# Water Conservation In Power Generation

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# 1999 Austin City Council

Resolution September 14, 1999

**"Cost-effective conservation programs shall be the first priority in meeting new load growth requirements of Austin Energy. "**

Clean Energy Resolution August 28, 2003

**… Austin Energy Strategic Plan to ensure Austin remains a national and international leader in the development and use of clean energy**

# 2003 Austin Energy Strategic Plan

- Energy Efficiency is first priority
  - 15% Demand-Side Management by 2020
  - 30% Renewable Energy by 2020
  - 100 MWs of Solar by 2020
- Commercial, Residential and Solar Energy Efficiency Programs

# Austin Climate Protection Plan - 2007

- Makes all COA facilities/fleets carbon neutral by 2020
  - COA facilities 100% renewable by 2012
  - Make fleet carbon neutral by 2020
- Makes Austin building codes most EE in nation
- Most aggressive utility GHG-reduction in nation
  - 700 MW of energy conservation by 2020
  - 30% energy needs with renewable energy by 2020
  - Carbon neutrality on new generation
  - Establish $CO_2$ cap for utility emissions

# Power Plant Water Use

- Water for steam
  - Steam Turbine (Nuclear, Gas, Coal)
    - Usually cooling lake
    - Cooling media for steam condensation
  - Nuclear 7,440 Gal/home/yr, (620 Gal/MWH)
  - Coal 5,880 Gal/home/yr, (490 Gal/MWH)
  - Oil/Gas/Steam 5,160 Gal/home/yr, (430 Gal/MWH)
- Combined Cycle (Gas)
  - Cooling river/lake/cooling tower
  - Evaporative cooling to reduce inlet air temperature
  - Comb/Cyc (gas) 3,000 Gal/home/yr, (250 Gal/MWH )

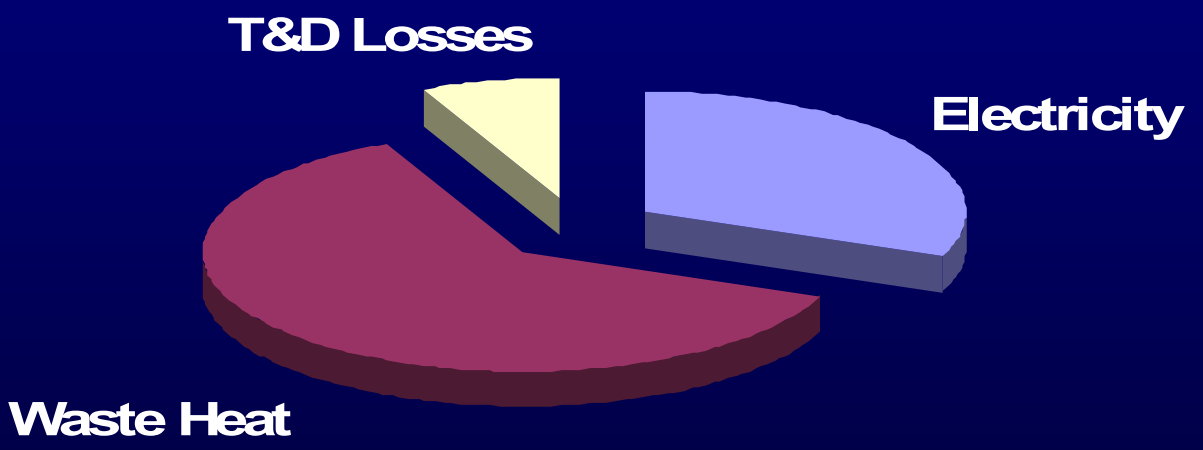
# Water Use in Power Generation

- Combustion Turbines
  - Direct Inlet air cooling
  - Inlet air cooling w/ chiller/cooling tower
- Simple Cycle Turbine (Gas)
  - No direct cooling water required
  - Inlet air cooling
  - 0 Gal/MWH

# Water use in Renewable Power Generation

- Solar PV 0 Gal/home/yr
- Wind Energy 0 Gal/home/yr
- Solar/Steam 5,160 Gal/home/yr (430 Gal/MWH)
- Bio-Fuels Varies Greatly
- Waste Methane 0 Gal/MWH

# Steam Cycle Power Plant Efficiency (Gas/Oil/Coal/Nuclear)



# Combined Cycle Plant Efficiency

# Energy Conservation Creating Water Conservation

**2002 Retrofit of about 5,200 traffic signals**

**Existing incandescent lamps 135 watts**

**New LED lamps* - 11 - 15 watts**

**Energy savings per lamp 120 watts**

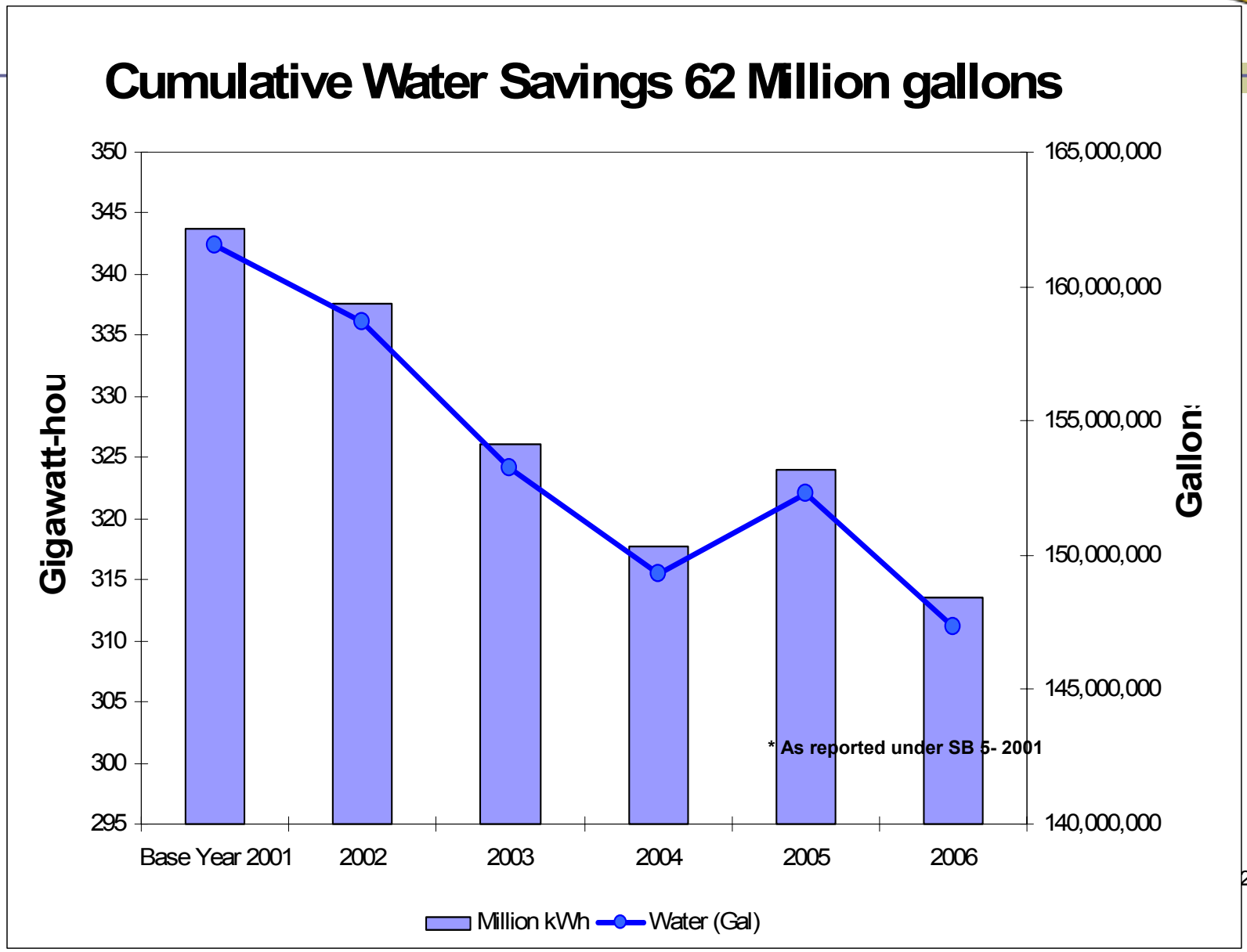
**= (90%) energy reduction**

***5 year Manufacturer warranty**

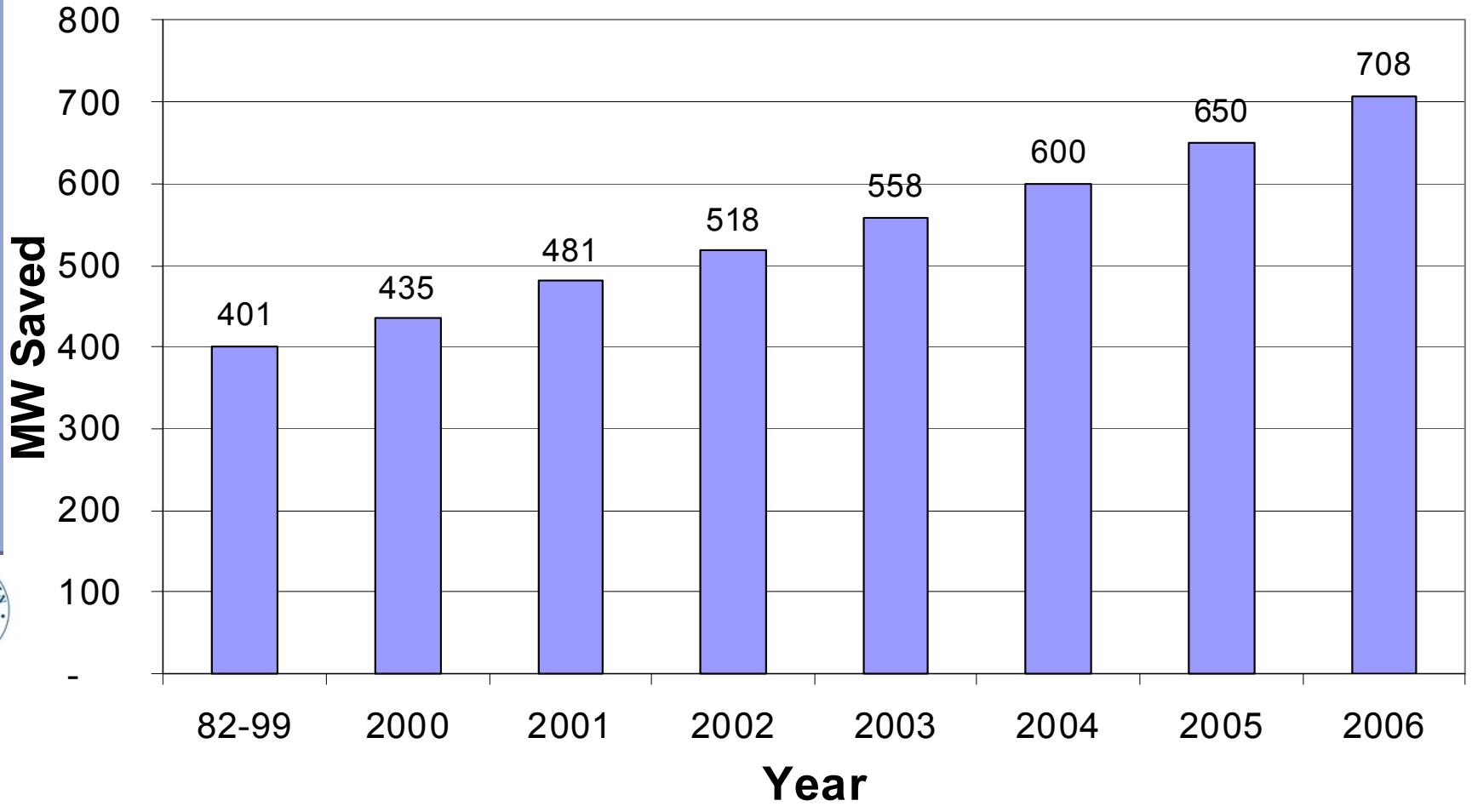
# Water Conservation through Energy Conservation

- LED Traffic Signal Project Savings Estimates
  - 7,250,000 kWh per year (3% of total COA municipal use)
  - 1,812,500 Gallons per year
  - Air Pollution Reduction:
    - SO2 and Nox emission savings equivalent to removing 1,000 vehicles or 12 million vehicle miles traveled.

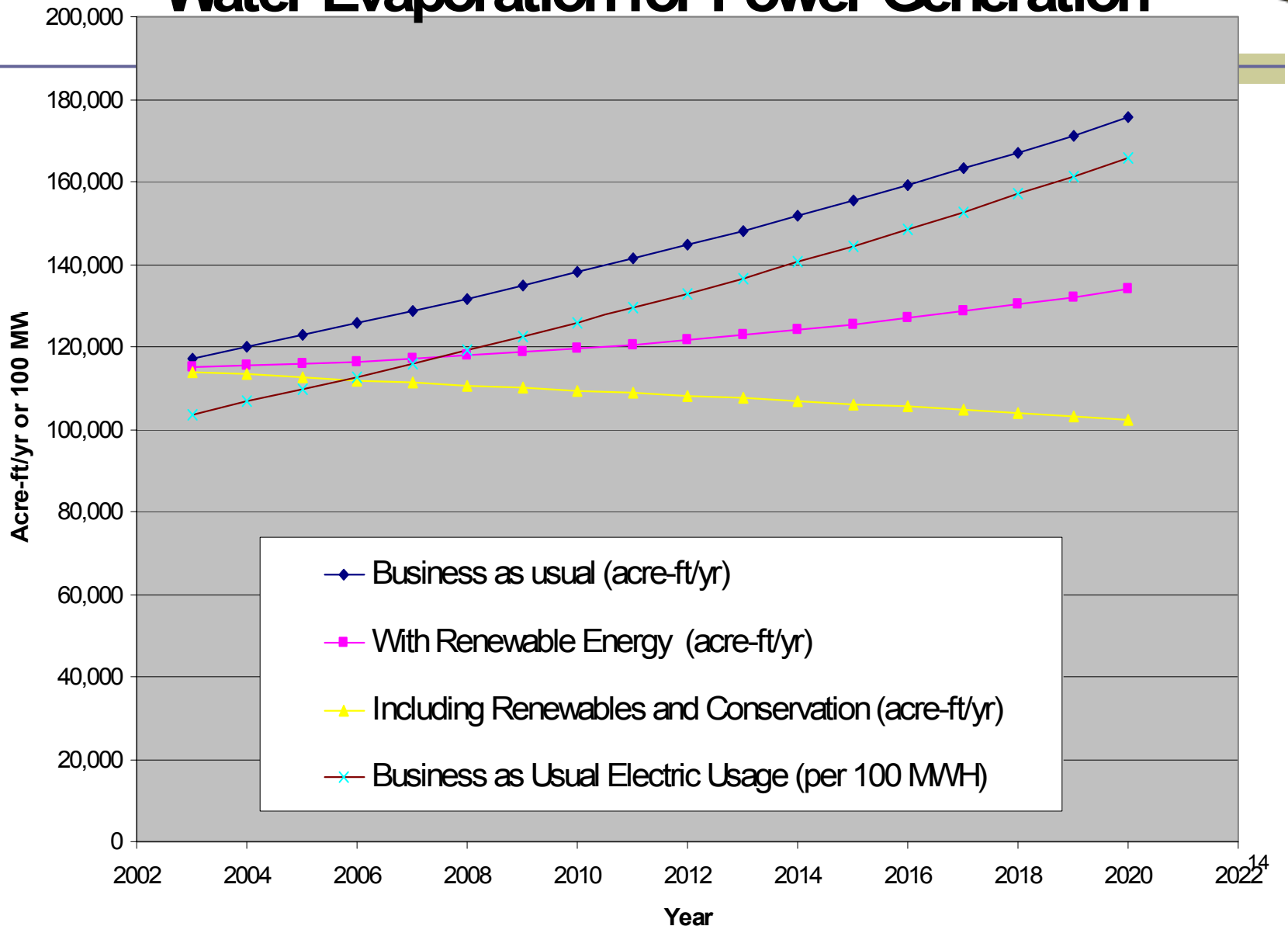
# Water Conservation through Energy Conservation



# DSM Cumulative Savings



# Water Evaporation for Power Generation



# Decker Creek Power Plant

- Raise Walter E. Long lake levels 18”
  - Increase rain detention
  - Reduce make up from river
  - Approximately 4,700 acre-ft/yr
  - Reduced Pumping energy by 1,000,000 KWH/yr
- Use lake water for boiler make up
  - Approx. 40 Million gallons/yr potable water saved
  - ~$165,000 /yr in water cost savings

# Sand Hill Energy Center

- Combined Cycle Plant
- Use of Reclaimed Water for Cooling Towers
  - 75% Reclaimed Water
  - 25% Colorado River Water
- Reduces operating cost by ~$1,000,000/yr

# Summary

- Water is essential to power generation
- Power Generation adds to water consumption
- Water increases power generation efficiency
- Use of renewable energy reduces water use
- Energy conservation reduces fuel and water use
- Using non-potable water sources frees treatment capacity
- Using non-potable water sources reduces energy usage