

Information on Energy – Water Relationships

Connected at the hip!

**“Water is the oil of
the 21st century.” —**

***Andrew Liveris, chief
executive,***

Dow Chemical Co.,

August 2008.

Water for Energy Production

Gallons per Million BTU's

Electric - Solar PV or wind

Electric - Gas Turbine

Coal/Lignite Mining

Oil refining

Oil & Gas Production

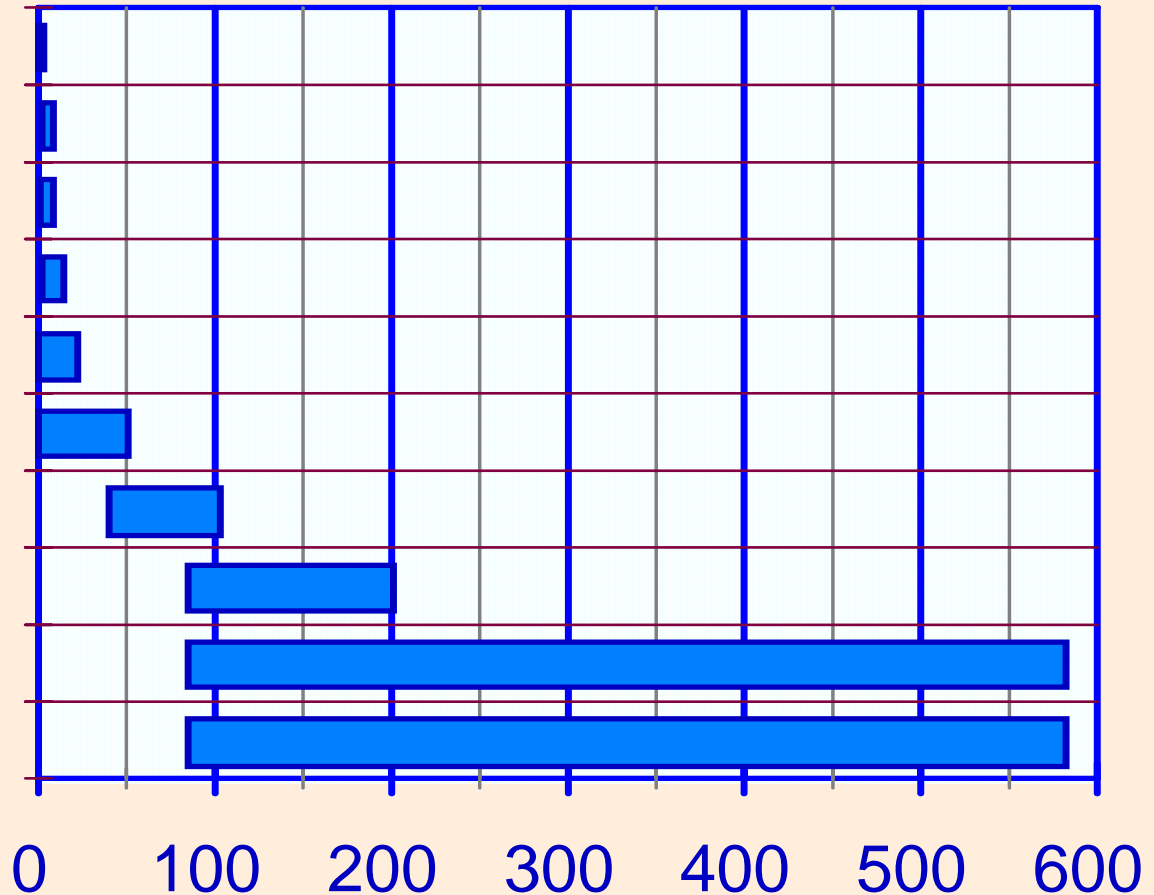
Coal liquid/Gas

Electric - Combined Cycle

Electric - Steam

Electric - Solar/steam

Electric - Geothermal



Consumptive use
such as evaporation

Gallons per Million BTU's

Total Fresh Water Withdrawals

US Geological Survey

2000

Public supply, 11 percent



Richard L. Marella, USGS

Public supply water intake, Bay County, Florida

Irrigation, 34 percent



Jeff Vanuga, USDA NRCS

Gated-pipe flood irrigation, Fremont County, Wyoming

Aquaculture, less than 1 percent



Courtesy of Clear Springs Foods, Inc.

World's largest trout farm, Buhl, Idaho

Mining, less than 1 percent



Nancy L. Barber, USGS

Spodumene pegmatite mine, Kings Mountain, North Carolina

Domestic, less than 1 percent



Alan M. Cressler, USGS

Domestic well, Early County, Georgia

Livestock, less than 1 percent



Jeff Vanuga, USDA NRCS

Livestock watering, Rio Arriba County, New Mexico

Industrial, 5 percent



Alan M. Cressler, USGS

Paper mill, Savannah, Georgia

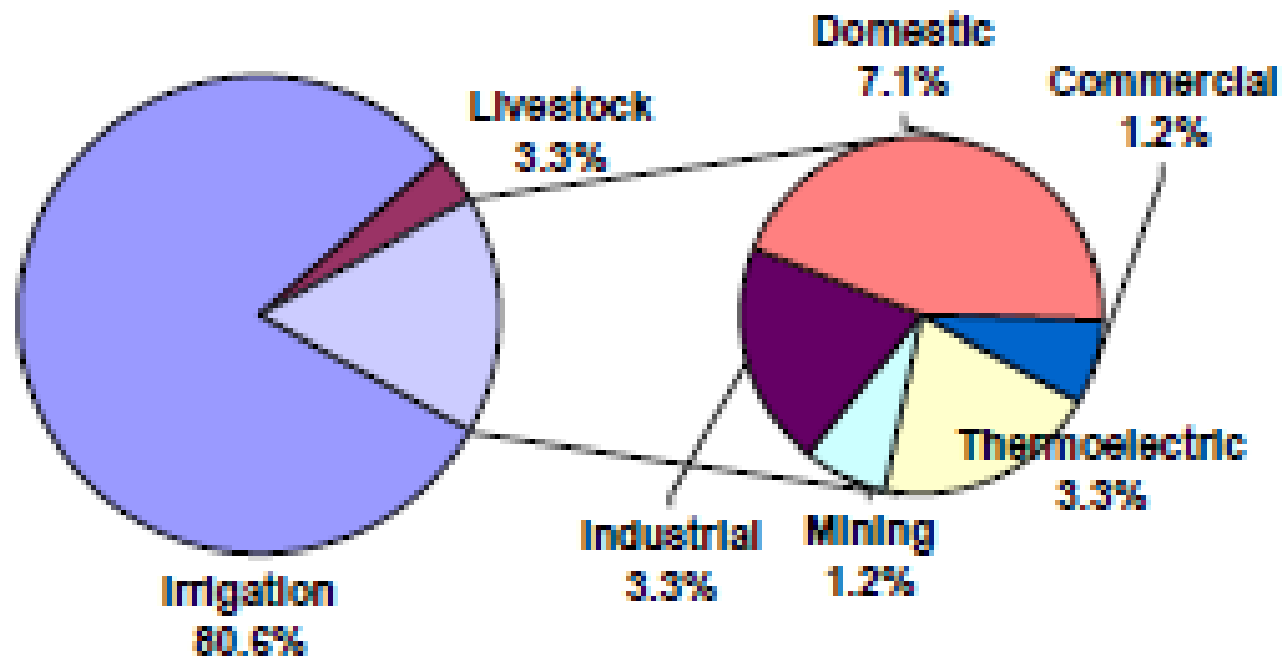
Thermoelectric power, 48 percent



Alan M. Cressler, USGS

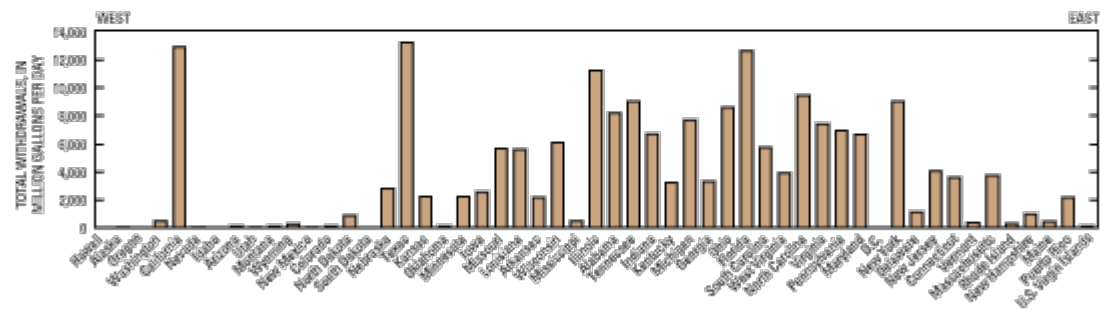
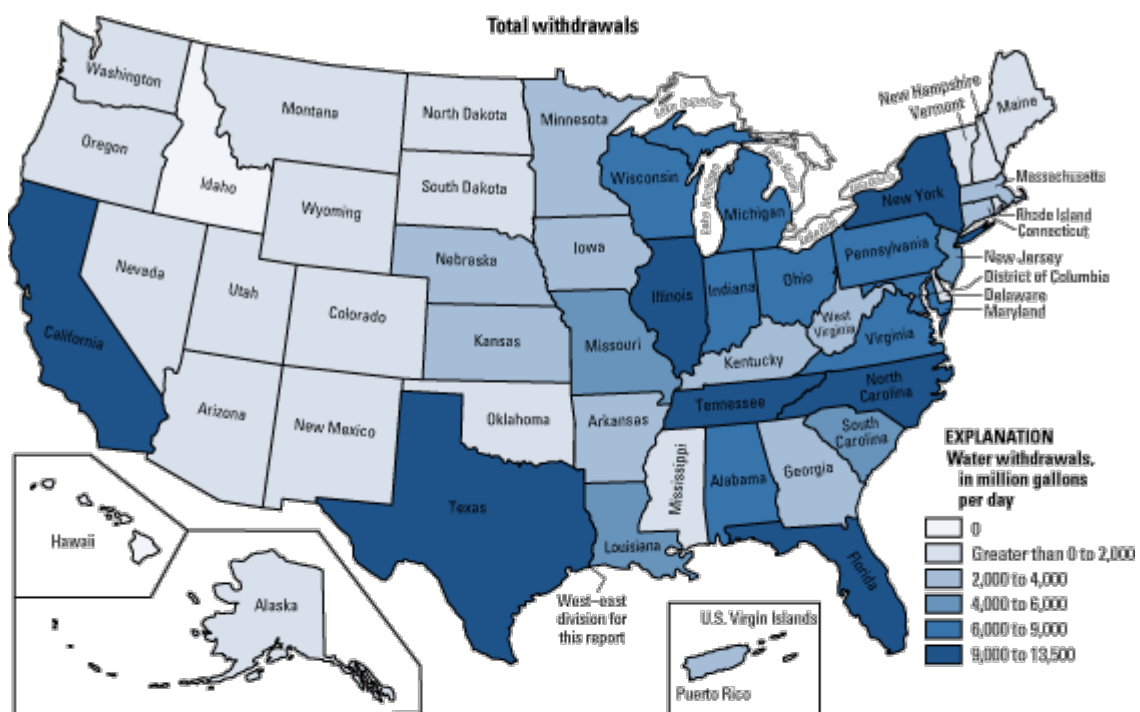
Cooling towers, Burke County, Georgia

U.S. Freshwater Consumption, 100 Bgal/day

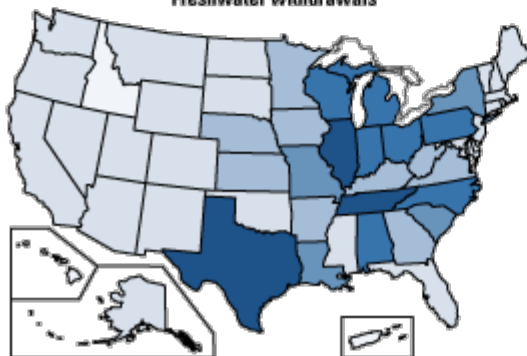


**Figure II-4. Estimated Freshwater Consumption by Sector, 1995
(Solley et al., 1998)**

Total withdrawals



Freshwater withdrawals



Saline-water withdrawals



Industrial Water Use in Texas

Energy Related Water Use = 78%

Other Uses - 22%

*Process, sanitation,
landscape, etc.*

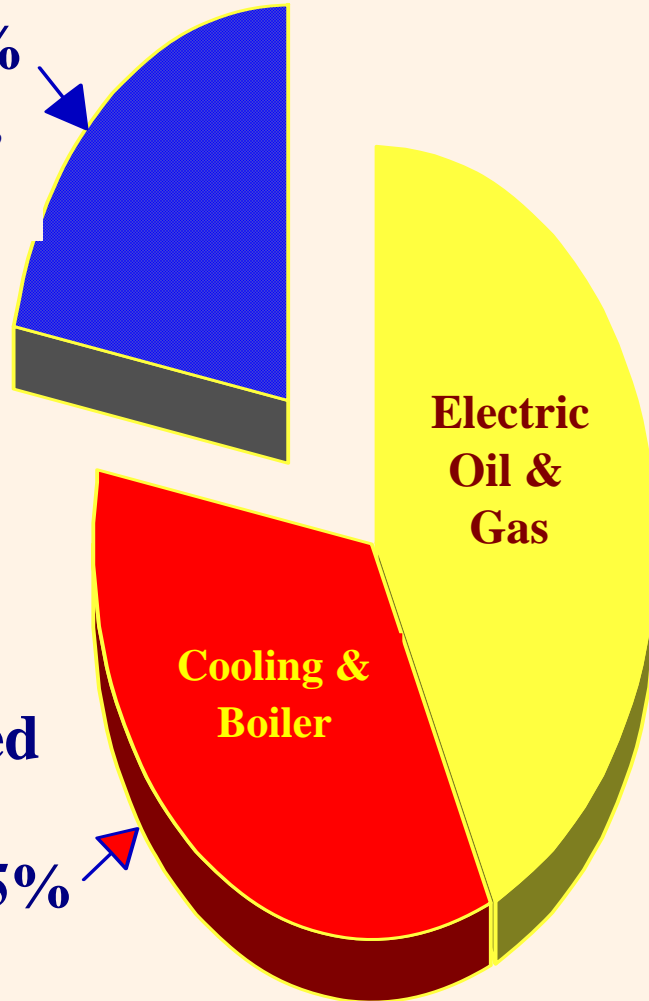
**Direct Energy
Production - 43%**

**Electric
Oil &
Gas**

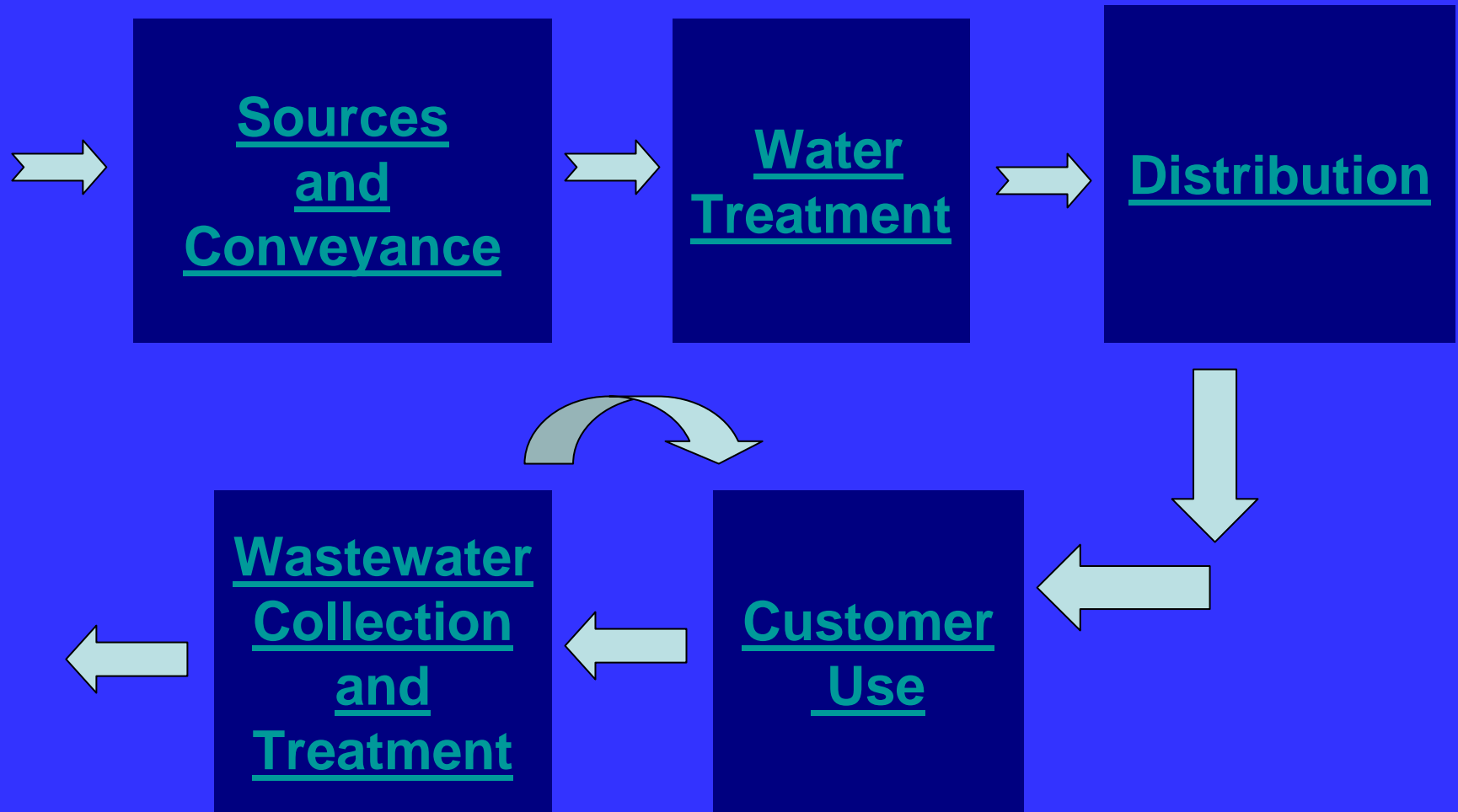
**Cooling &
Boiler**

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

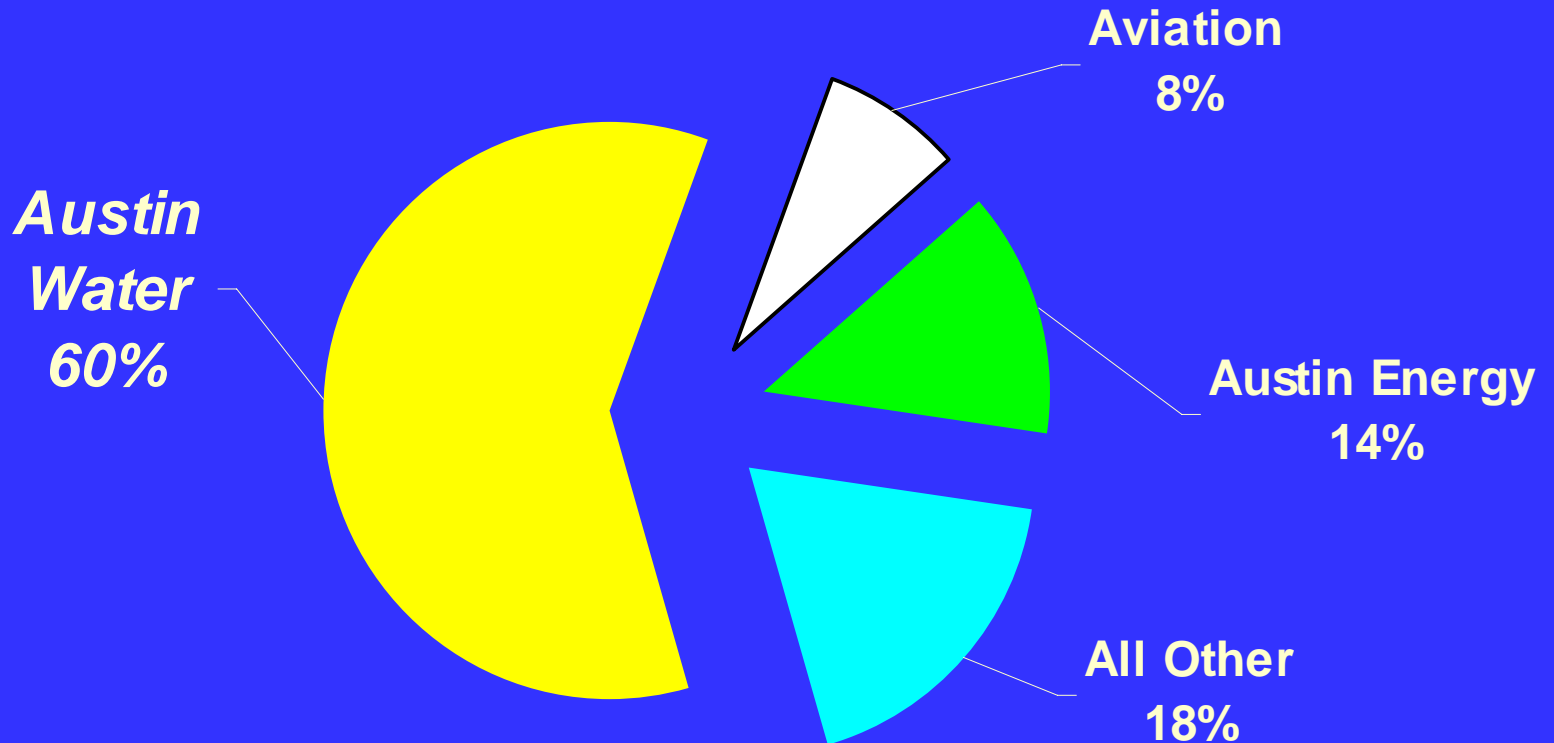
**Industrial use is 2.3
million acre-feet a year**



Embedded Energy in Water



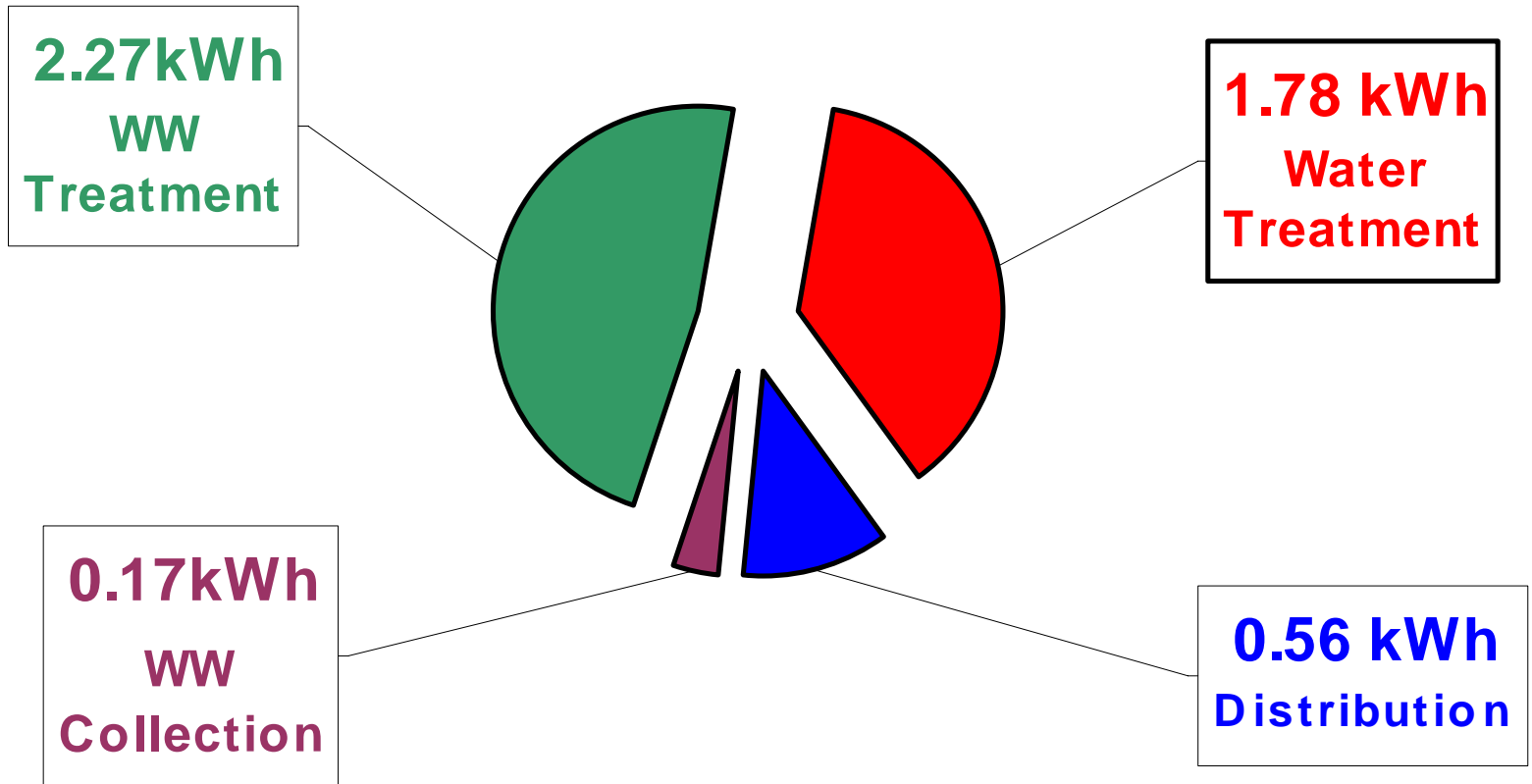
COA Electric Energy Use (all departments)



So water conservation is integral to SB 5

Energy Use by Austin Water Utility

Total = 4.77 kWh/Kgal



Examples of Water Use for Power Generation

Appliance	kWh	Gallons Evaporated
Dishwasher	1.0/load	0.4/load
Clothes Dryer	2.7/load	1.1/load
Microwave	1.5/hr	0.6/hr
Freezer	6.0/day	2.4/day

Embedded Energy

<i>MEASURE</i>	Savings per Measure Gal./Day	Water Savings Gal./Year	Water Energy Savings kWh/Yr.	Customer * Energy Savings kWh/Yr.	Total Energy Savings kWh/Yr.
Residential Examples					
Toilet Rebates	25	9,125	25		25
Clothes Washer Rebates	15	5,475	15	600	615
Commercial Examples					
Dental Vacuum Pumps	720	262,800	717	1,750	2,467
Pre-rinse spray valve (restaurant)	200	73,000	199	4,370	4,570
Remove Garbage Grinder	400	146,000	399	8,741	9,139
* Energy used to operate the equipment					

Air Pollution

Based on Austin Mix of Generation

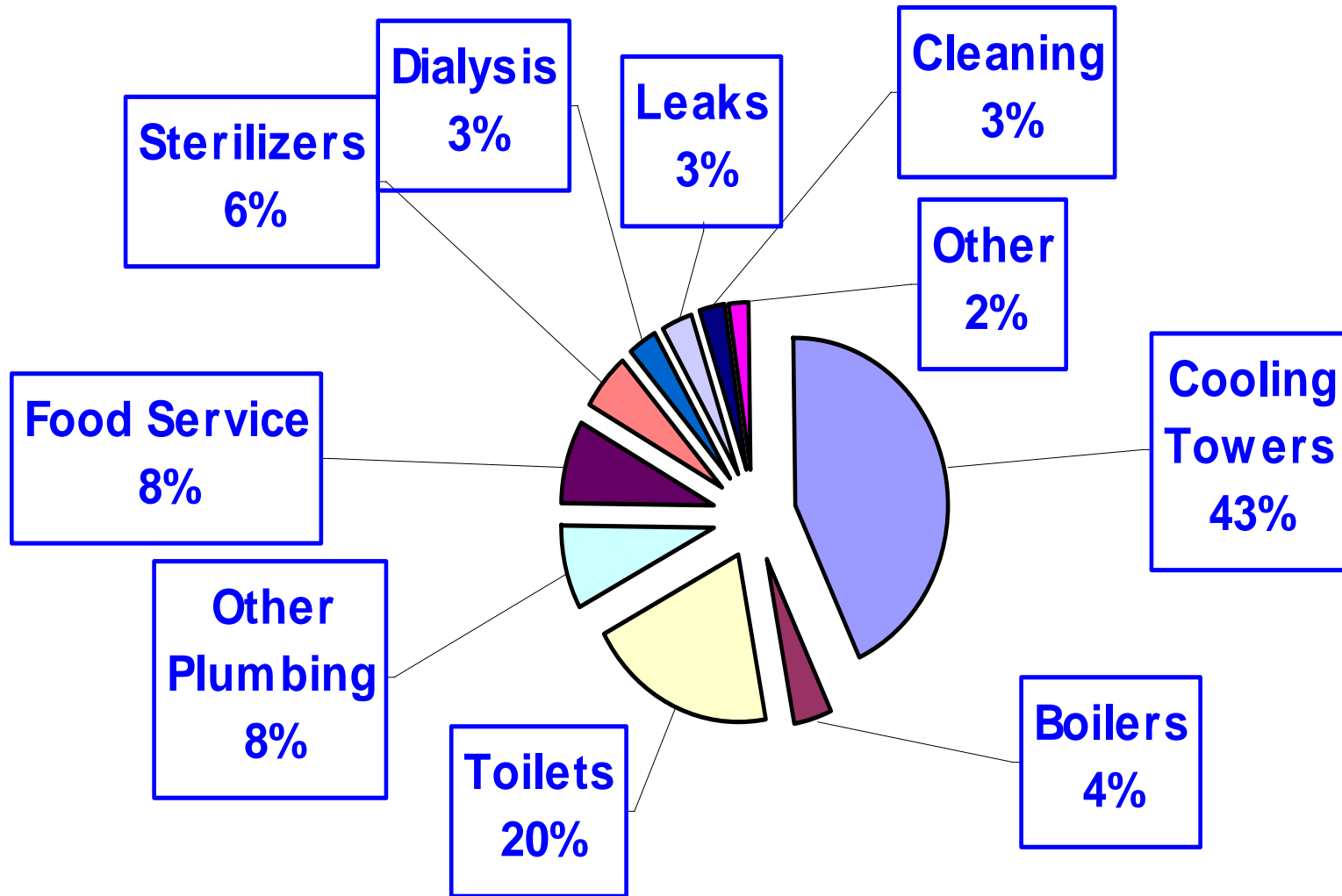
Pollutants	SO_x	NO_x	Particulates	CO	CO₂
Grams/ Kilowatt - Hour	1.58	1.22	0.13	0.16	540
Grams / thousand gallons	7.54	5.82	0.62	0.76	2567

Table 1-1: Water-Related Energy Use in California in 2001

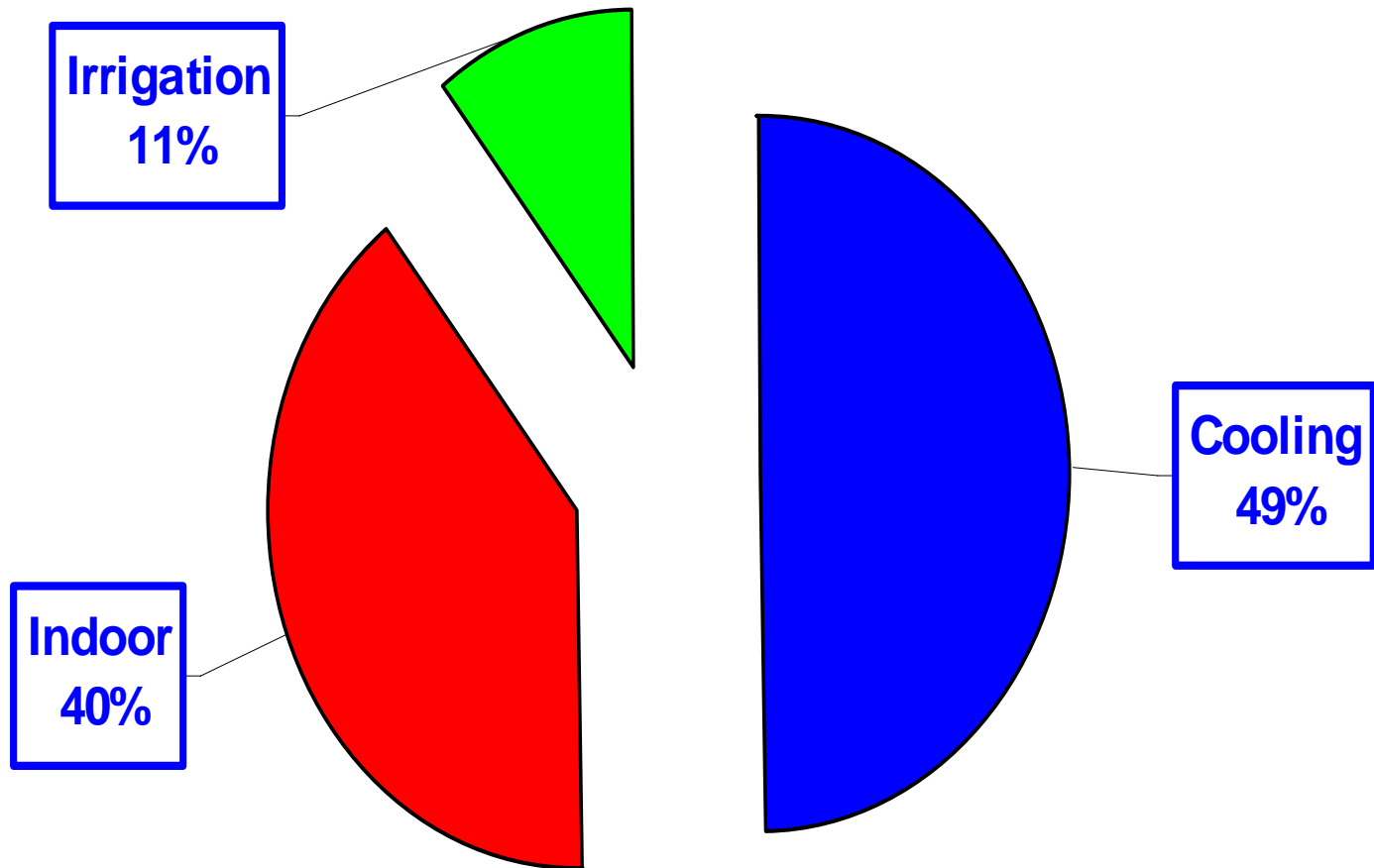
	Electricity (GWh)	Natural Gas (Million Therms)	Diesel (Million Gallons)
Water Supply and Treatment			
Urban	7,554	19	?
Agricultural	3,188		
End Uses			
Agricultural	7,372	18	88
Residential	27,887	4,220	?
Commercial			
Industrial			
Wastewater Treatment	2,012	27	?
Total Water Related Energy Use			
	48,012	4,284	88
Total California Energy Use			
	250,494	13,571	?
Percent	19%	32%	?

Source: California Energy Commission

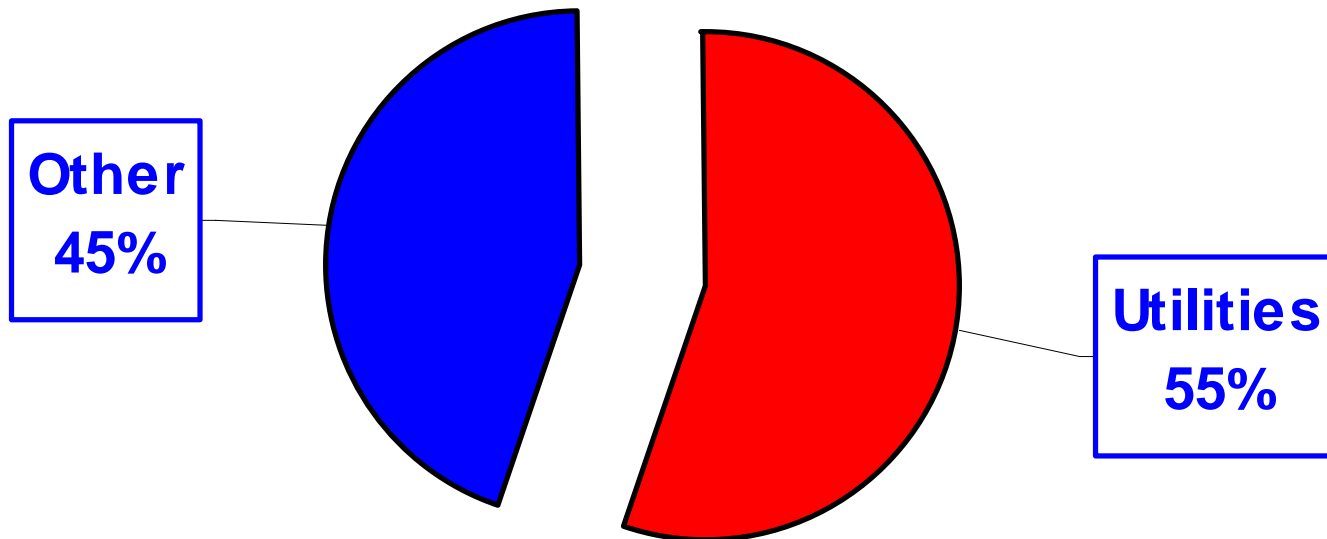
A Large Hospital in Florida



Annual Water Use Waller Creek Center

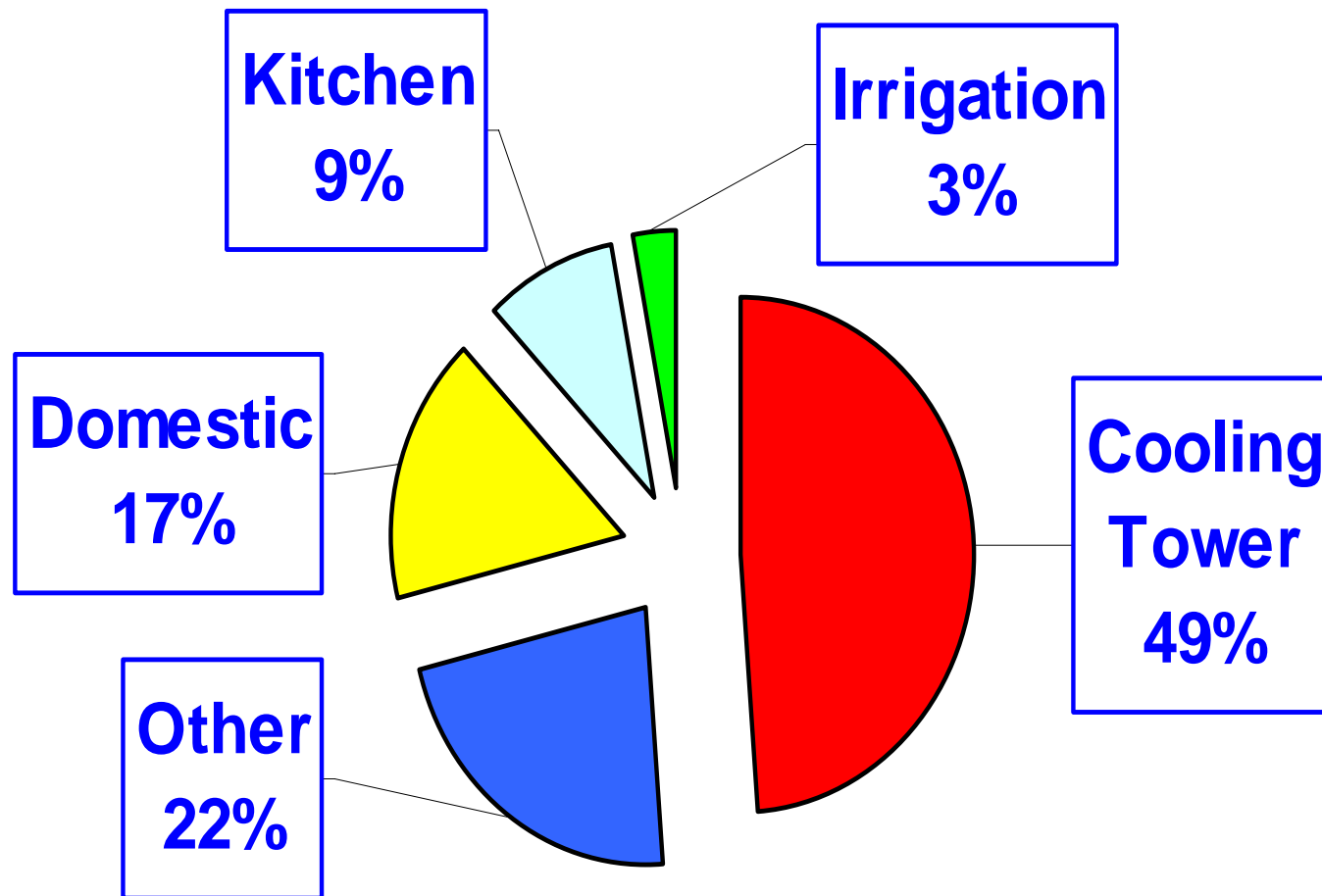


University of Texas at Austin

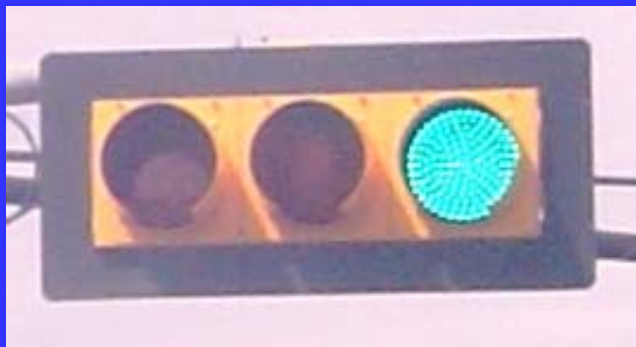


Grocery Store Water Use in California

Pacific Institute



Even Traffic Lights Can Save Water



Question - What is the difference between these two traffic lights?

Answer – 1.2 gallons per day savings in water evaporated at the power plant and 90% more energy efficient.