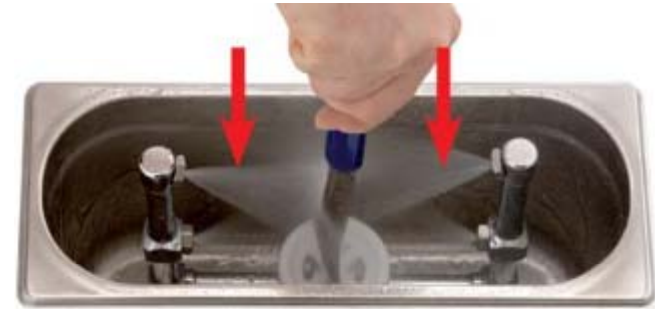
UTENSIL HOLDER CONSERVEWELL™



Cost per Day for Conventional Dipper Well Operation at National Average Water and Sewer Costs or \$9.48 Per Thousand Gallons



Lolsberg



Rinsewell

This produce has not yet been released.
It is in development.



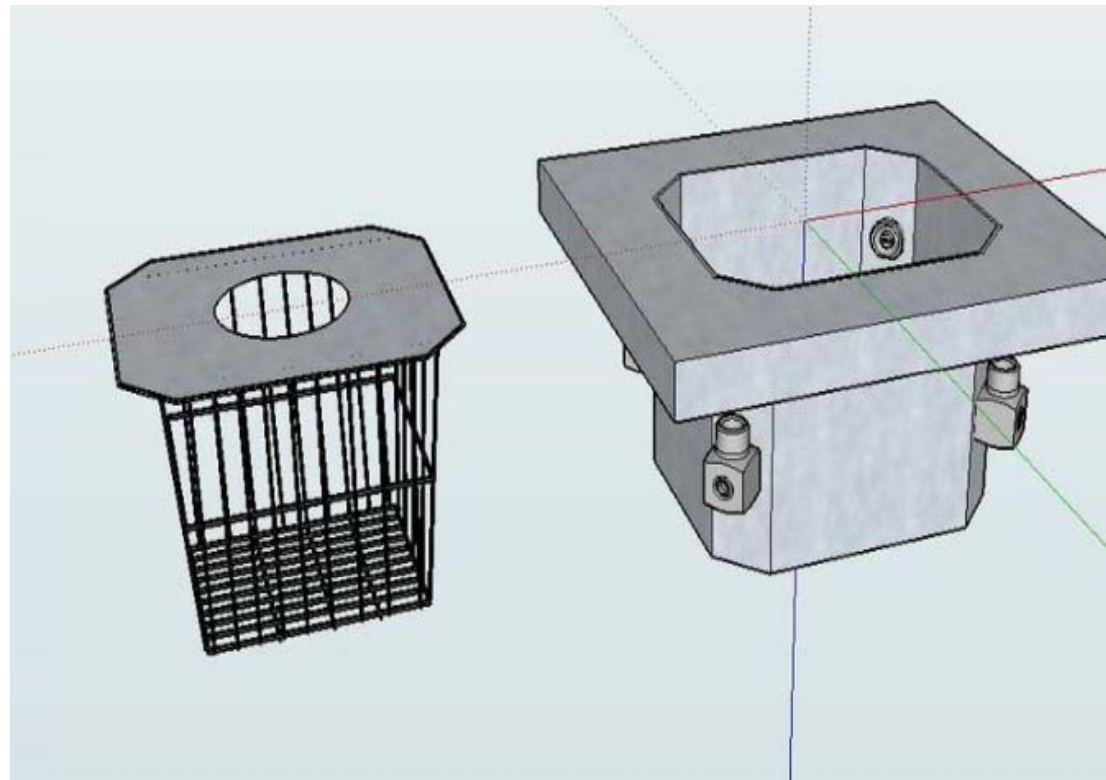
Chris Gilreath

Founder/President

T: 479-899-8191

E: chris.gilreath@recycledhydrosolutions.com

Rinsewell



Water consumption is estimated at 0.226 gallons per 10 second cycle

The Cheapest Water You
Will Ever Have Is The Water
You Already Have!

INNOVATE!

