

# **The Whole Ball of** **Wax .....**

***Or water & energy  
conservation integrated into  
the sustainability-marketing  
picture.***

**H.W. (Bill) Hoffman**

**Water Conservation Program  
City of Austin, Texas**

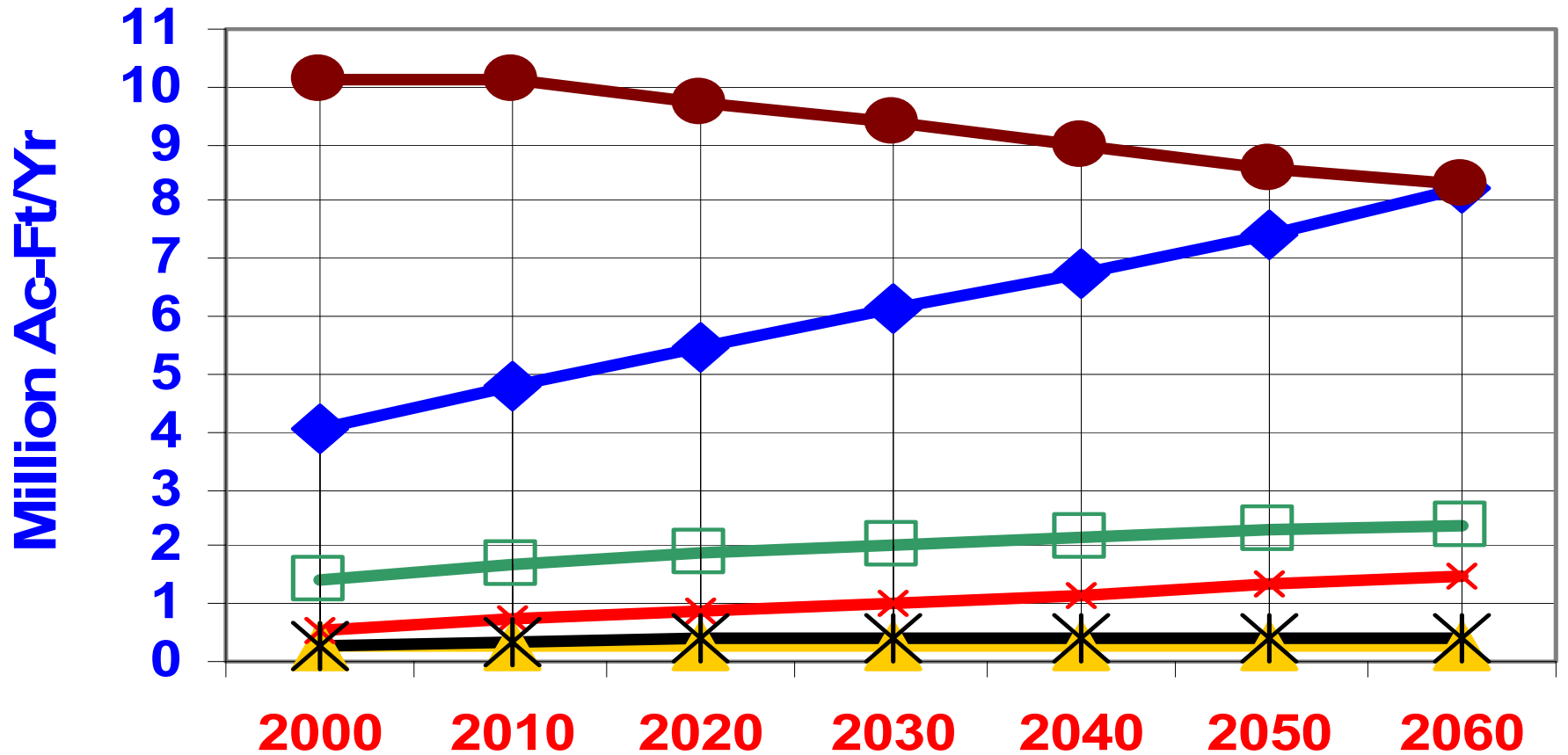
# Some Texas Statistics

- **Texas is a net importer of energy!**

*11-12 quad used vs 9-10 quad produced*

- **25% of all energy goes to evaporating water**

# Projected Water Use in Texas



◆ Municipal

▲ Mining/Oil&Gas

\* Livestock

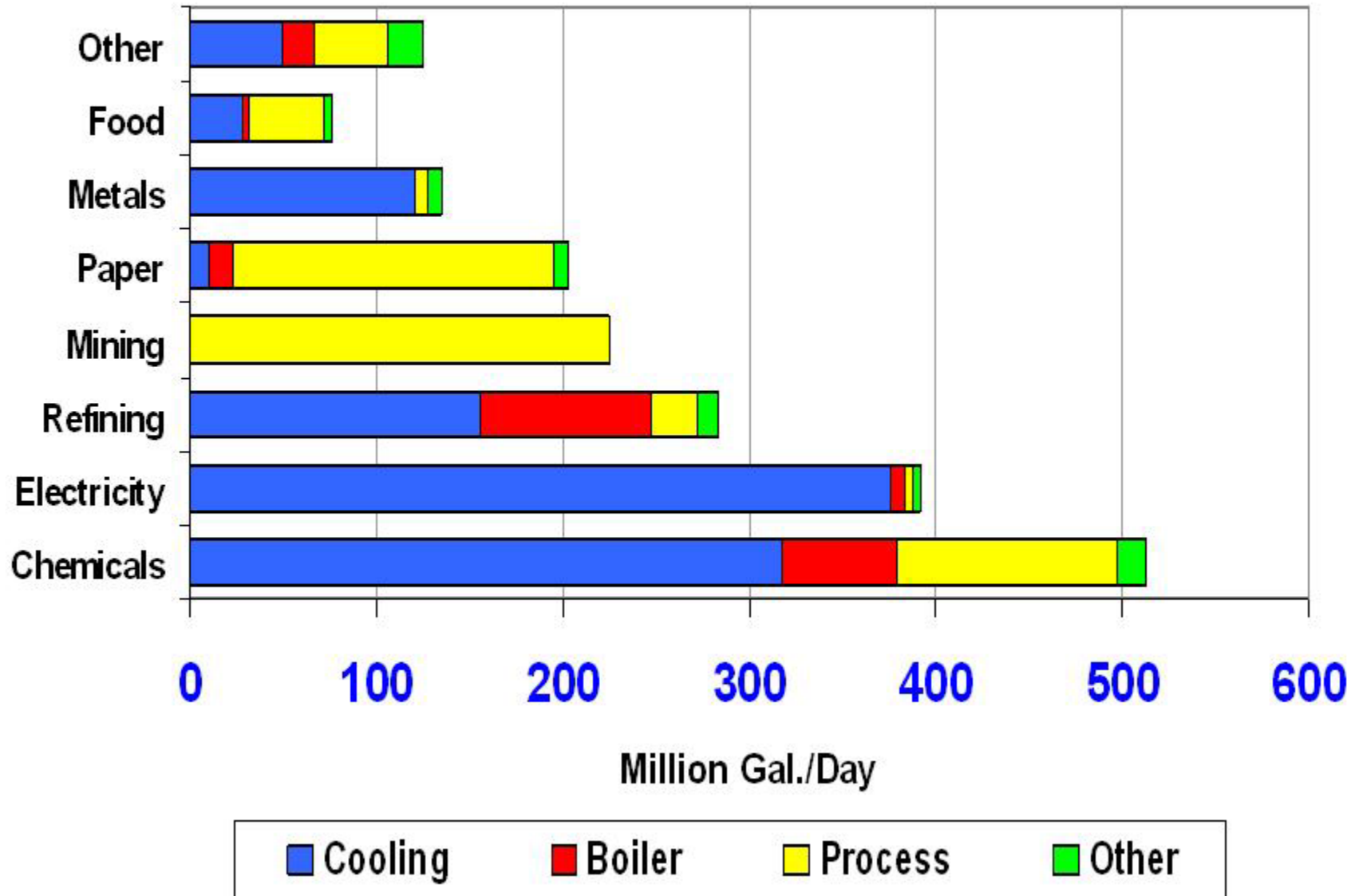
□ Manufacturing

× Thermo-electric Gen.

● Irrigation

# Industrial Water Use in Texas - 1997

(1.0 Million Gal./Day = 3,790 Cubic Meters/Day)

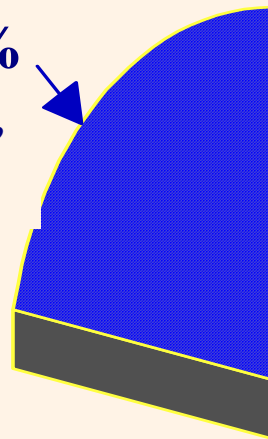


# Industrial Water Use in Texas

*Energy Related Water Use = 78%*

**Other Uses - 22%**

*Process, sanitation,  
landscape, etc.*



**Direct Energy  
Production - 43%**

**Electric  
Oil &  
Gas**

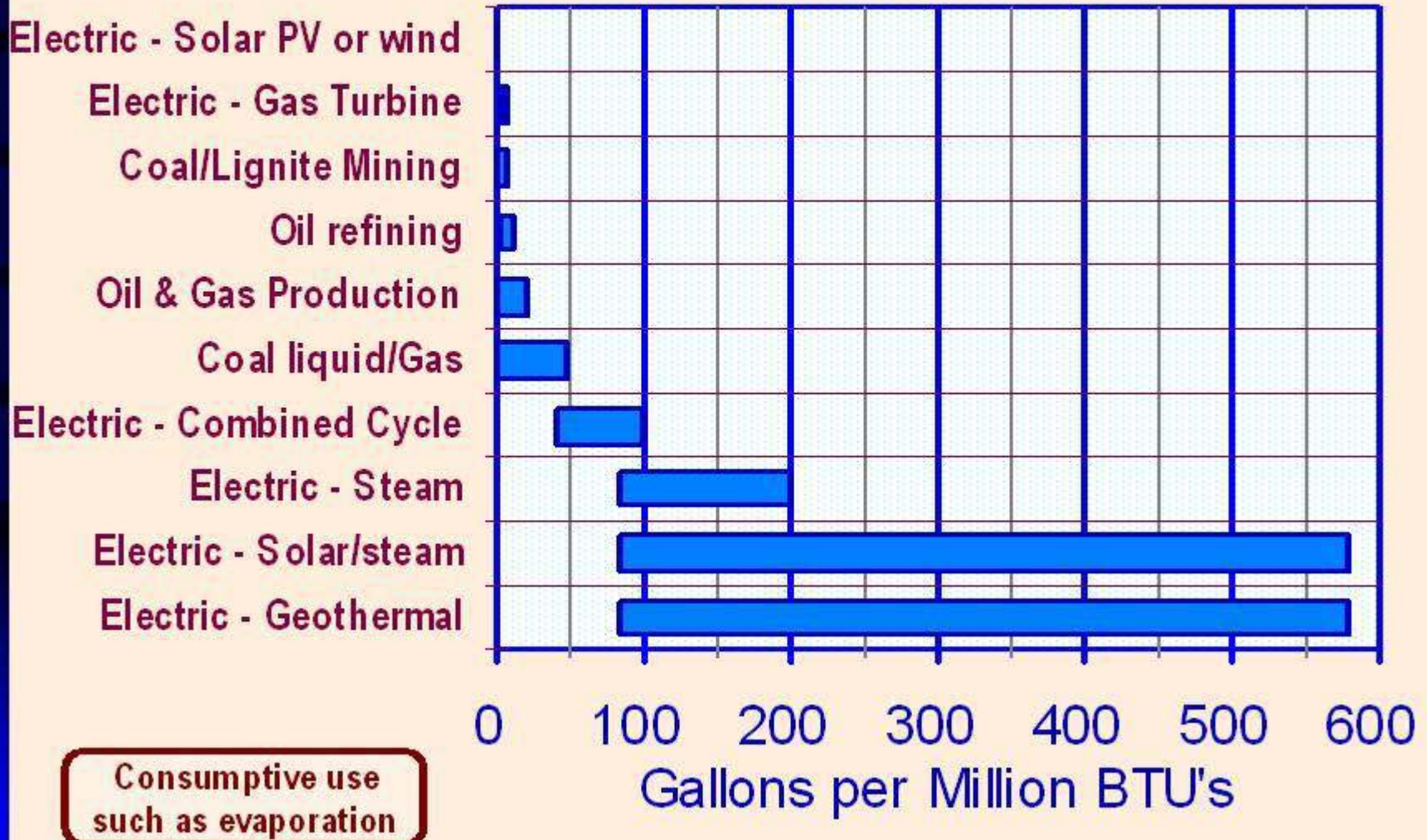
**Cooling &  
Boiler**

**Energy Related  
Uses in Other  
Industries - 35%**

**Industrial use is 2.3  
million acre-feet a year**

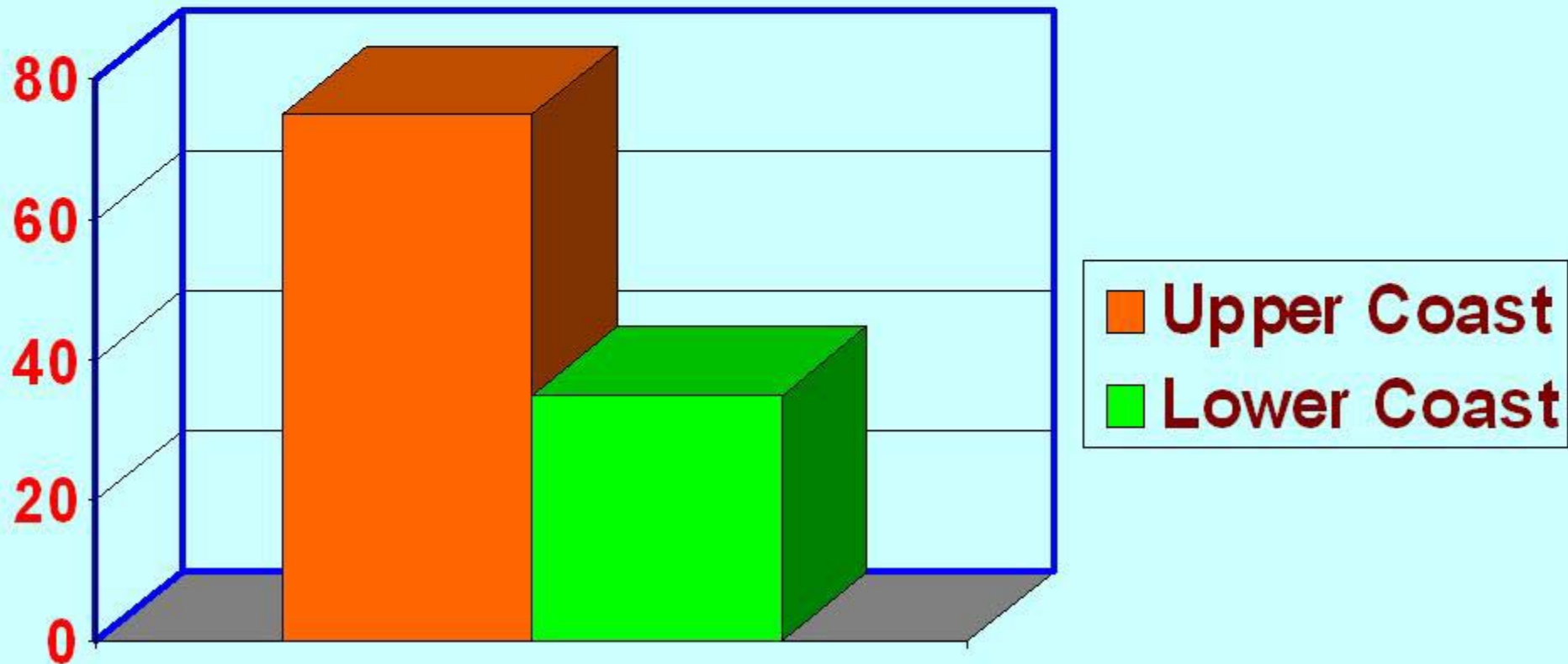
# Water for Energy Production

Gallons per Million BTU's



# Petroleum Refining Water Use in Texas

Gal./Barrel Refined



# Texas Energy – Water Programs

- **Ag. Irrigation Equipment**
  - *Start with SECO \$ for interest by-down*
  - *Now direct state funding*
- **Unaccounted-for Water**
  - *Start with SECO funding*
  - *HB 3338*
- **SECO Requirements**
  - **Annual reporting for state funded entities**
  - **Guidelines**
  - **Performance contraction**

# Water-Efficient Commercial Equipment

- *Financial and Business Incentives*
- *Legislation and Codes*
- *New Equipment Innovations*

# Legislative & Code Initiatives

- *Commercial Clothes Washers*
  - ✓ *Maryland, Connecticut, & California have standards. Texas & Washington have new Bills now.*
  - ✓ *Would require a water factor of 9.5 gallons per cubic foot or less.*
- *Pre-Rinse Spray Valves*
  - ✓ *Would set a limit of no more that 1.6 gal./min. at 60 psi.*
  - ✓ *California, Washington, and Texas all have Bills*

# Tax Incentives

## Sales Tax

- Texas, Oregon, & Washington State
- Texas applies to reuse, rainwater harvesting and some limited conservation measures.

## Property Tax

- Texas provides limited relief

See <http://www.cityofaustin.org/watercon>

and click on commercial

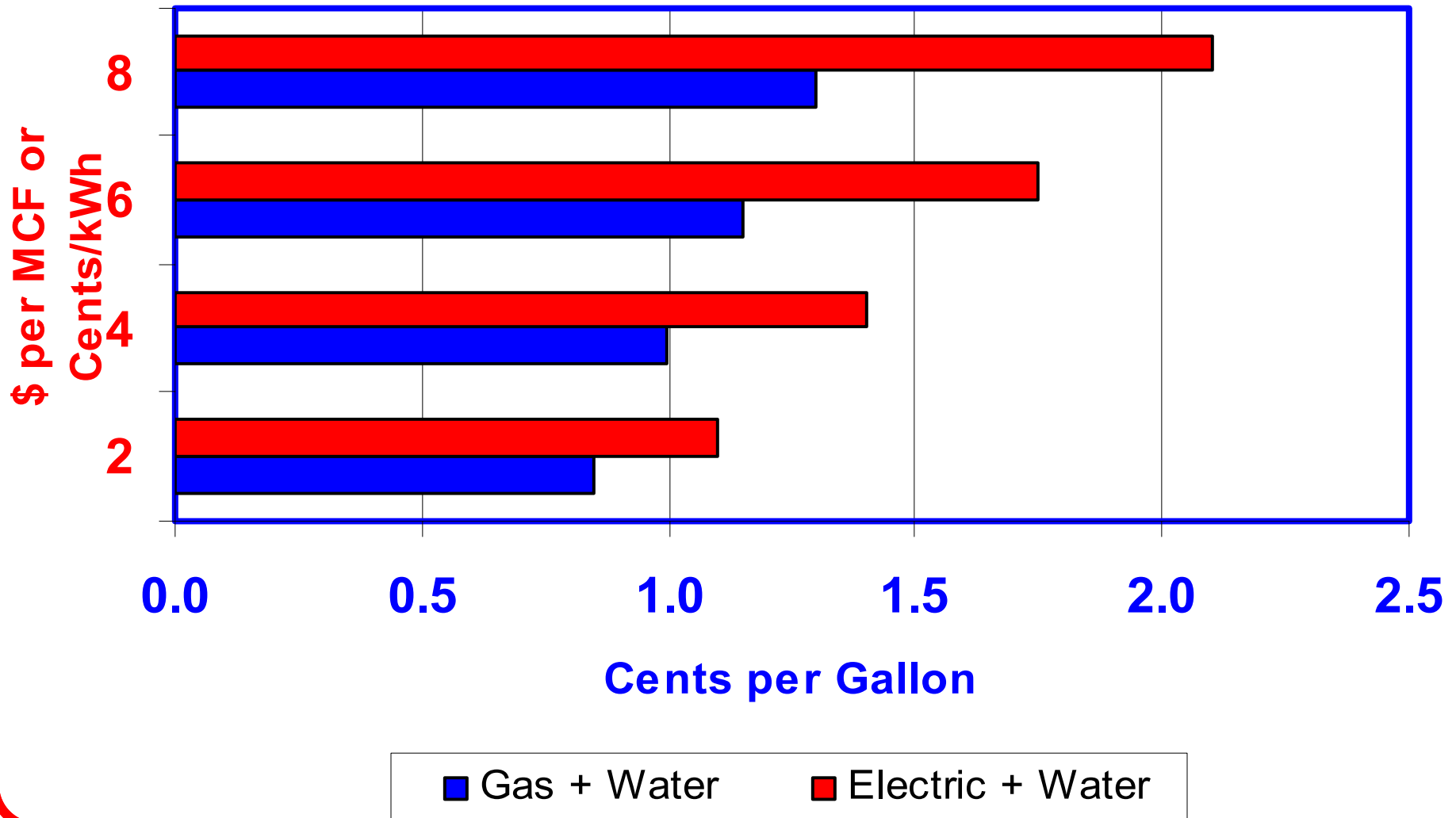
# **Austin Joint Energy – Water Efforts**

- *History of cooperation*
- *Joint rebates & educational efforts*
  - *SB 5*

# A Multiple Resource Approach

- *Energy*
- *Water*
- *Wastewater*
- *Solid Waste*
- *Air Quality*
- *Green Building*
- *Watershed Protection*

# Energy & Electric Costs for Hot Water



# *Financial and Business Incentives*

- **Rebates**
- **Free fixtures and equipment**
  - **Free Services**
  - **Tax Incentives**
- **Evaporative Credit Program**

# **Commercial Equipment That Saves Water & Energy**

- **Laundry Equipment**
- **Eliminating Garbage Disposals**
  - **X-Ray Film Development**
  - **Sterilizers and Autoclaves**
    - **Dry Vacuum Pumps**

# Rebates in Austin

- **Unique joint energy and water rebates for:**
  - ✓ **Commercial and residential clothes washers**
  - ✓ **Dry Vacuum Pumps**
  - ✓ **Scrap Baskets to replace garbage dispose-alls**

# Starting with Water/Energy

**The normal culprit**



**12,000 replaced**

**190,000 Gal./day**

**22 Billion BTU/Yr.**

# Coin-Operated Commercial Clothes Washers



*Water Savings of 25 gallons  
per load are common*



# Ozone System at a Hotel Laundry



**An  
Example  
of Water  
Reuse at  
a Hotel  
Laundry.**

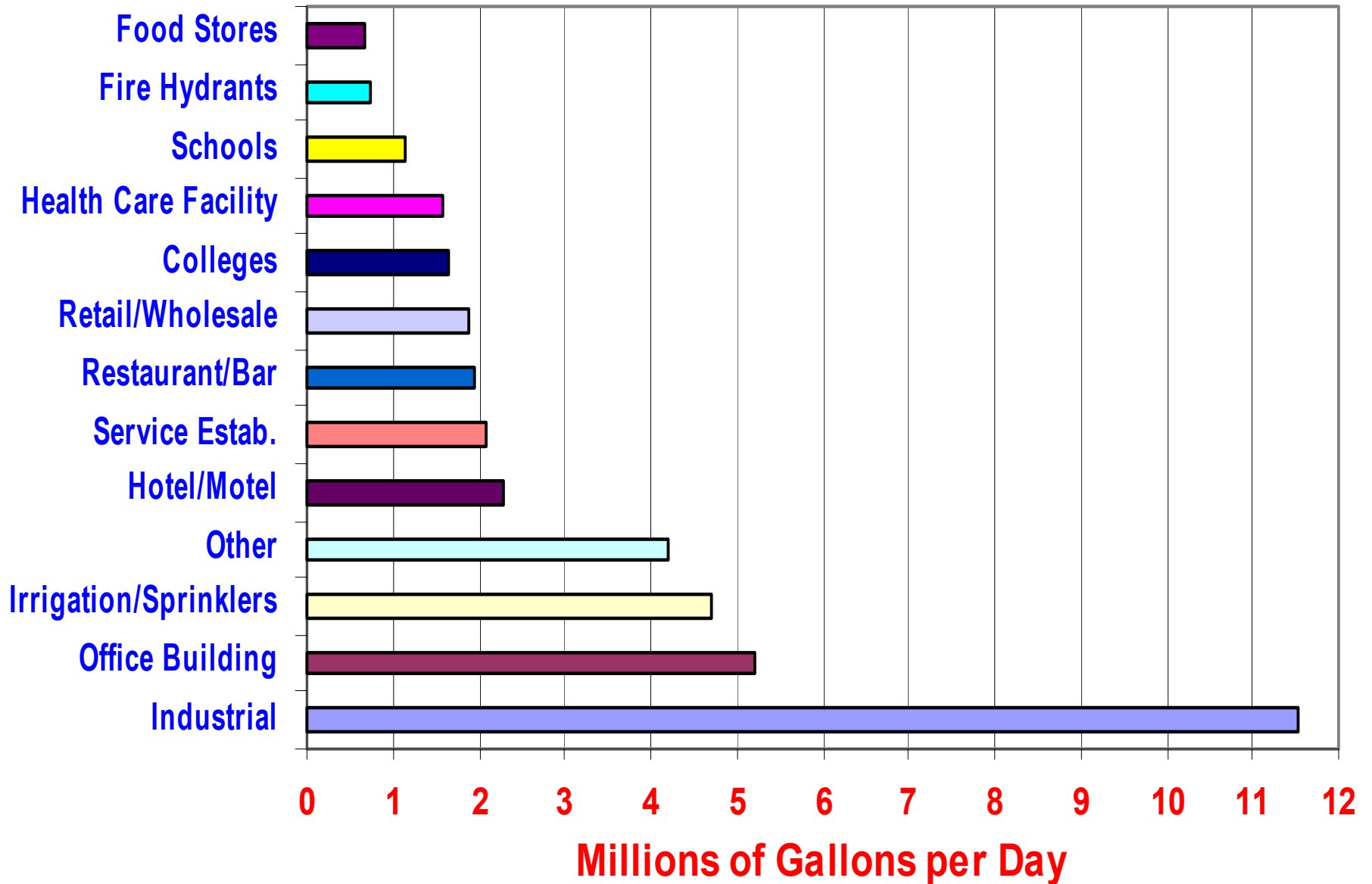
# Food Service Operations

- **Refrigeration**
- **Ice machines**
- **Garbage grinders**
- **Pre-rinse spray nozzles**
- **Dishwashers**

# Food Service Operations Cont.

- **Steam Tables**
- **Food steamers**
- **Clean-up**
- **Thawing food**
- **Steam kettles**
- **Steamers**

# Commercial/Industrial Water Use in Austin, Texas 2000-2001



# WaterWise Restaurants

## Criteria to be WaterWise

- 1. Toilets all 1.6 gpf*
- 2. No garbage dispose-all*
- 3. No once-through cooling*
- 4. 1.6 gpm pre-rinse spray valve*
- 5. Implement irrigation audit recommendations*

# Restaurant Initiatives in Austin

*EarthSmart is a  
joint effort with*

- ✓ **Water conservation**
  - ✓ **Water quality**
- ✓ **Austin Energy (electric)**
  - ✓ **Solid waste**

# Food Service Equipment Examples





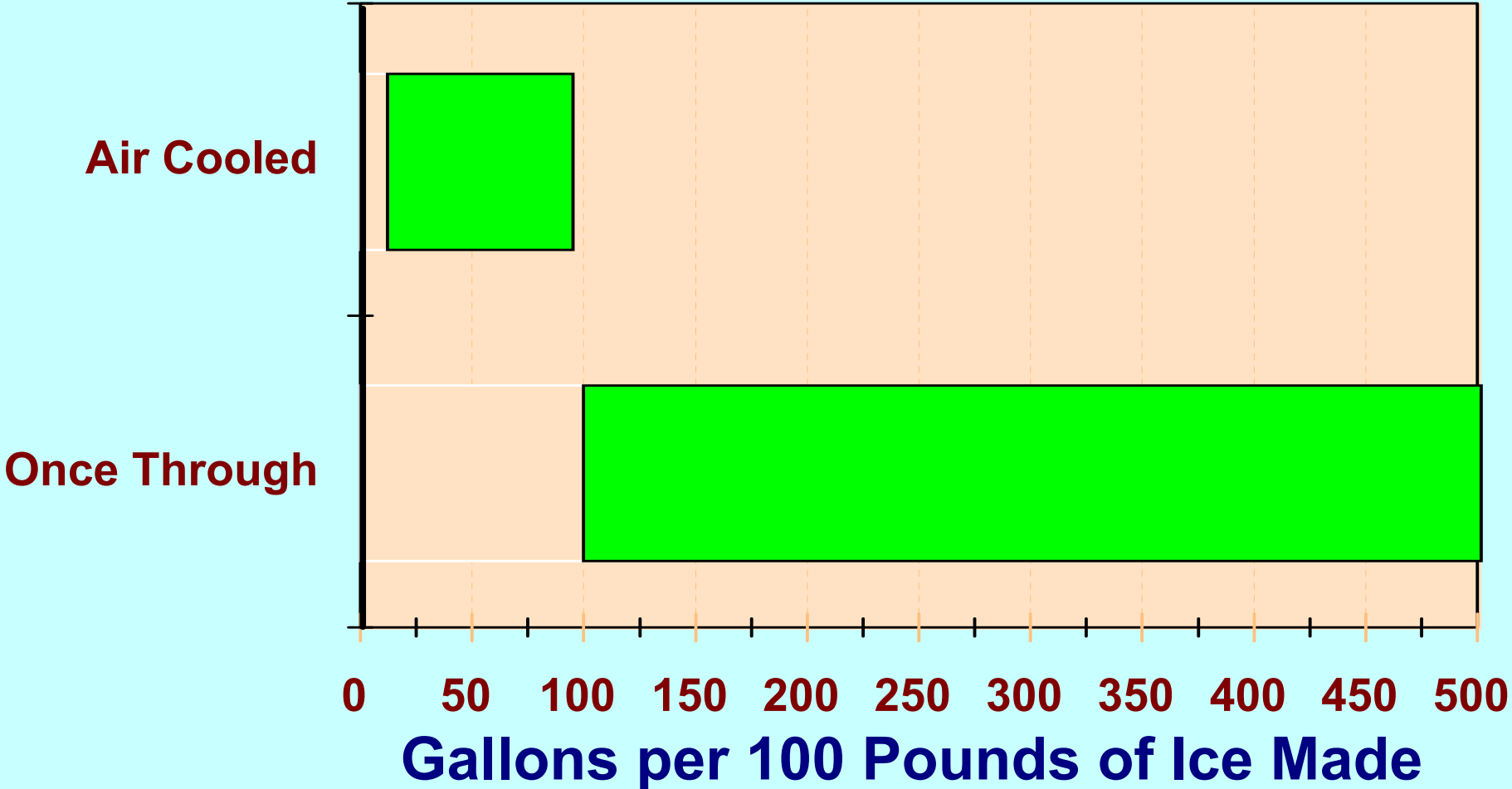
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(no louvers)

# Comparison of Water Use for Ice Making

## *Commercial Units*



## ***Inputs***

See ARI Directory for input numbers  
by model

Select ice machines made by the same company capable of making this  
amount per day

Hundreds of pounds made per day	<b>10</b>
kWh per 100 pounds of ice <u><b>air cooled</b></u>	<b>6.5</b>
kWh per 100 pounds of ice <u><b>air cooled</b></u> <u><b>remote head</b></u>	<b>6.9</b>
kWh per 100 pounds of ice <u><b>water</b></u> <u><b>cooled</b></u>	<b>5.2</b>
Gal. Per 100# <b>for cooling</b>	<b>105</b>
Gal. Per 100# of ice - <b>air cooled unit</b>	<b>15</b>
Gal. Per 100# of ice - <b>air cooled unit</b> <b>remote head</b>	<b>17</b>
Gal. Per 100# of ice- <b>water cooled</b> <b>unit</b>	<b>15</b>
Cost of Electricity (cents/kWh)	<b>7</b>
\$ per 1000 gal for water	<b>3.32</b>
\$ per 1000 gal for wastewater	<b>5.1</b>
Air Conditioner efficiency	<b>0.75</b>
Water/WW electric energy use/1000 gal	<b>3.9</b>
Number of days used per year	<b>365</b>
Expected lifetime of ice machine (years)	<b>7</b>

**LIFETIME OPERATING COST OF ICE MACHINES (water and energy)**

Equals days of operation a year X cost per day X life of machine

**Lifetime of ice machine in years**

**7**

**AIR COOLED IN AIR CONDITIONED SPACE**

**\$18,855.62**

**AIR COOLED IN UN AIR CONDITIONED SPACE**

**\$14,766.16**

**AIR COOLED REMOTE HEAD**

**\$15,890.31**

**WATER COOLED**

**\$35,029.87**



Once through cooling from refrigeration unit = 30,000 gallons a day!

# Replacing Garbage Disposals with Strainer Systems

- Water Use – Grinders from 2 to 12 gpm  
Scrap baskets 0.0 gpm
- Horse Power – Grinders from 1 to 10 hp  
Scrap baskets 0.0 hp



**Example**

**10 HP**

**12 Gallons  
per minute**

**or**

**720 gallons  
per hour**

# Scrap Basket System



**Note that the strainer catches food waste that used to go to the grease trap and sewer. This system uses no water or energy while it was common for a grinder to have a 5 hp motor and use 6 gpm.**

# Before and After



**Dispose-all and old spray valve**



**New setup and spray valve  
Note garbage in garbage can  
And not in the water.**

**What a novel idea!**

# Garbage Disposal Rebate

=

- **\$50/hp up to \$250 for water**
  - **\$40/hp for electricity**
- **Not to exceed a total of \$300**

# Door-type machine





- **90% less water**

- **Big energy savings**

- **No water hookup**

- **No sewer hookup**

- **No vent**

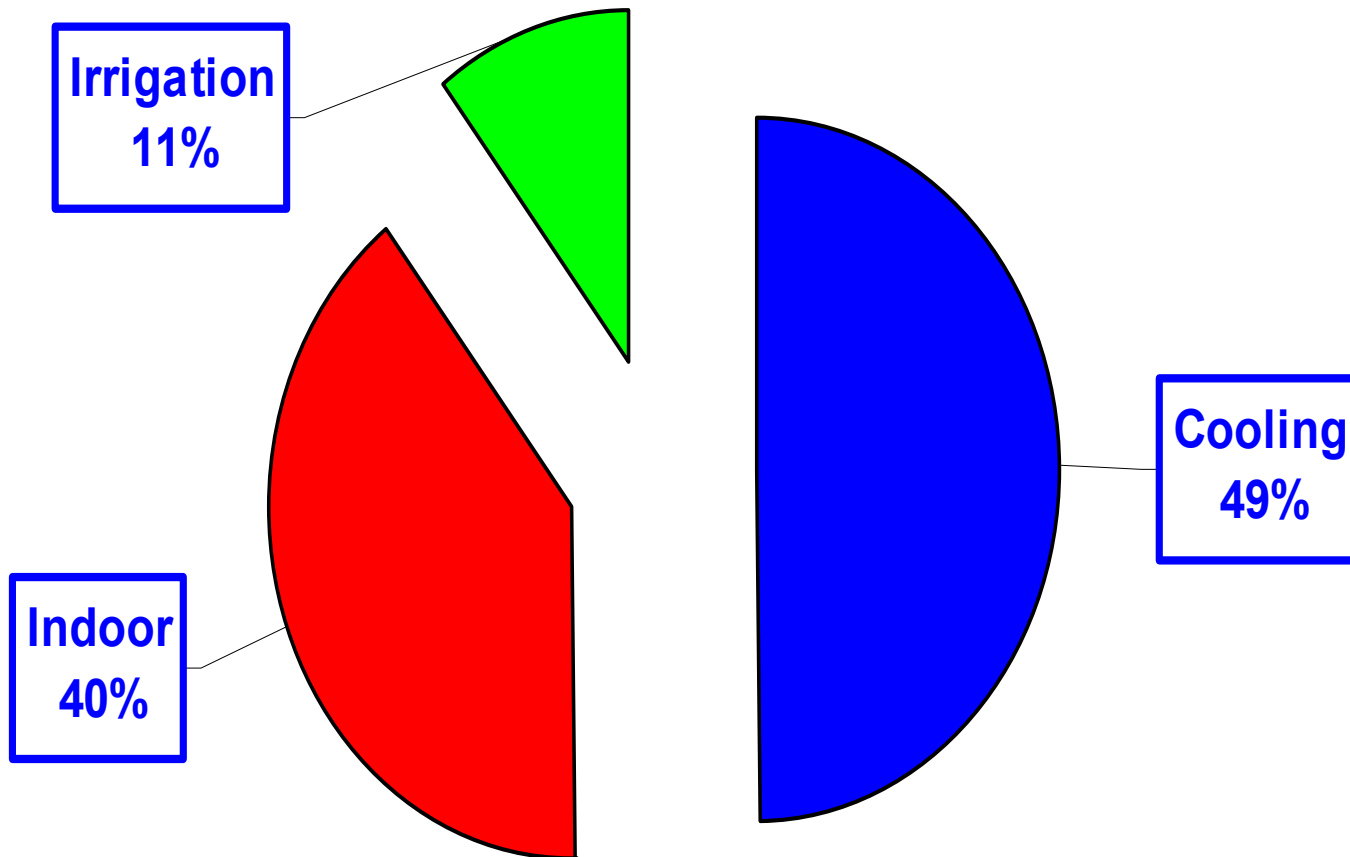
# Spray Systems Waste Water





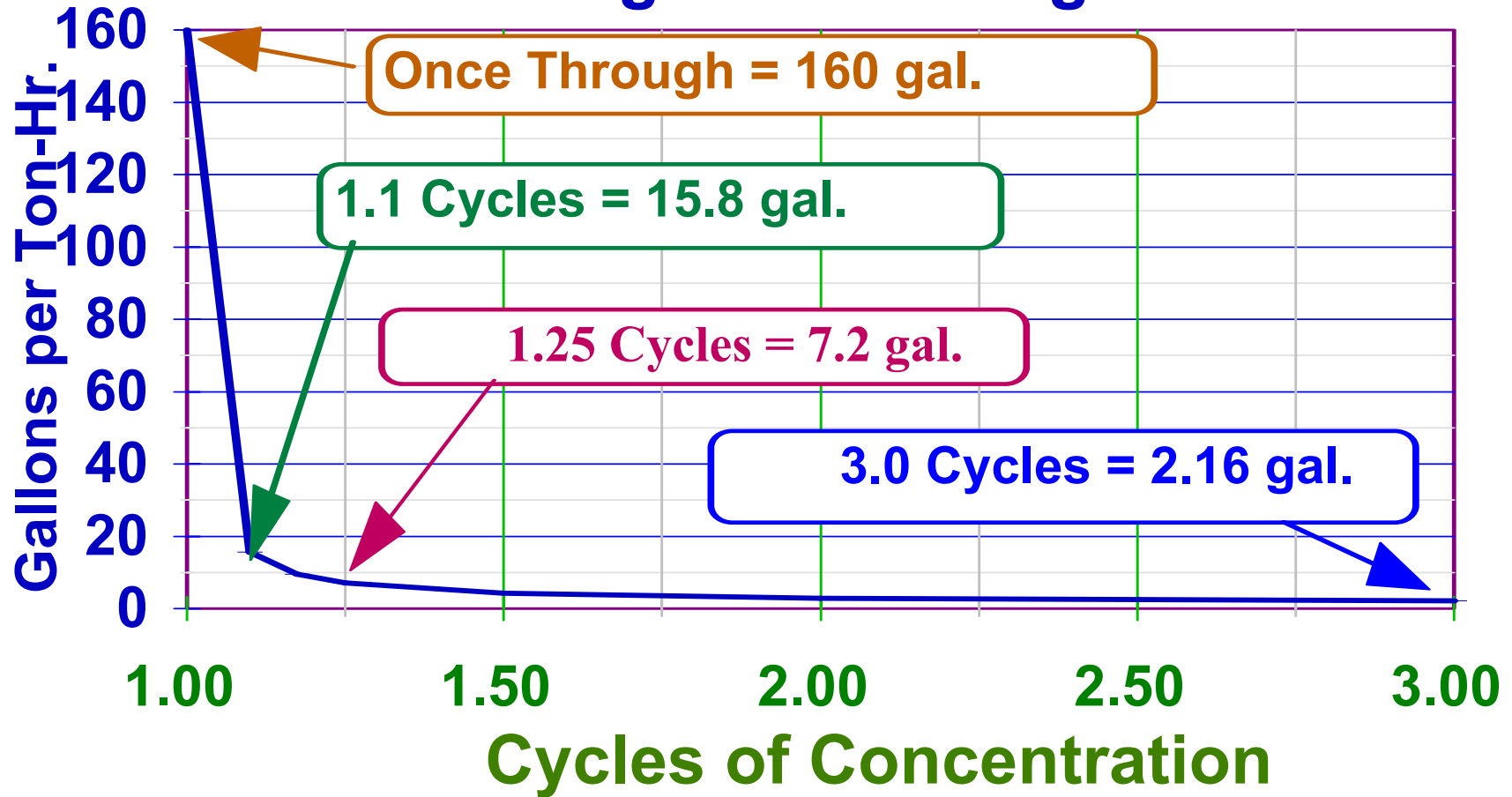
# Evaporative Credit Program

# Annual Water Use Waller Creek Center



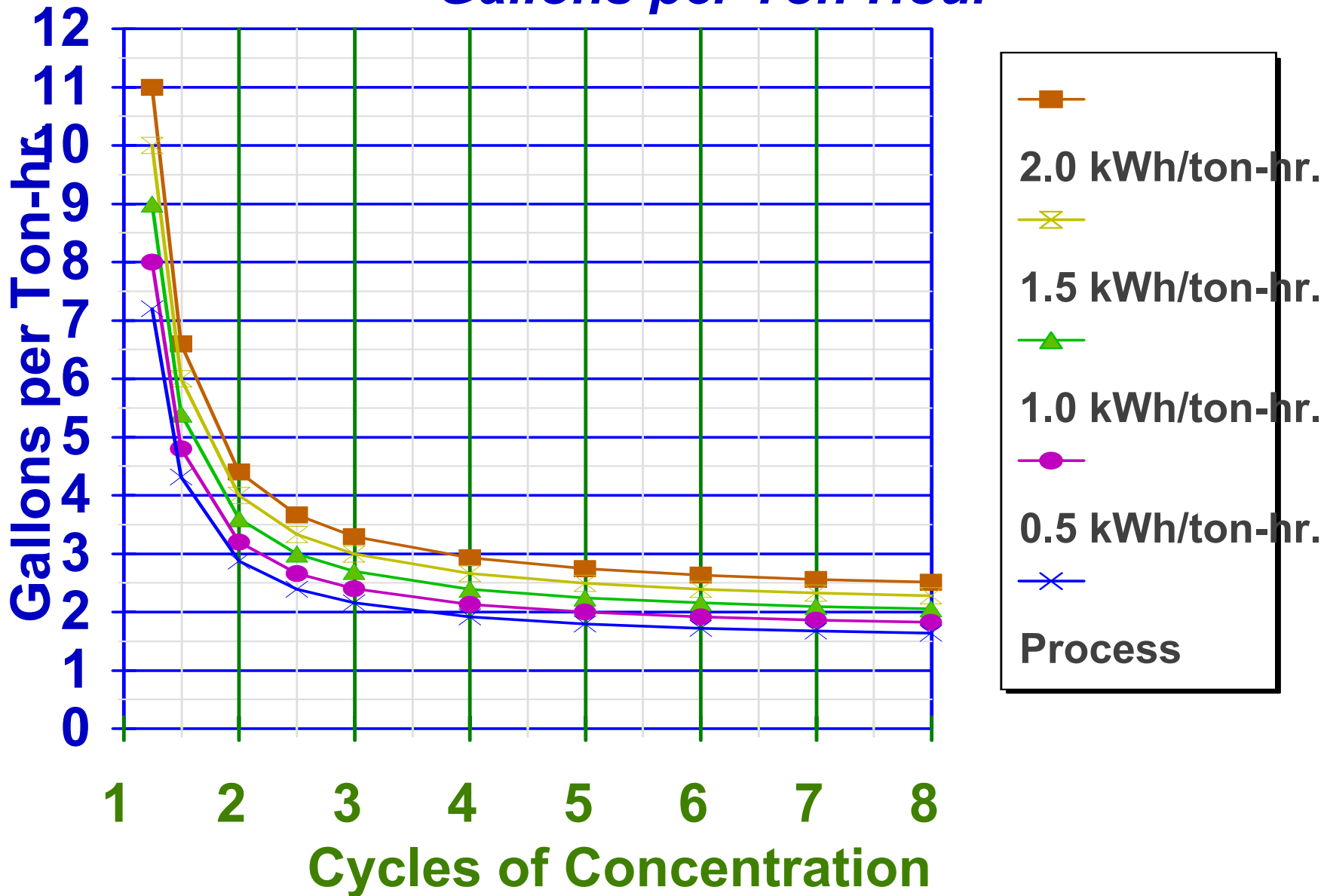
# Cooling Tower Water Use

## Once Through vs. Cooling Tower



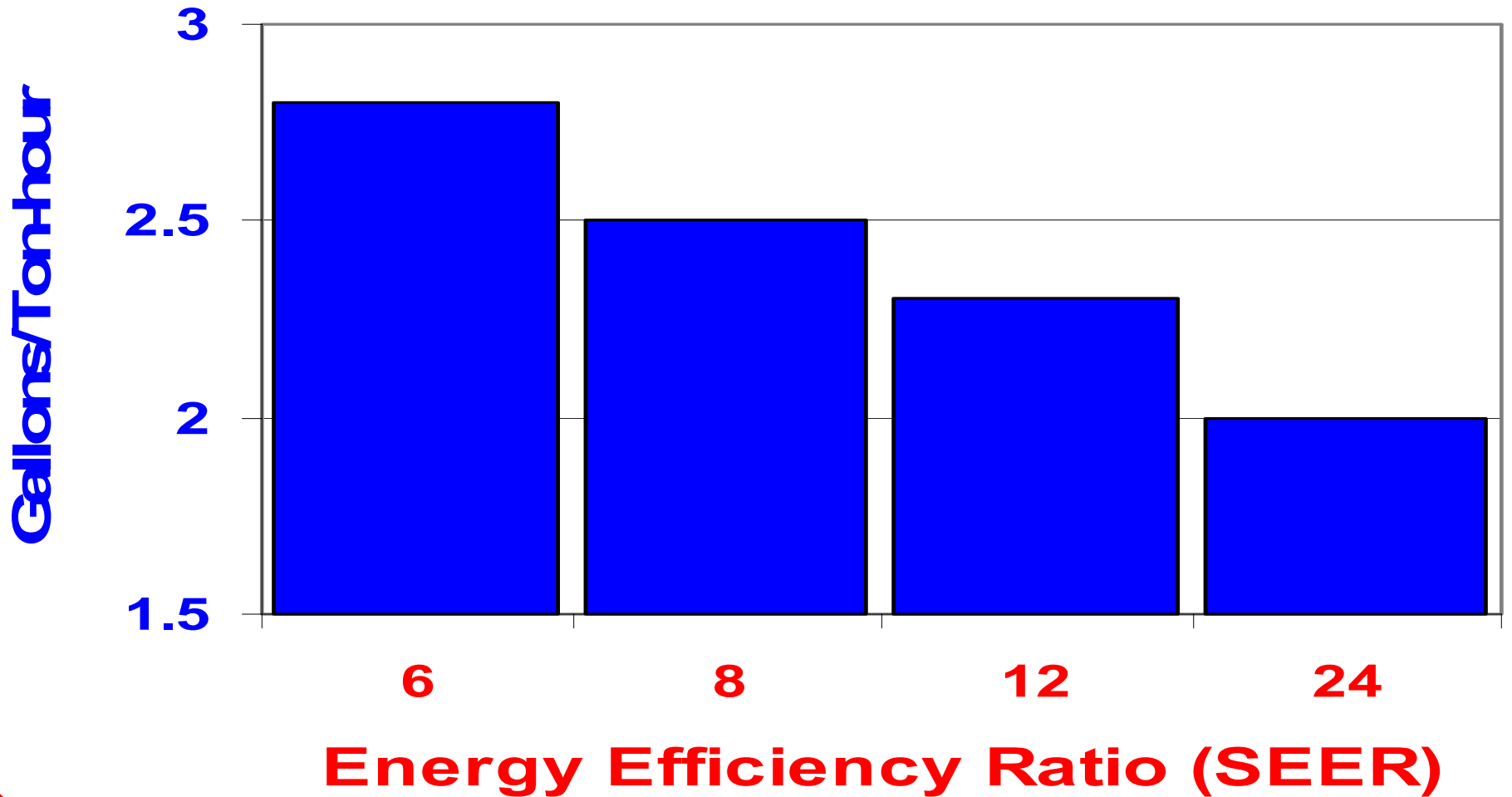
# Cooling Tower Water Use

*Gallons per Ton-Hour*



# Impact of Air Conditioning Efficiency on Water Use in Cooling Towers

*Assumes Five Cycles of Concentration*



# Alternate Sources

- Storm/rain water
- Local groundwater
- Air conditioner condensate
  - Reclaimed Water
  - Other sources??

# X-Ray Film Developers

- Old machines dump 0.5 to 1.0 gpm for cooling
- Recirculating systems save huge volumes, but
  - The new wave is to digital technology that eliminates all water use

# **Sterilizers and Autoclaves**

- Retrofit Kits can reduce steam trap discharge cooling water needs by 90%**

**Savings with retrofit kits are in the range of 600 gallons to 900 gallons per sterilizer per day**



# Large Hospital Steam Sterilizer

# Vacuum Pump Rebate

=

- \$500 up to 2.5 hp and then \$1 per gal. – day saved for water
- \$168 per hp reduction for energy



**Old Liquid Ring and New Dry Vacuum Pump at Dental Office**

# And then the Air

- **Water energy relationships**
- **5% of all electricity used (60% by city gov.) for water and wastewater**
- **Energy production & Pollution.**

# Air pollution for Power use for Water and Wastewater Treatment

*Based on Austin Mix of Generation*

<b>Pollutant</b>	<b>SO<sub>2</sub></b>	<b>NOx</b>	<b>Particulates</b>	<b>CO</b>	<b>CO<sub>2</sub></b>
<b>Grams/kWh*</b>	<b>1.58</b>	<b>1.22</b>	<b>0.13</b>	<b>0.16</b>	<b>540.0</b>
<b>Grams/1000 Gal.</b>	<b>6.2</b>	<b>4.8</b>	<b>0.5</b>	<b>0.6</b>	<b>2,277.3</b>

# Air Pollution Reduction Through Water Conservation Measures

			Water	Other *	Total	Grams per Year			
	Savings per	Water	Energy	Energy	Energy				
	Measure	Savings	Savings	Savings	Savings	SO <sub>2</sub>	NOx	Particulate	CO
	Gal./Day	Gal./Year	kWh/Yr.	kWh/Yr.	kWh/Yr.	1.58 g/kWh	1.22 g/kWh	0.13 g/kWh	0.16 g/kWh
<b>Residential Programs</b>									
Free Toilets	25	9125	21		21	33	26	3	3
Toilet Rebates	25	9125	21		21	33	26	3	3
Clotheswasher Rebates	15	5475	13	600	613	968	747	80	98
Irrigation Rebates	30	10950	25		25	40	31	3	4
WaterWise Rebates	30	10950	25		25	40	31	3	4
Aerators	4	1460	3	50	53	84	65	7	9
Showerheads Picked Up	7	2555	6	153	159	251	194	21	25
Irrigation Audits	30	10950	25		25	40	31	3	4
Rainwater Rebates	79	28835	67		67	106	82	9	11
Rain Barrel Rebates	6	2008	5		5	7	6	1	1
Indoor Audits	20	7300	17		17	27	21	2	3
Hose Timers	3	1095	3		3	4	3	0	0
Rain Shutoffs	20	7300	17		17	27	21	2	3
<b>Multi-Family Programs</b>									
Free Toilets	30	10950	25		25	40	31	3	4
Toilet Rebates	30	10950	25		25	40	31	3	4
Clotheswasher Rebates	45	16425	38	2000	2038	3220	2486	265	326
<b>Commercial Programs</b>									
Toilet Rebates	34	12410	29		29	45	35	4	5
Free Toilets	34	12410	29		29	45	35	4	5
Irrigation Audits	250	91250	212		212	334	258	28	34
Indoor Audits	100	36500	85		85	134	103	11	14
Clothes Washers	45	16425	38	2000	2038	3220	2486	265	326
Dental Vacuum Pumps	720	262800	610	1750	2360	3728	2879	307	378
Pre-rinse spray valve	200	73000	169	4370	4540	7173	5538	590	726
Remove Garbage Grinder	400	146000	339	8741	9079	14346	11077	1180	1453

\* Additional energy savings due to reduced hot water, decreased dryer energy use and increased motor efficiency assuming heating of water done with electricity.

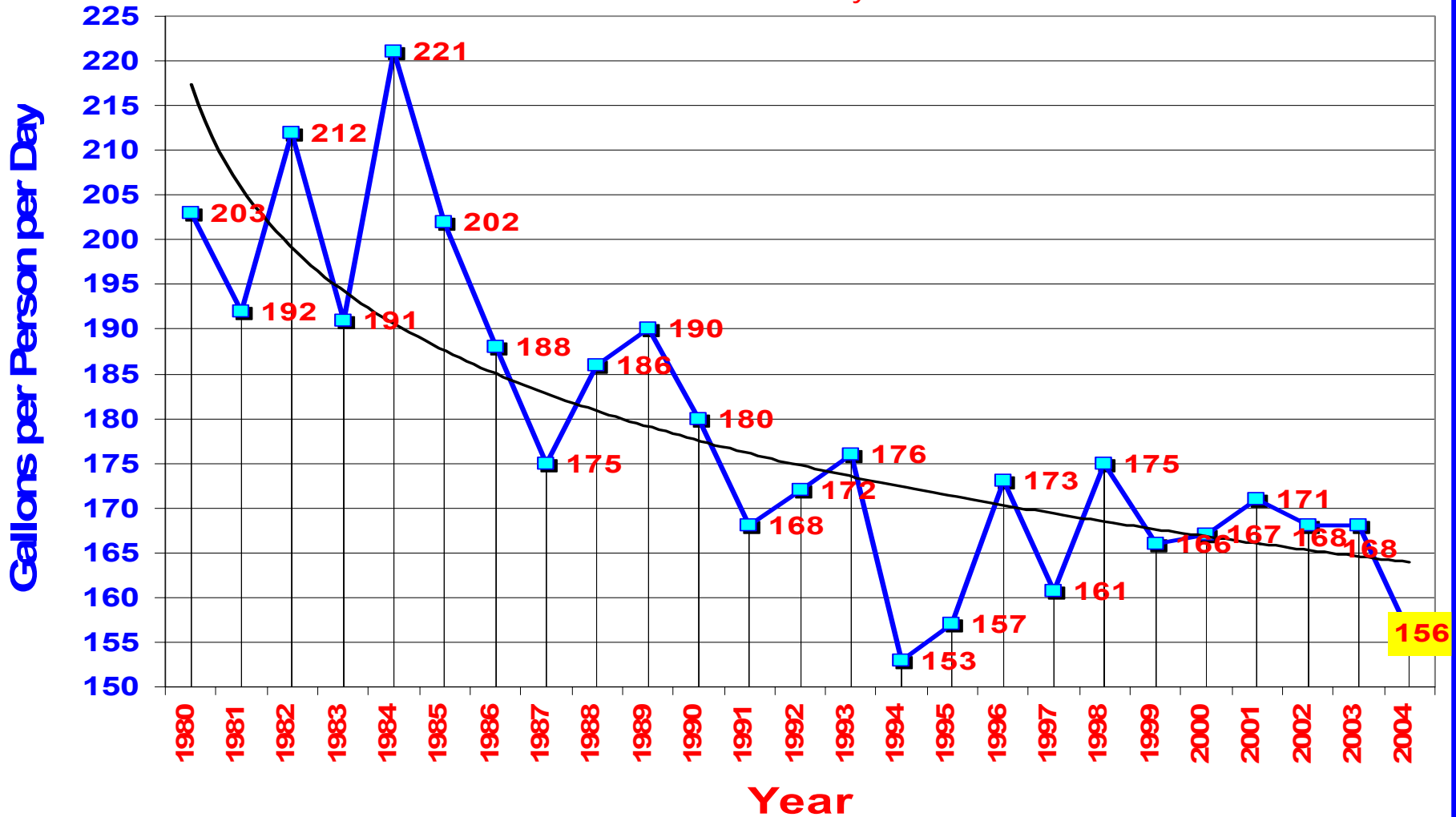
## Grams of Pollutant Generated Based on Austin Power Generation Mix

Pollutant	SO <sub>2</sub>	NOx	Particulates	CO	CO <sub>2</sub>
Grams/kWh*	1.58	1.22	0.13	0.16	540
Grams/1000 Gal.*	6.2	4.8	0.5	0.6	2,277

# Non-Industrial Per Capita Water Use in Austin

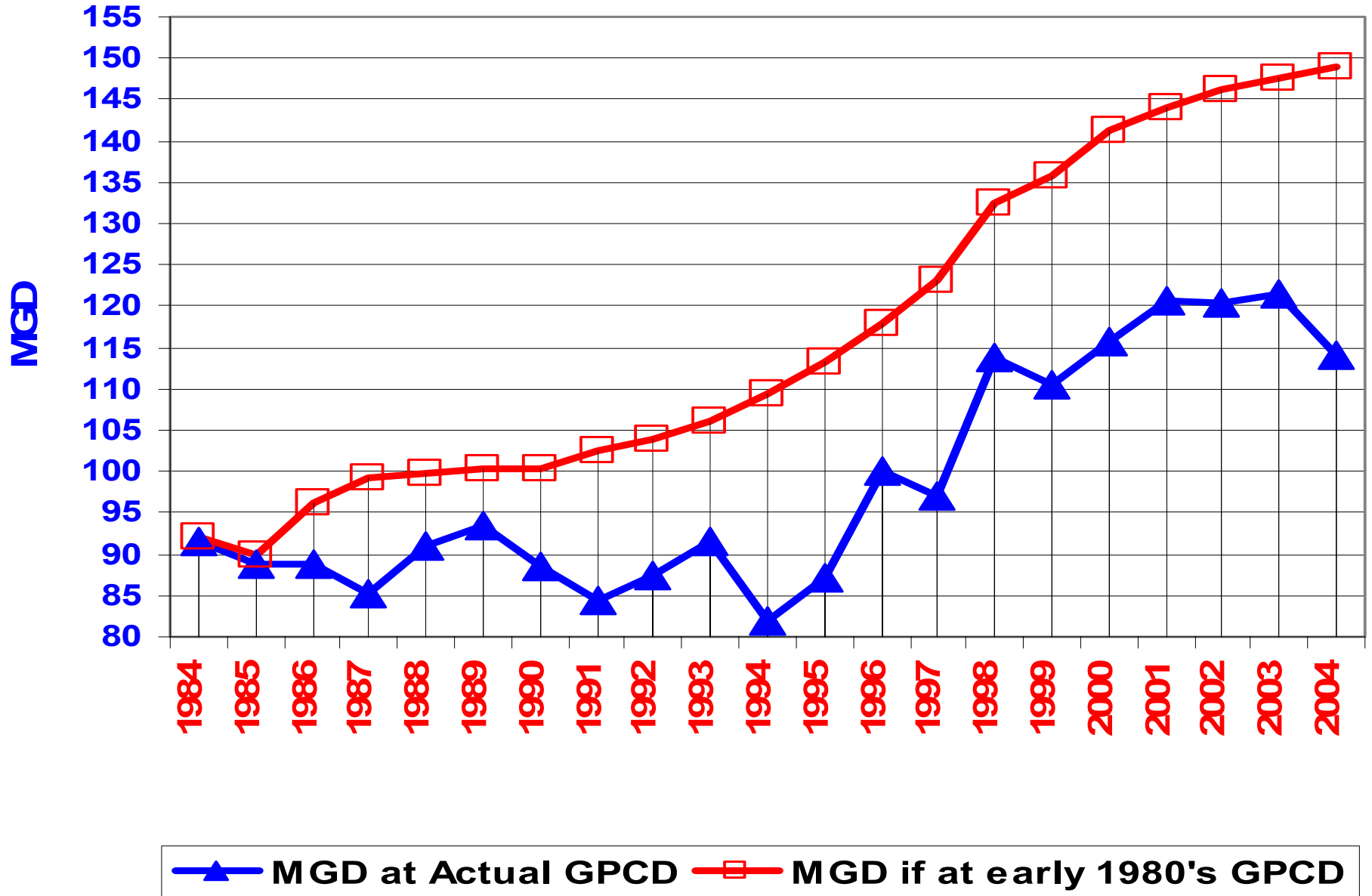
1980 - 2004

TWDB data to 2000 and City data to 2003

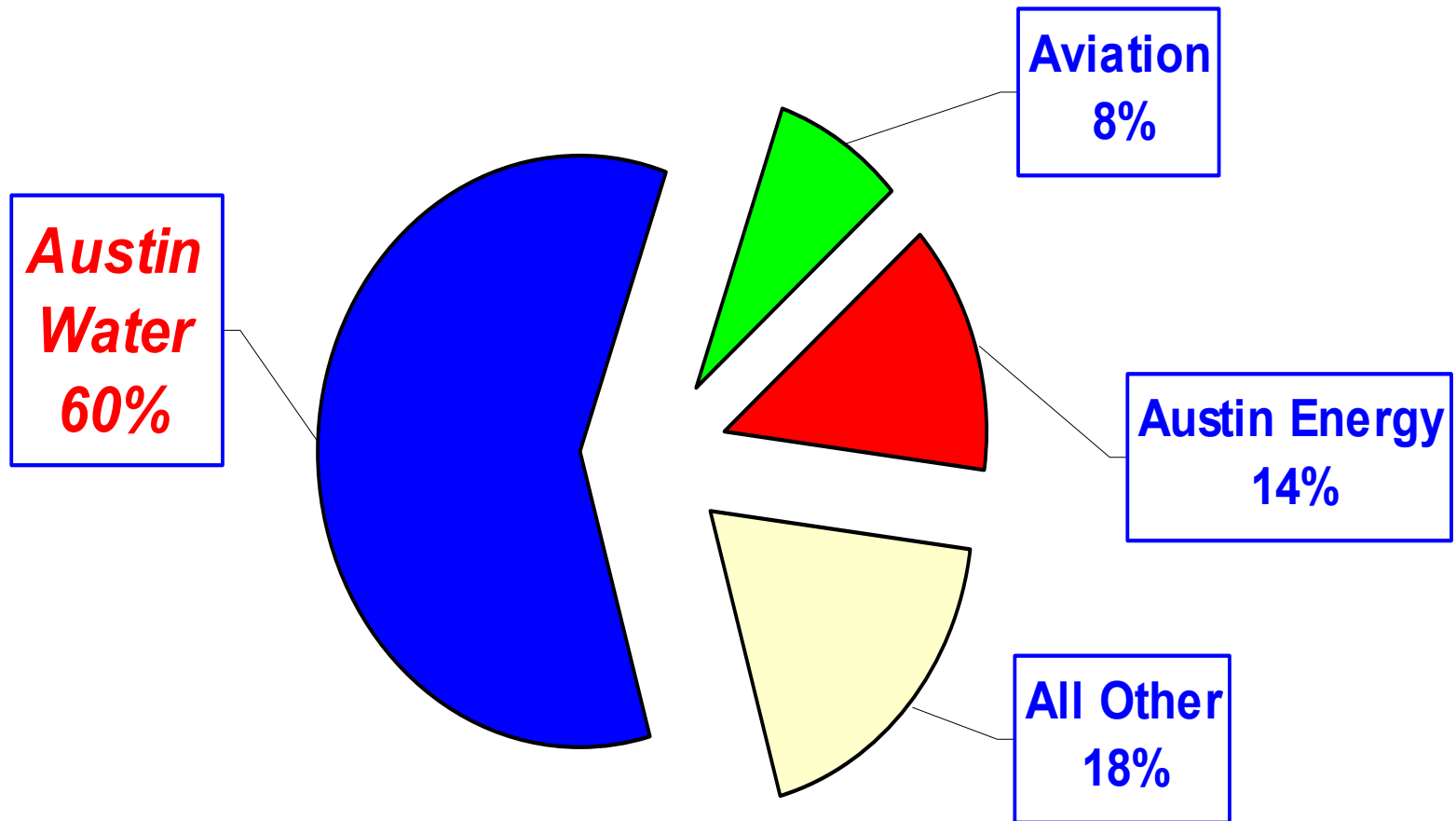


# Conservation Savings Since 1984

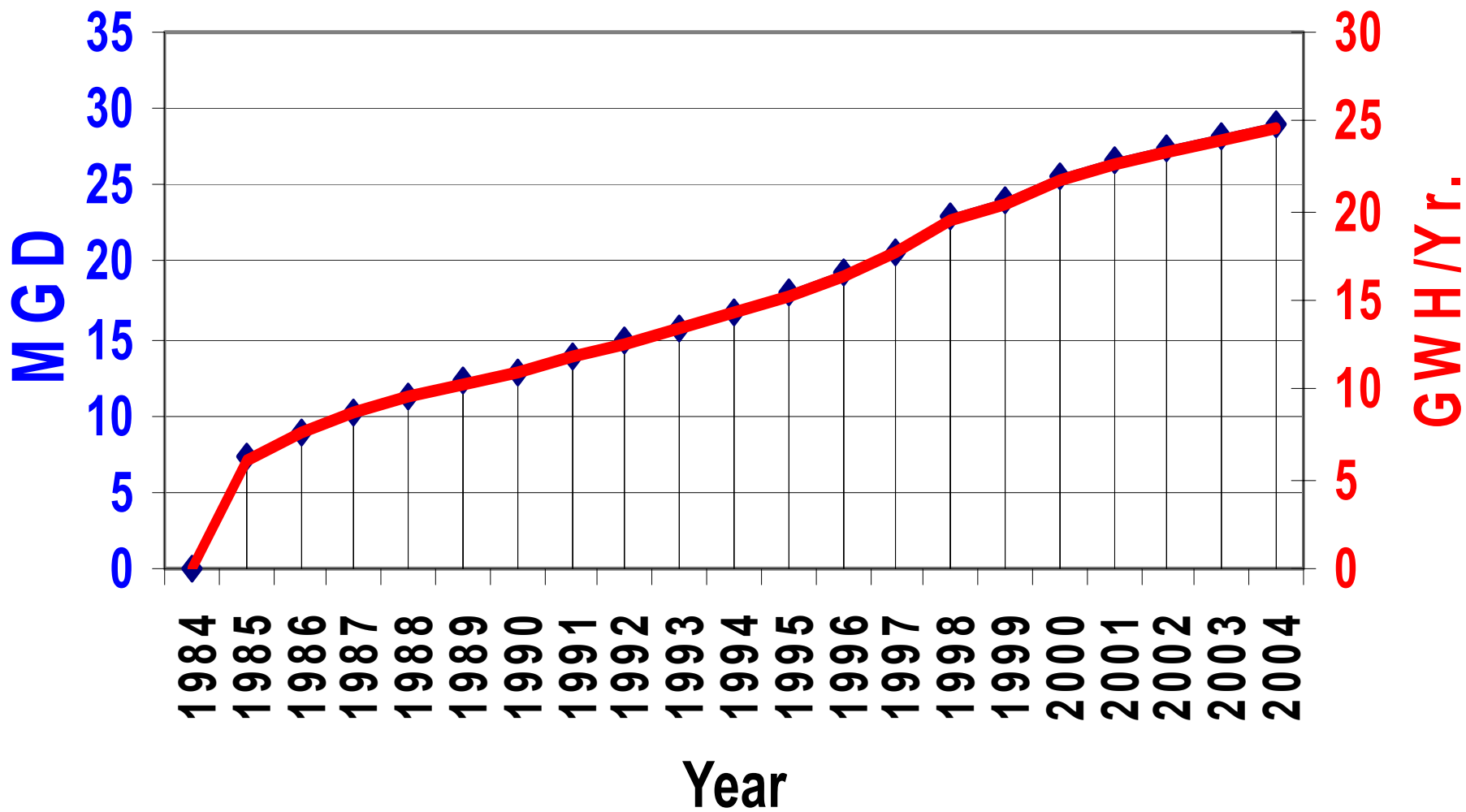
(Excludes wholesale and industrial sales)



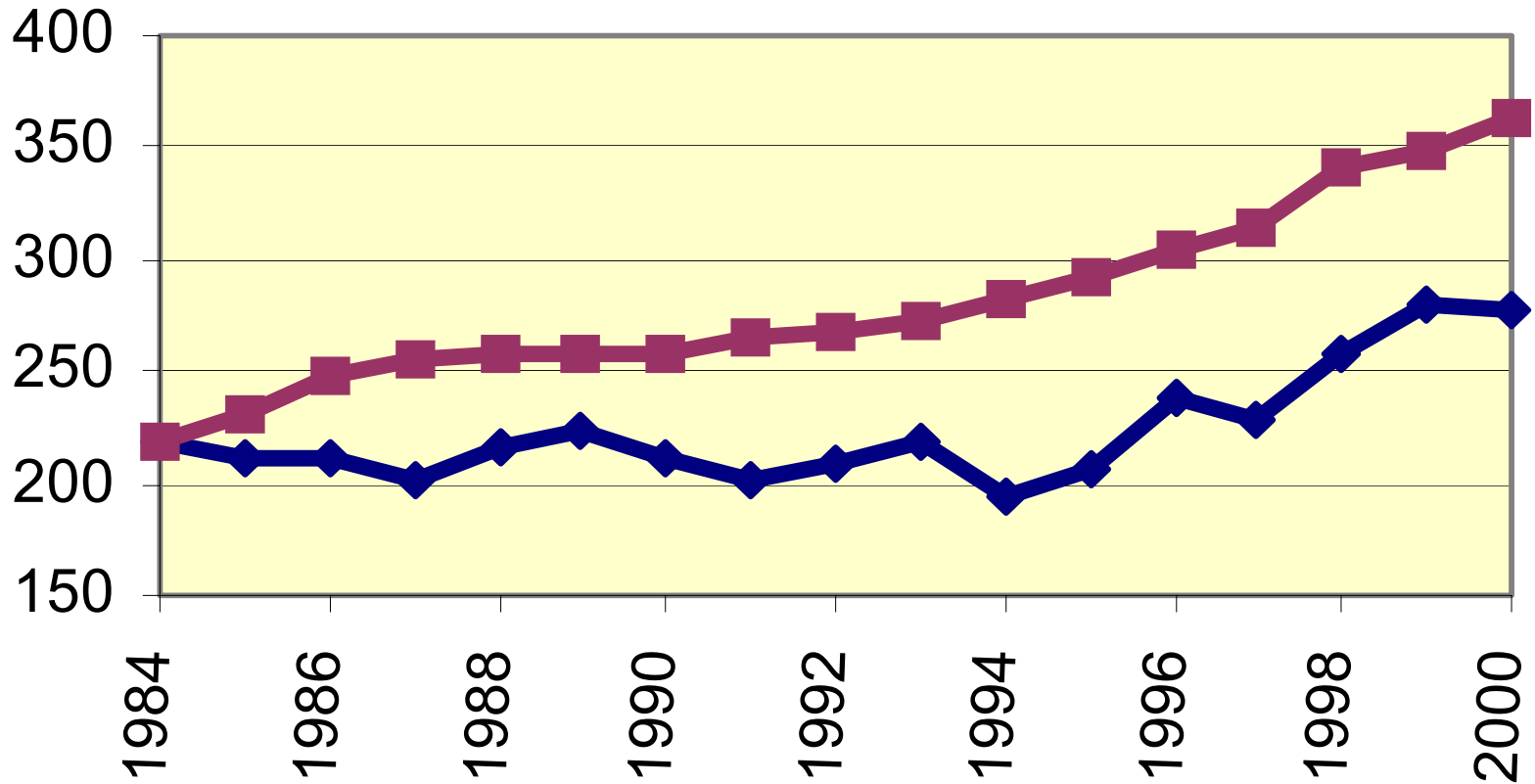
# Electric Energy Use by City Department for Austin



# Cumulative Savings



# CO<sub>2</sub> Emmissions With & Without Water Conservation



Water Processing Related CO<sub>2</sub> Emissions for all City of Austin Water



CO<sub>2</sub> Emissions Assuming 1984 Per Capita Water Consumption