Austin Water Utility and Climate Change

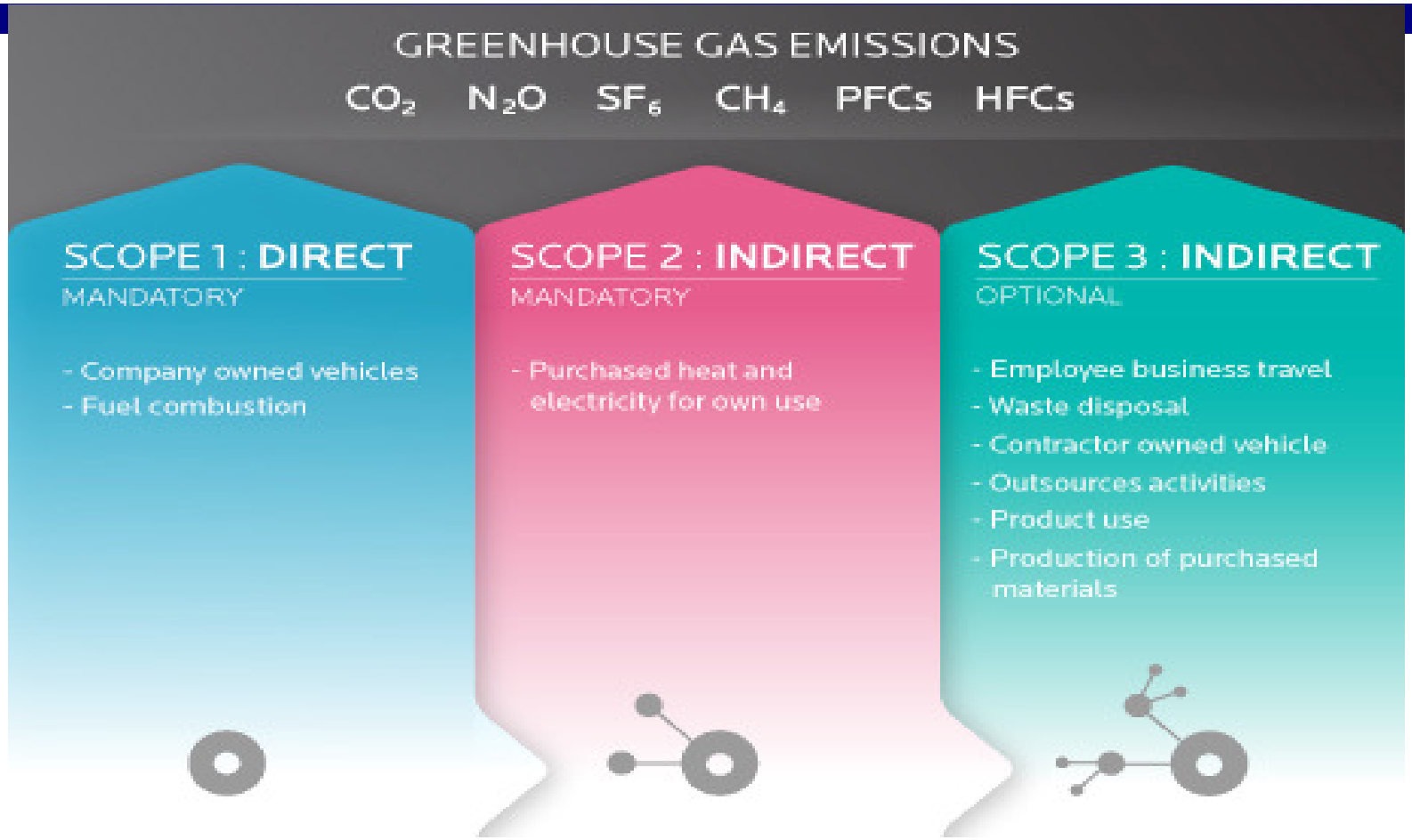
David Greene, P.E.
AWU Energy & Resources Engineer

November 16, 2010
Resource Management Commission

AWU Climate Change Program

- Identify and quantify impacts:
  - Greenhouse Gas Emissions Inventory
- Reduce (mitigate) impacts through:
  - Water Conservation
  - Energy efficiency
  - Process fugitives reduction
  - Renewable energy generation
- Measure progress and revise strategies (DCPP)
- Anticipate and adapt to changes

GHG Emission Inventory



Units of metric tons CO2-equivalent (MTCO2e) - use GWPs (Global Warming Potentials) to find equivalent

Important CO_2-eq rates:

- *AE: ~0.5 kg/kWh; US avg.: ~0.7 kg/kWh*
- *Unleaded: 8.8 kg/gal; Diesel 10 kg/gal*

The Path of Austin's Water

Wildlands

Lake Austin

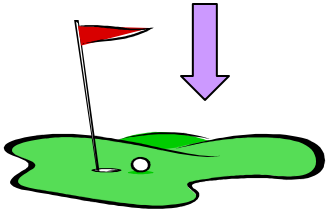
Drinking Water Plant

Wastewater Treatment Plant

Hornsby Bend Biosolids Plant

DILLO DIRT

Reclaimed Water

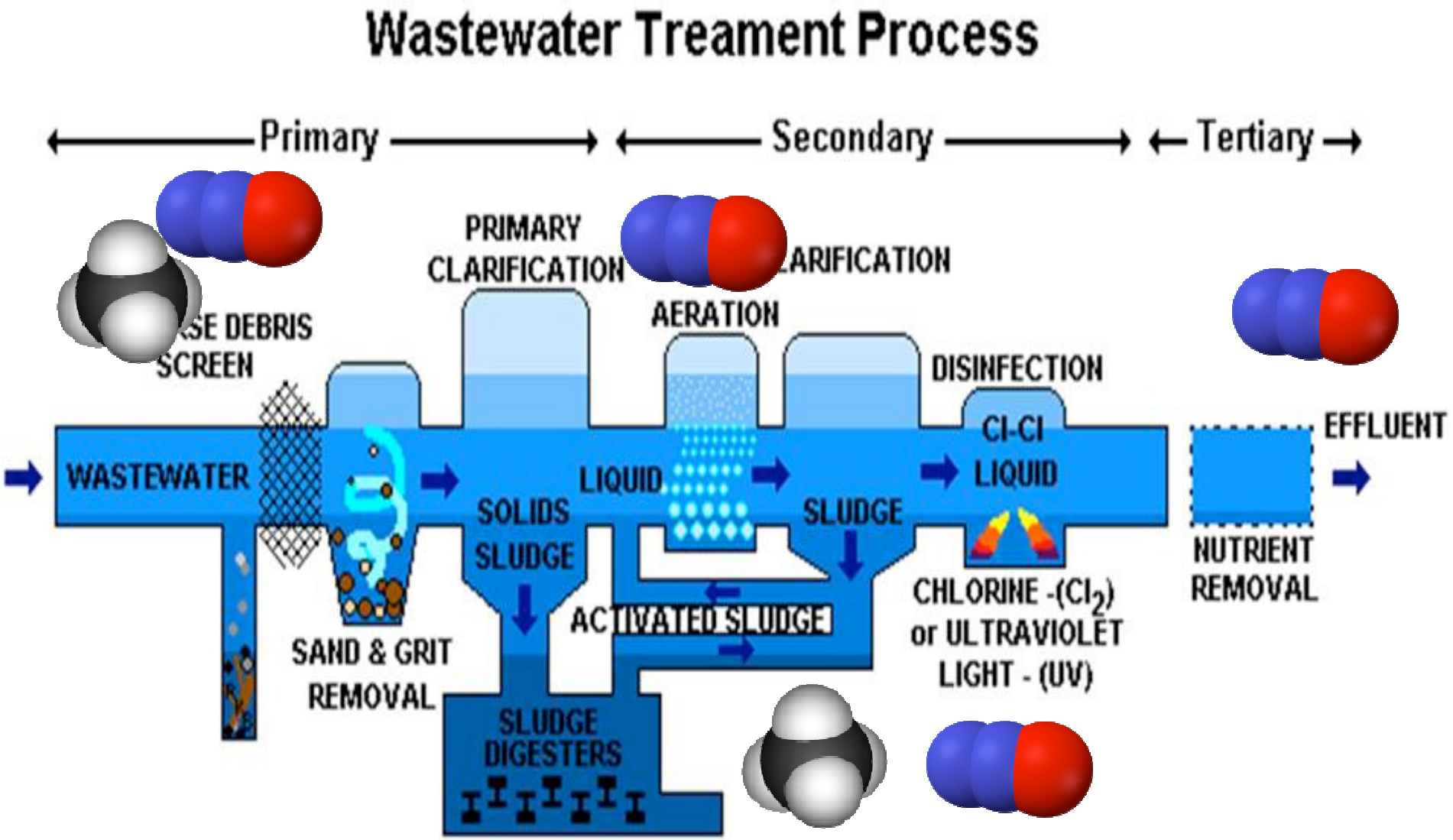


Downstream Colorado River

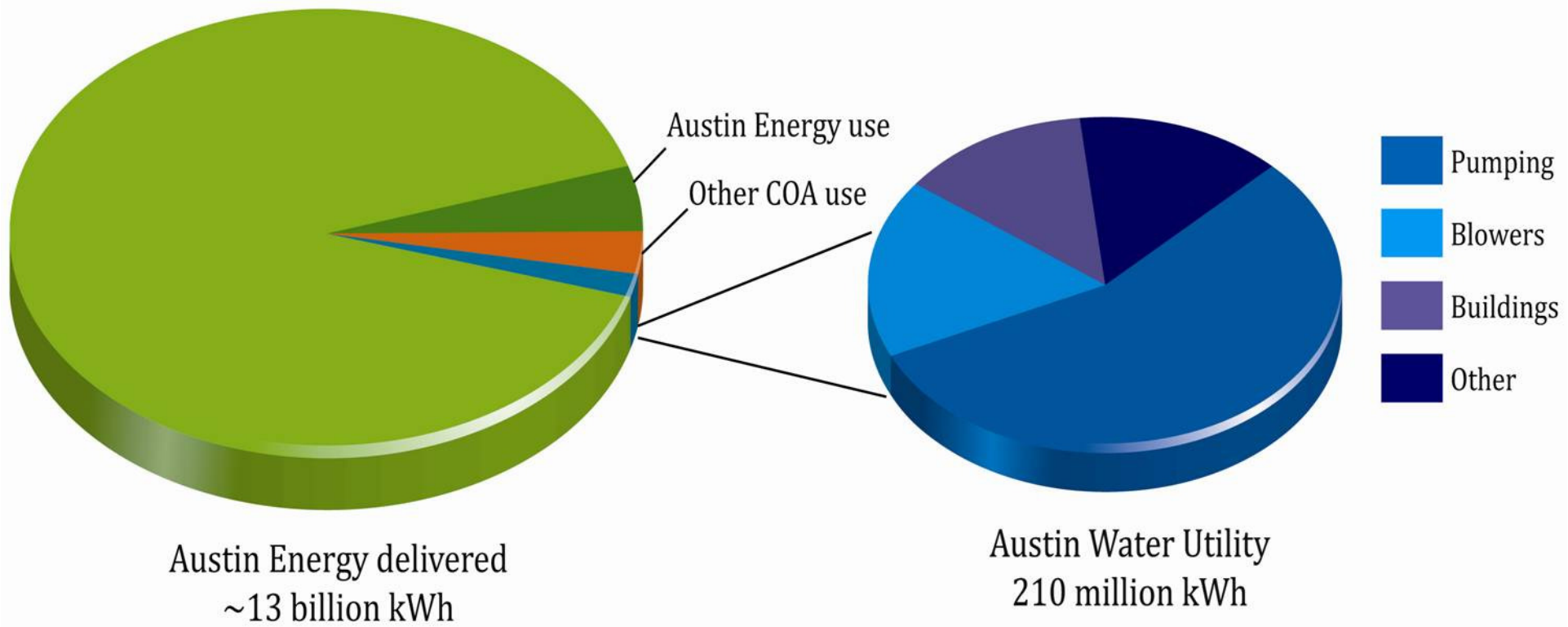
CITY OF AUSTIN

Austin WATER

Direct Emissions: Methane and Nitrous Oxide



Indirect Emissions: Electricity



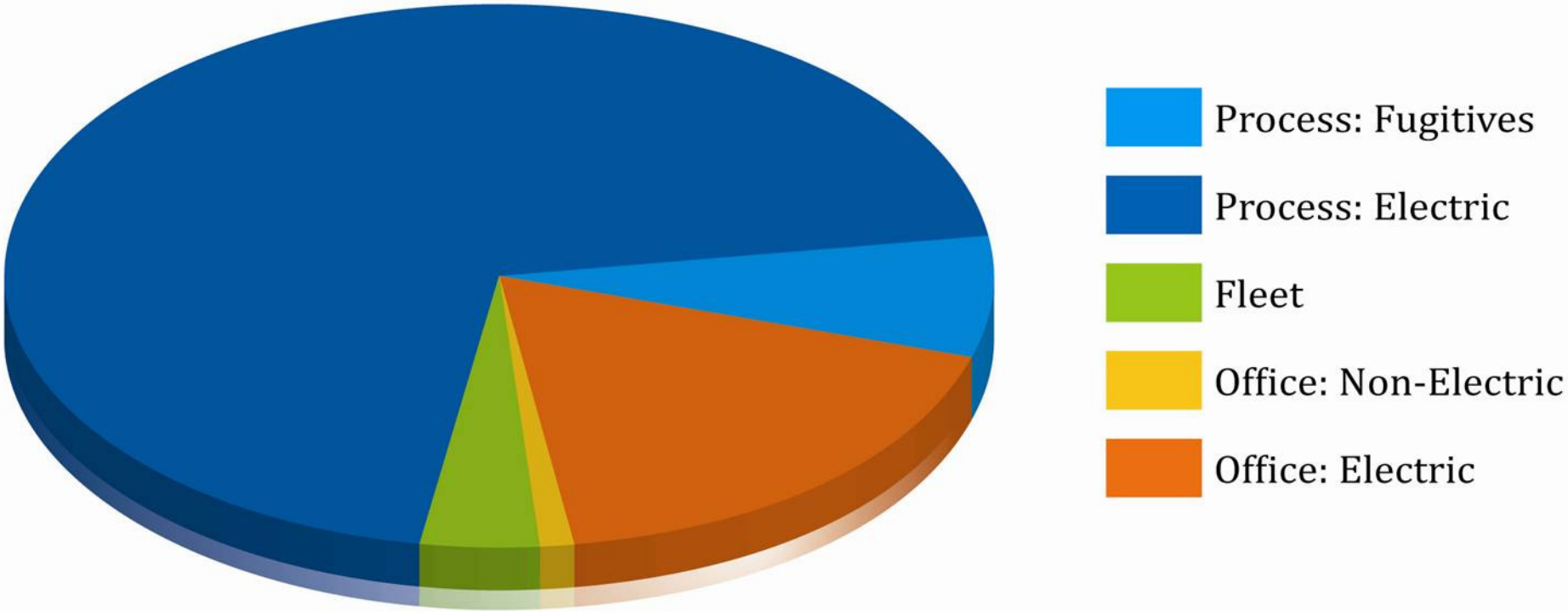
80% of AWU energy used for:

Pumping clean water

Treating wastewater ("blowers")

Buildings (lighting, HVAC)

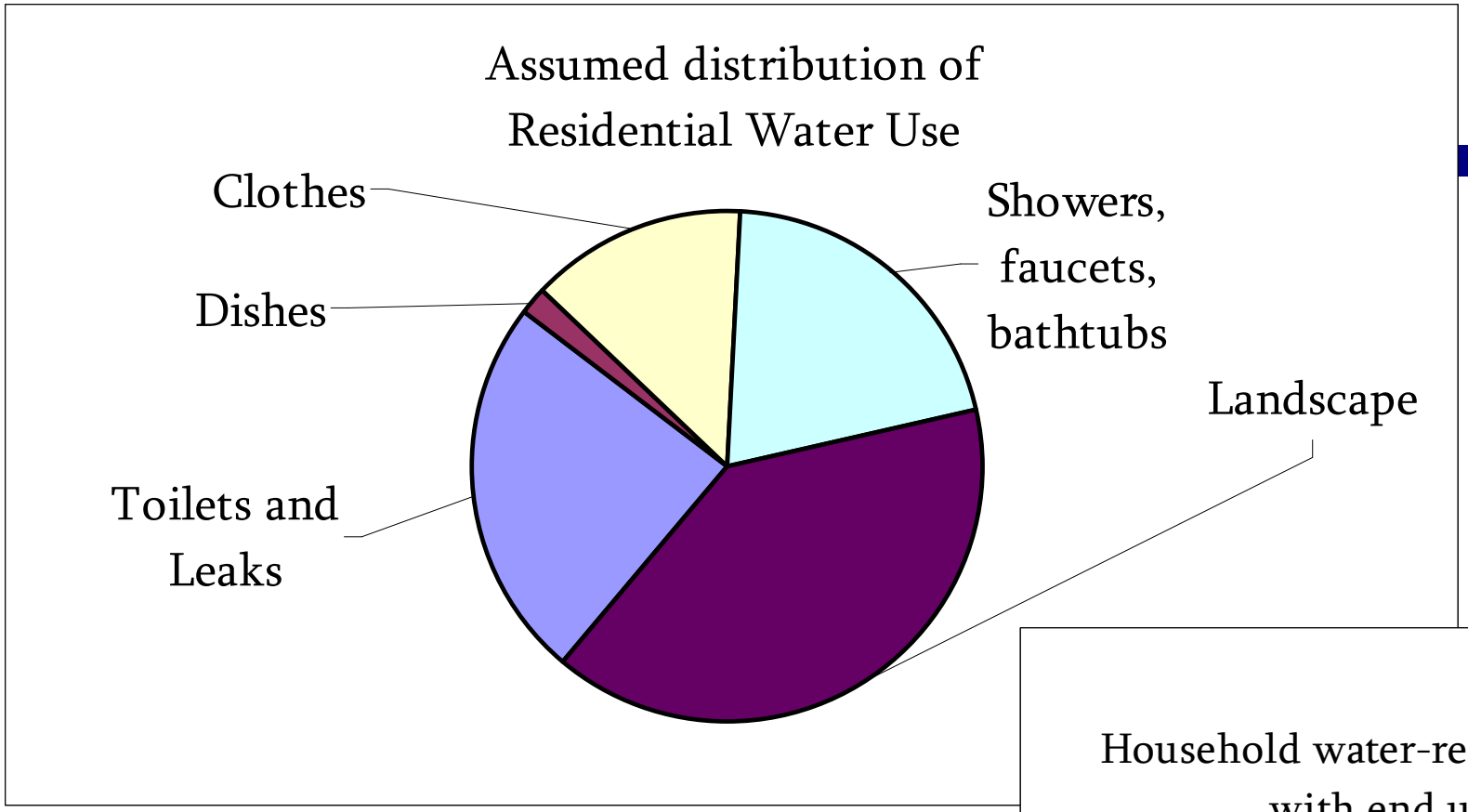
AWU 2008 Greenhouse Gas Emissions Inventory

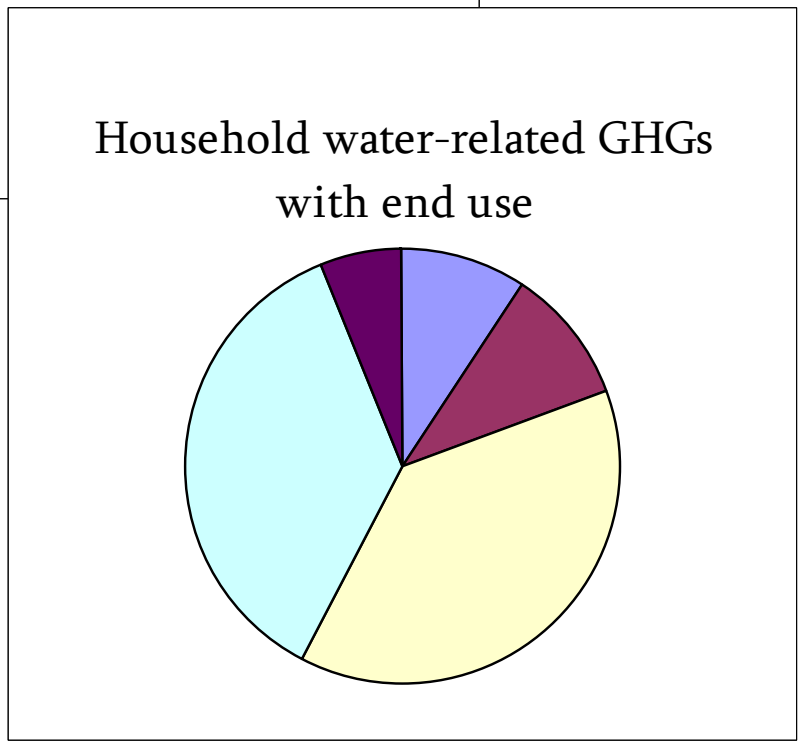


- Electricity - 121,000 MTCO2e (89%)
- Fleet & other fuels - 5,000 MTCO2e (4%)
- Fugitives - 9,000 MTCO2e (7%)
- TOTAL: 135,000 MTCO2e

Put another way…

- Process (Excluding lighting & HVAC):
  - 2.5 kWh & 1.3 kg CO_2e per kgal drinking water
  - 2.4 kWh & 2.0 kg CO_2e per kgal wastewater
  - 4 kWh & 2.5 kg CO_2e per kgal avg
    - Assumes 60% of drinking water becomes wastewater
- About 1kg GHG per household per day – or 3%
  - Compare to:
    - kWh: 17 kg per day @ 1000kWh/month
    - Car: 17kg for 40 mile/day @20mpg

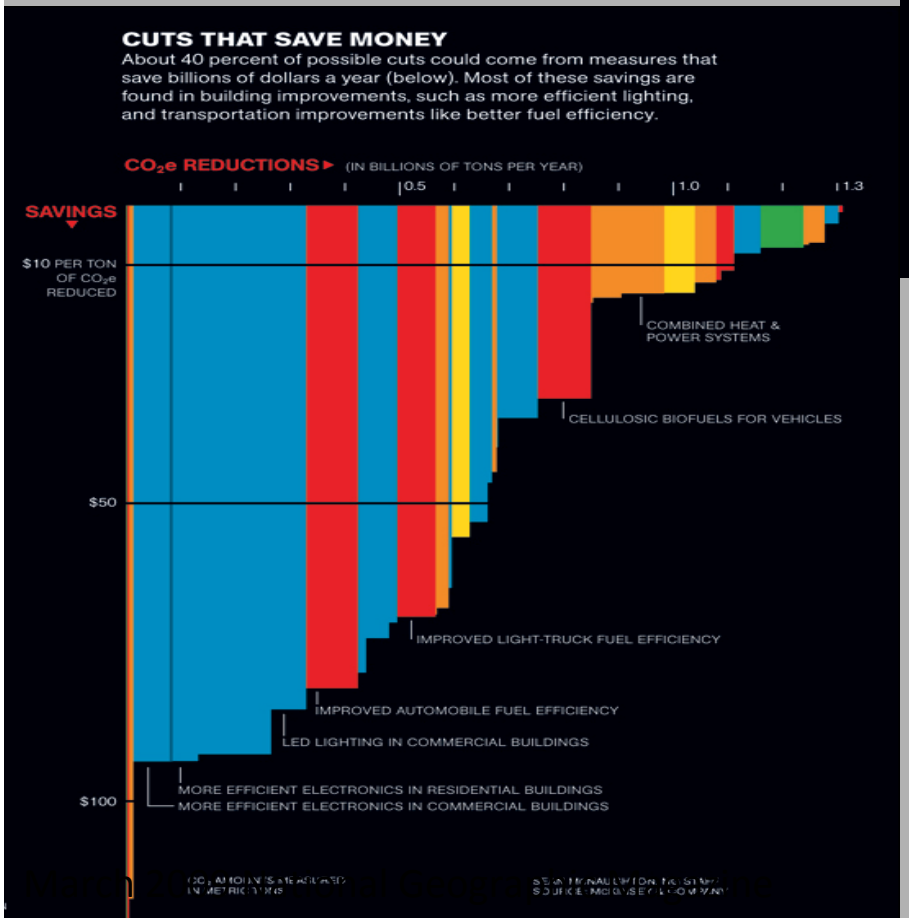


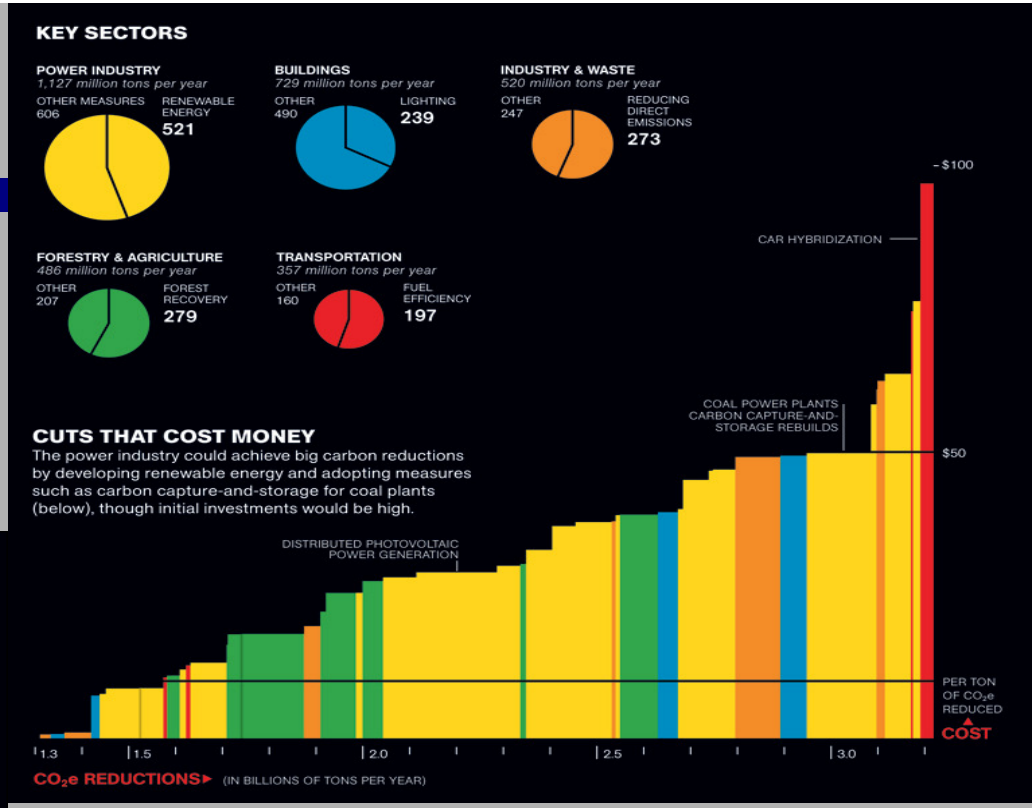


End Use Energy

- AWU: 4 kWh and 2.5 kg GHGs per 1000 gallons (assumes 60% to WW)
- End use energy may be twice AWU's
- Total impact ~68kg GHG/yr/household

Mitigation:
Marginal Abatement Cost Curve





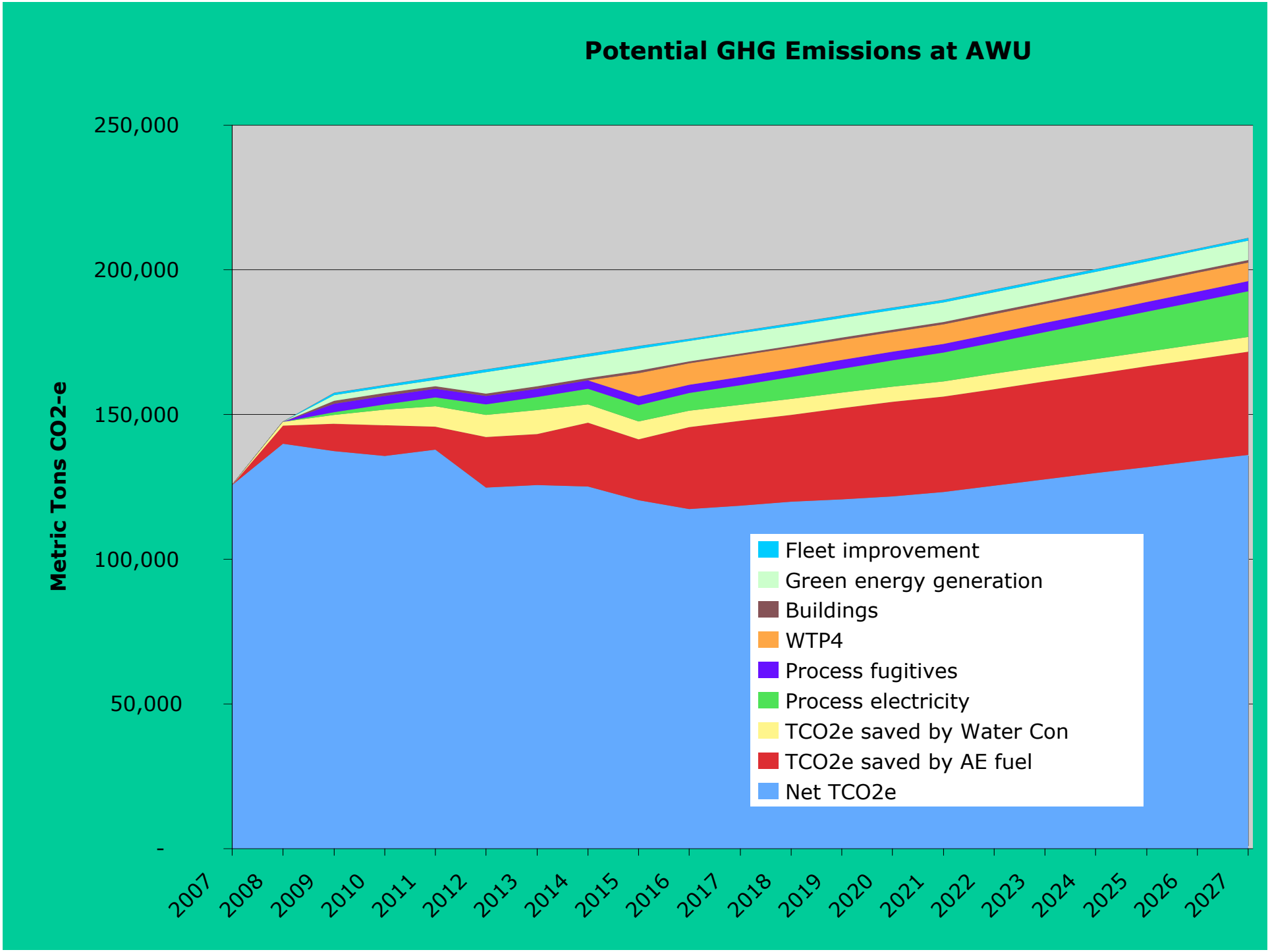
Cost effectiveness:

1. Efficiency (buildings, transportation, & process)
2. Agriculture & Land Management
3. Power generation

Austin WATER

AWU GHG Mitigation Sectors

- Water conservation
- Energy efficiency
- Reduced fugitives (direct GHG emissions)
- Onsite renewable energy generation


Potential GHG Emissions at AWU
Metric Tons CO2-e
250,000
200,000
150,000
100,000
50,000
-
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
Fleet improvement
Green energy generation
Buildings
WTP4
Process fugitives
Process electricity
TCO2e saved by Water Con
TCO2e saved by AE fuel
Net TCO2e

Austin Climate Protection Plan

- Municipal Plan
- Utility Plan
- Homes and Buildings Plan
- Community Plan
- “Go Neutral” Plan

AWU's Climate Protection Plan

Mitigation

- AWU will reduce its carbon footprint using a variety of cost-effective measures. Meeting the following specific goals may allow AWU to reduce GHG emissions by 33% from a projected business as usual scenario in 2020.
  - Energy
  - Water
  - Transportation
  - Solid Waste
  - Education

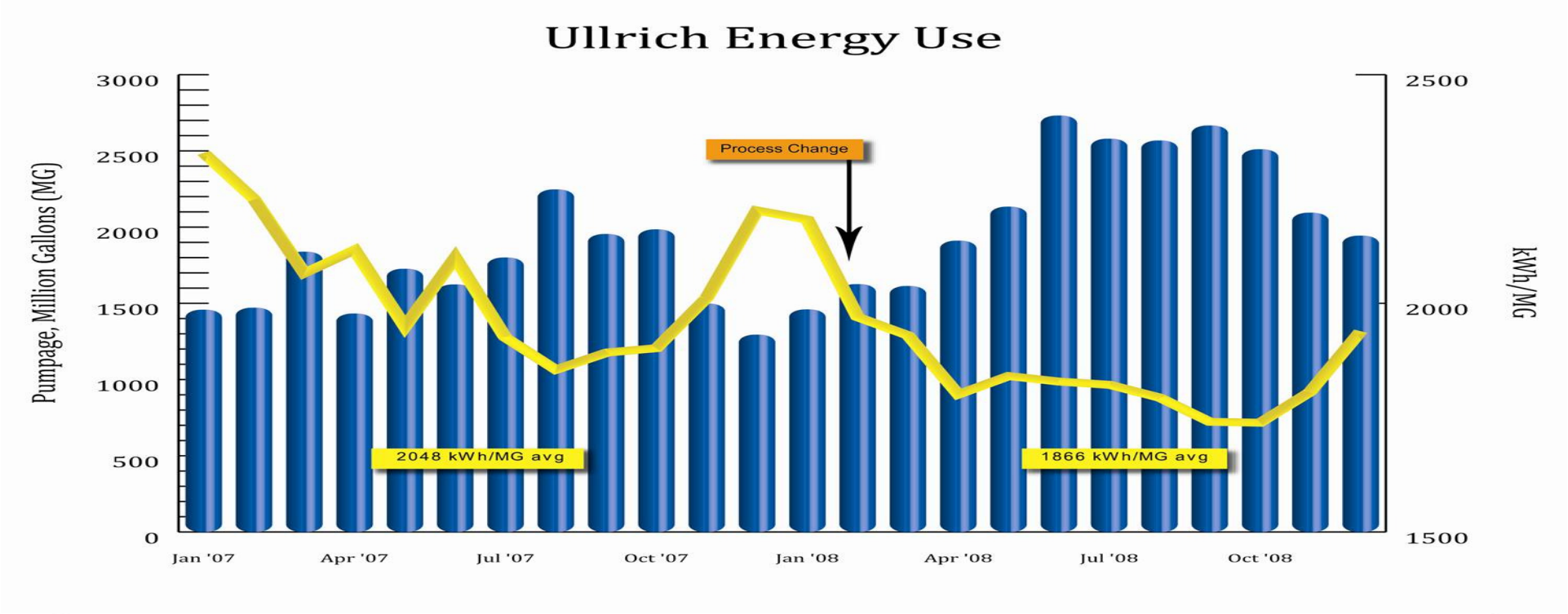
Energy

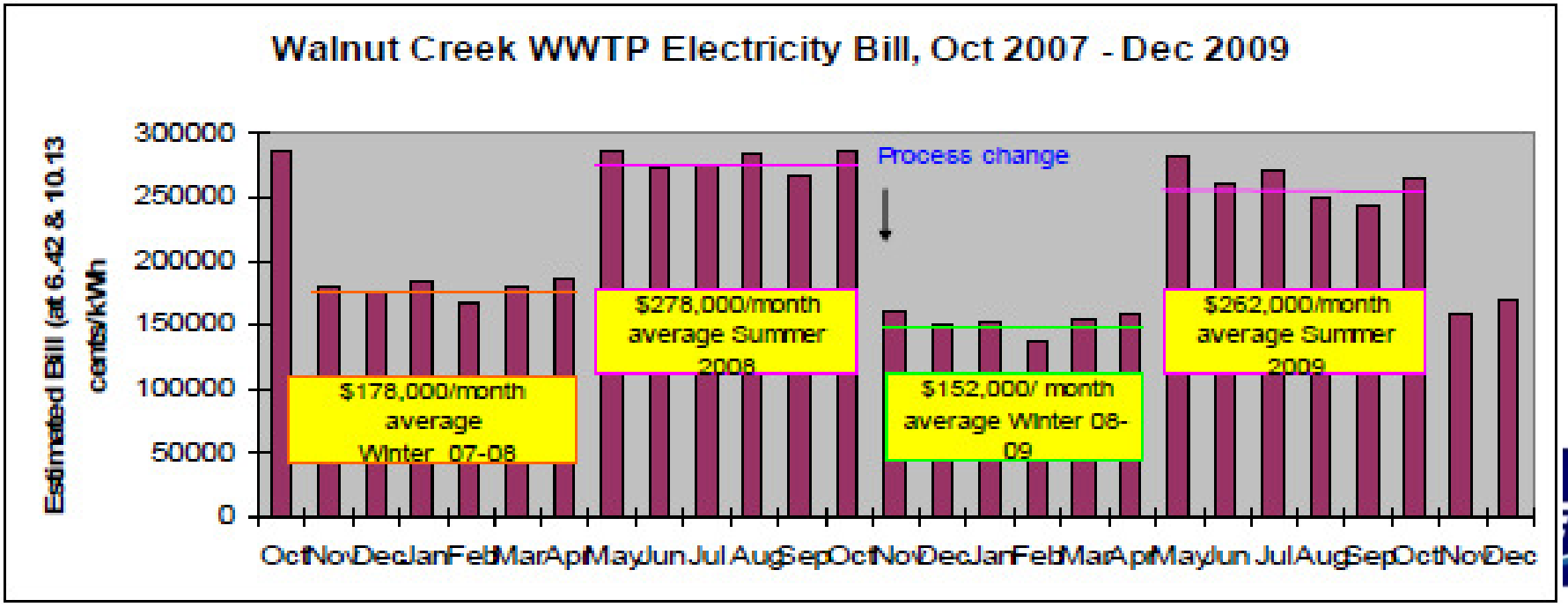
Administrative – office buildings and similar facilities:

- Reduce energy use by at least 5% per year.
- Produce 2 million kilowatt-hours (kWh) of onsite renewable energy production per year.

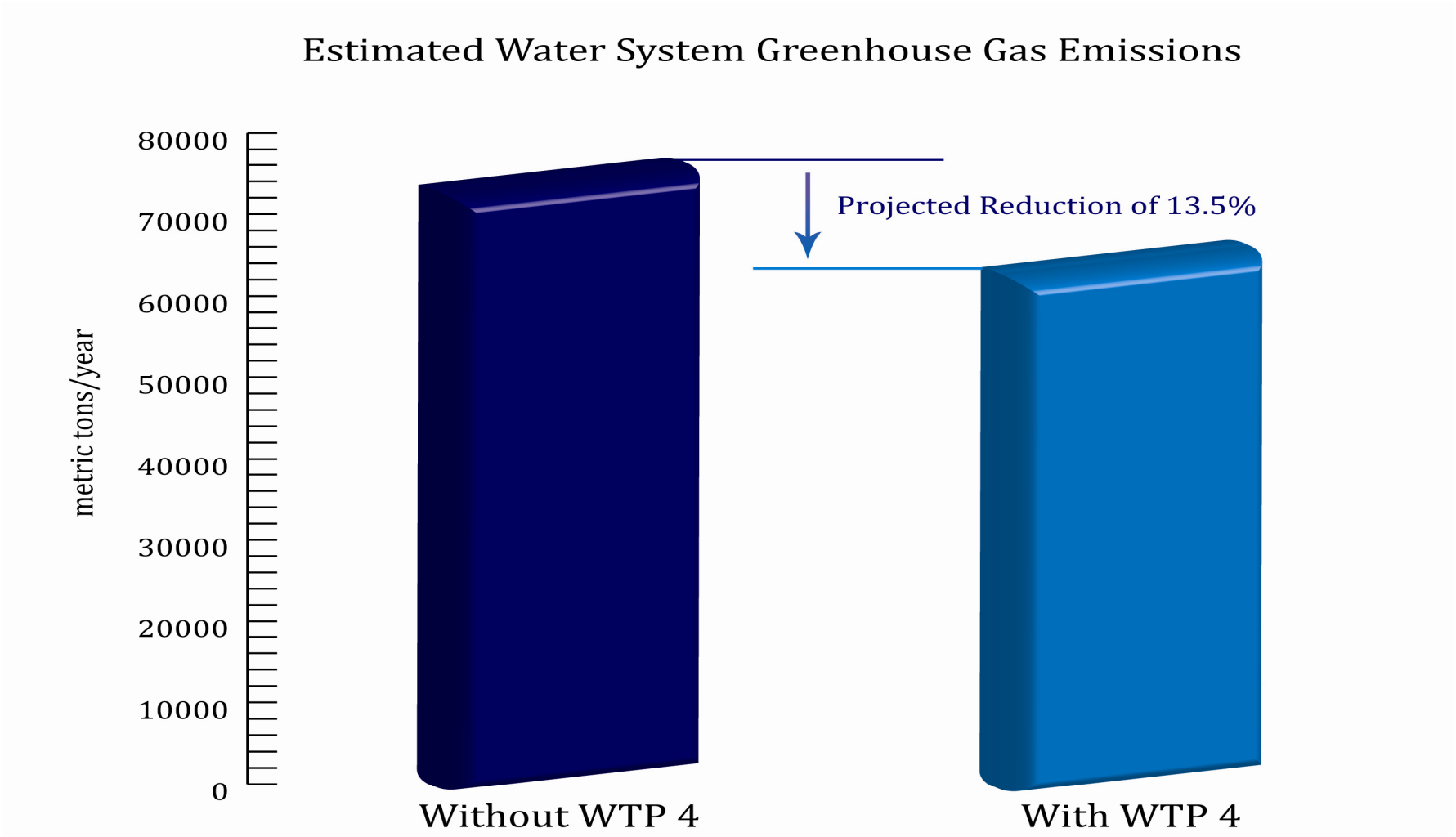
Process – treatment plants, pump stations, lift stations:

- Reduce energy intensity (kWh per million gallons of treated water or wastewater) by 3% per year (averaged over 10 years).


Ullrich Energy Use
Pumpage, Million Gallons (MG)
kWh/MG
3000
2500
2000
1500
1000
500
0
2500
2000
1500
Process Change
2048 kWh/MG avg
1866 kWh/MG avg
Jan '07
Apr '07
Jul '07
Oct '07
Jan '08
Apr '08
Jul '08
Oct '08


Walnut Creek WWTP Electricity Bill, Oct 2007 - Dec 2009
Estimated Bill (at 6.42 & 10.13 cents/kWh
300000
250000
200000
150000
100000
50000
0
Process change
$178,000/month average Winter 07-08
$278,000/month average Summer 2008
$152,000/ month average Winter 08-09
$262,000/month average Summer 2009
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Building Efficiency into Infrastructure



Building efficiency

Estimated to be 10-20% of AWU kWh

- HVAC upgrades throughout AWU
- IT: ‘standby’ mode and virtualized servers
- Lighting at service centers and Waller Creek Center
  - Expected to save about 250,000 kWh per year
  - Using AE’s Municipal Energy program support

Onsite Renewable Energy Generation

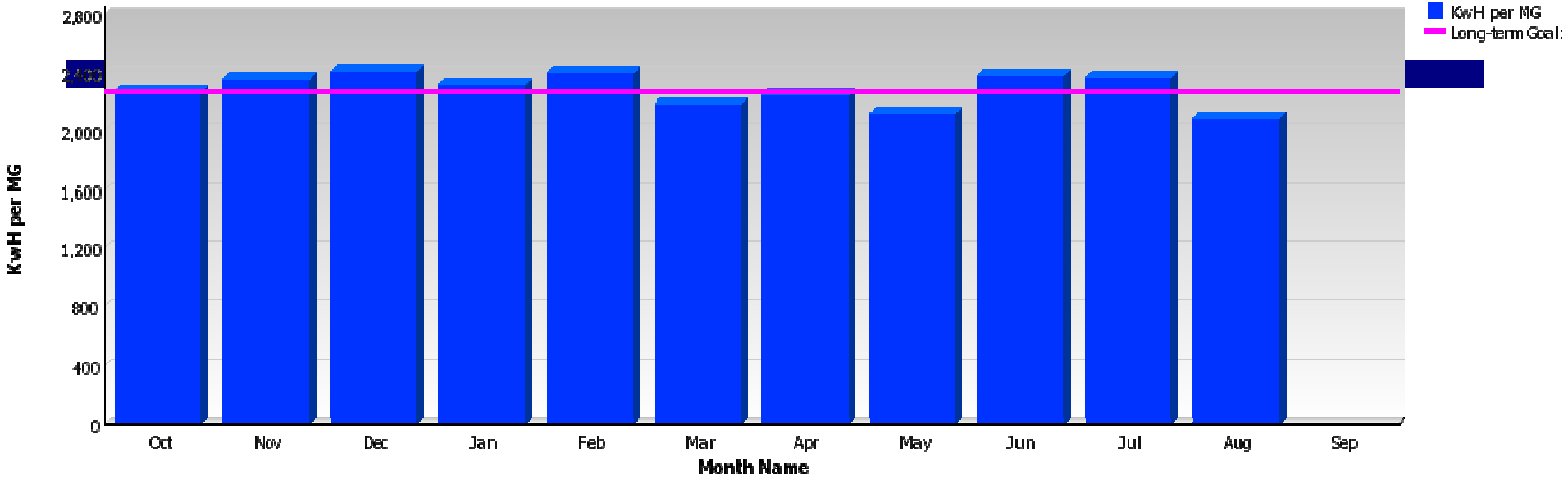
- Builds capacity and reduces greenhouse gas emissions of kWh used
  - Hornsby Bend biogas cogeneration:
    - Heat for digesters (existing)
    - Electricity for plant (planning at least 875 kW by 2012, up to 2 MW potential)
    - Can use food and waste grease
  - PV roofs at AWU facilities
    - Glen Bell Service Center 135 kW array near completion
    - 51st St. Reclaimed tower

Performance Metrics

- Indirect: kWh/MG
- Direct GHGs/MG
- Total GHG/MG

Electricity Use

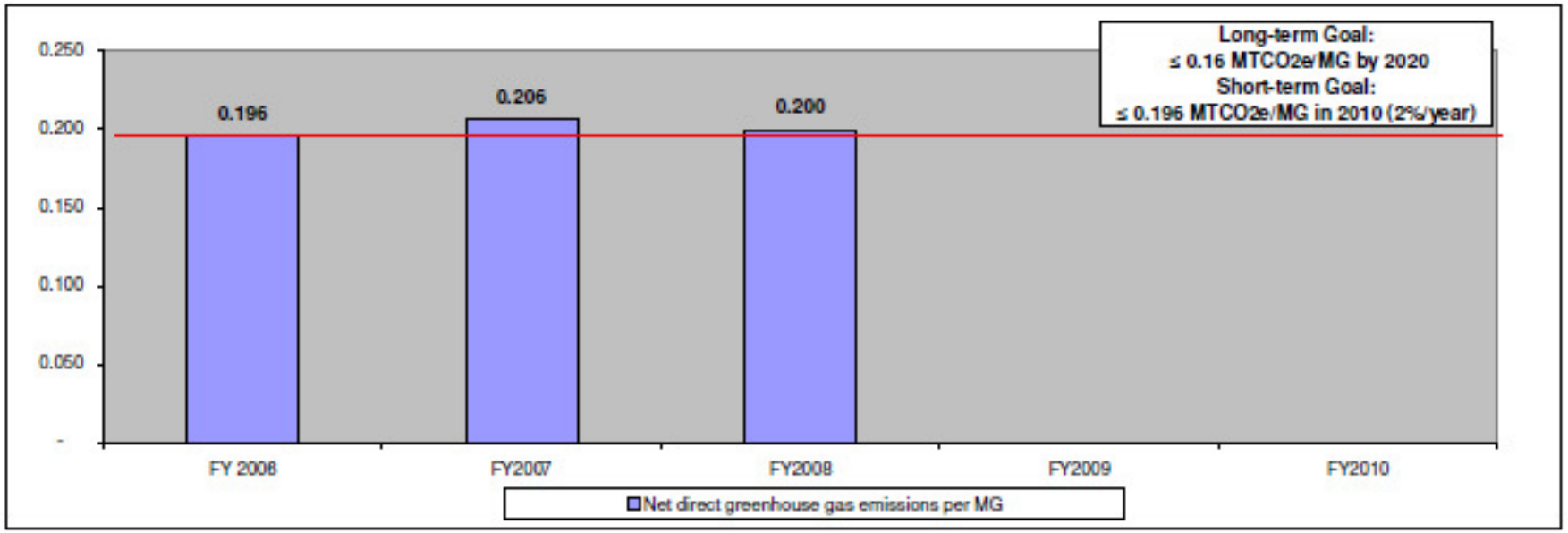
KwH per Million Gallons



Austin Water Utility FY2009-10 — **Performance Measure #12**

Annual

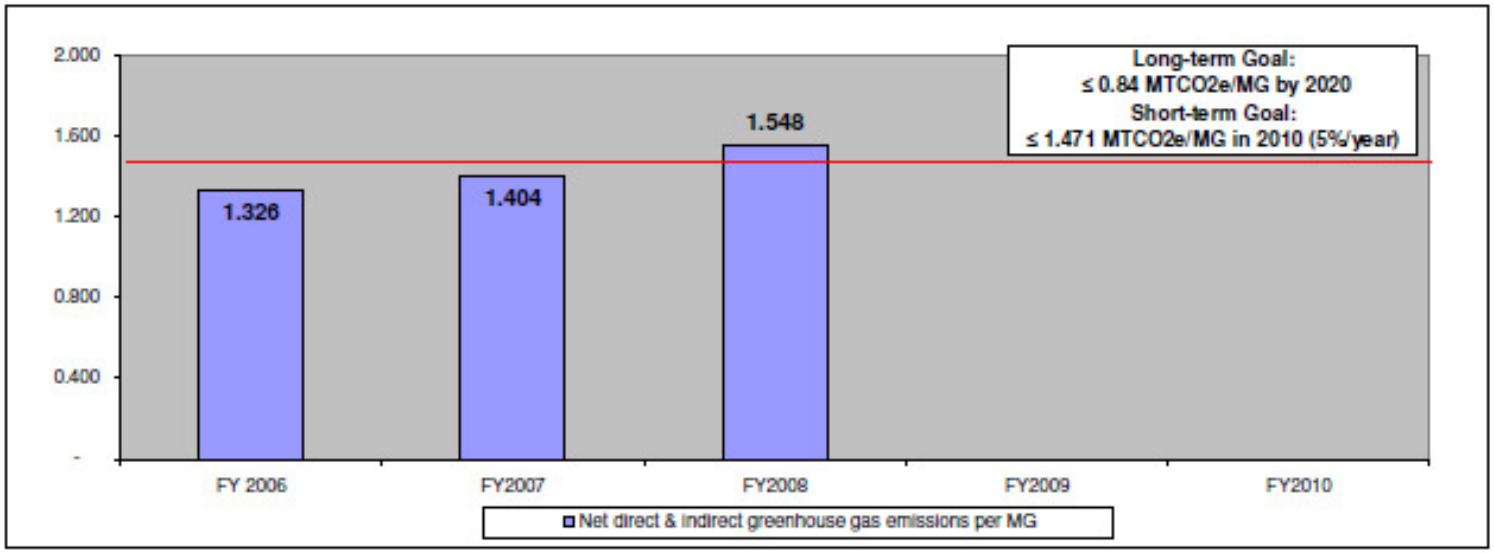
Net Direct Greenhouse Gas Emissions per MG



Austin Water Utility FY2009-10 **Performance Measure #13**

Annual

Net Direct and Indirect Greenhouse Gas Emissions per MG



Direct (fugitive) emissions

- Focus on CH_4 and N_2O, less on CO_2
- Tighter methane capture through Hornsby Bend improvements
- Biological C sequestration
  - Land management
  - Compost and sludge

AWU's Climate Protection Plan

Adaptation to Anticipated New Conditions in:

- Supply (climate, technology)
- Demand (population, technology, behavior)
- Water quality & chemistry
- Infrastructure

2050 Averages for Austin

Projected Changes from Historical

	GFDL	GFDL	CCSM	CCSM
CO2	A2	B1	A2	B1
Temp.	+ 3.4° F	+ 2.5° F	+ 3.9° F	+ 3.5° F
Precip.	- 1.6 in.	0.0 in.	- 0.1 in.	+ 2.4 in.
Net Evap.	+ 6.6 in.	+ 1.7 in.	+ 3.8 in.	- 0.2 in.

- Year 2050 = 2036 to 2065 average
- Historical = 1970 to 1999 average

Implications for Supply and Demand in Central Texas?

Collaborating with LCRA on understanding supply.

AWU staff research on climate impacts on demand found no significant impact on annual average, but 6-12% increase in peaking factor by 2100.

AWU staff continuing research on wastewater and on additional adaptation measures.

Thank You!

David Greene, P.E.
david.greene@ci.austin.tx.us
512-972-0071

Austin Water Utility
Energy & Resources Engineer