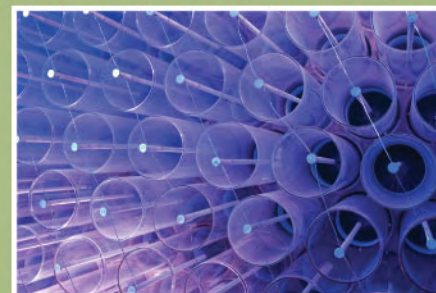




# AMERICAN WATER

## Being Proactive on Climate Change: Tracking and Controlling Greenhouse Gas Emissions

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**President**  
**California American Water**





## Global Warming Potential of GHGs Produced by Water Utilities

Greenhouse Gas	CO <sub>2</sub> Equivalent	Sources
<b>Carbon dioxide (CO<sub>2</sub>)</b>	-	Combustion of hydrocarbons, direct and indirect
<b>Methane (CH<sub>4</sub>)</b>	21 x CO <sub>2</sub>	Combustion of hydrocarbons, direct and indirect; WW treatment
<b>Nitrous oxide (N<sub>2</sub>O)</b>	310 x CO <sub>2</sub>	Combustion of hydrocarbons, direct and indirect; WW treatment
<b>R-134a</b>	1,300 x CO <sub>2</sub>	Leakage from vehicle and building air conditioning units
<b>Sulfur hexafluoride (SF<sub>6</sub>)</b>	23,900 x CO <sub>2</sub>	Insulator in high voltage electrical applications

SOURCE: Climate Leaders

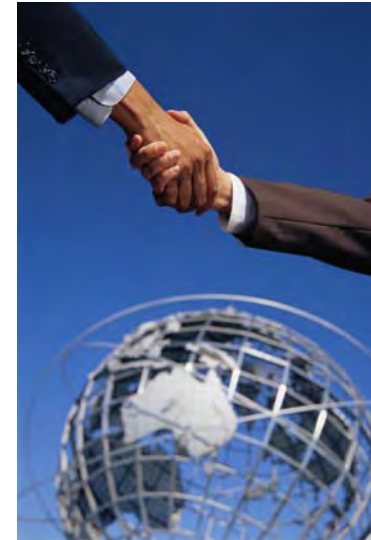
## What are the Impacts of GHGs?

- **Changing weather patterns**
- **Higher surface air temperatures**
- **Melting of polar ice caps**
- **Longer, more frequent droughts**
- **Shorter, higher intensity rainy seasons**
- **Variation in water quality, pathogen loading**
- **Rise in ocean levels causing salt water intrusion, habitat destruction, and displacement of significant human and animal populations**



## One Approach – Climate Leaders

- **A voluntary EPA partnership with U.S. companies to develop long-term, comprehensive climate change strategies**
  - Inventory corporate GHG emissions
  - Set corporate-wide GHG reduction goals
  - Measure and report GHG emissions to the EPA
- **For more information and a list of Climate Leaders partners, please visit [www.epa.gov/climateleaders](http://www.epa.gov/climateleaders)**



## Why did American Water Join Climate Leaders?

- **It makes good business sense**
  - Climate change will impact future water quantity and quality utilized to serve our customers
  - Investors want to own responsible, “green” companies
  - To plan for potential future liability
  - Commission and customer interest
- **Consistent with American Water’s Environmental Policy and leadership ethic**
- **American Water was accepted into the Climate Leaders Partnership on January 19, 2006**



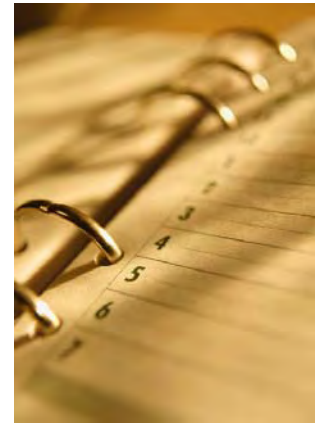
## Project Status

- **January 2006: American Water signs Climate Leaders Partnership Agreement**
- **March 2006: Submit draft GHG inventory to EPA**
- **March 2006: AW Climate Leaders Kick-off Workshop**
- **March 2007: Submit database tracking plan to EPA**
- **March 2008: Complete 12 months of GHG emission monitoring and report same to EPA....baseline**
- **September 2008: Submit GHG emissions reduction plan to EPA**



## Creating a GHG Inventory

- **Conduct inventory using internationally recognized protocol (United Nations IPCC-Intergovernmental Panel on Climate Change) which includes:**
  - Stationary Combustion: Fuels burned on-site for Furnaces, On-Site Generators, Hot Water Heaters, Engine Driven Devices (e.g. pumps), etc.
  - Mobile Combustion: Cars, Trucks, Boats & Planes
  - Fugitive Emissions: Refrigeration and Air Conditioning Units, Process emissions, Landfill emissions
  - Indirect Sources: From the fuels used to produce Purchased Electricity or Steam



## Major Sources of Water Utility GHGs

A typical water utility will find that the majority of their greenhouse gas emissions come from:

- **Purchased electricity (chiefly for pumping)**
- **Fuel for fleet vehicles**
- **Natural gas, diesel, fuel oil for engine driven pumps, generators, and heating**
- **De minimis amounts from: fugitive emissions from HVAC units, process emissions, and minimally used fuels, e.g. LPG**



## AW Inventory of GHG Emissions

Emissions Source Category	Fuel	Quantity	Units	Emissions (Metric Tons CO <sub>2</sub> e)	Percent Total Emissions
Stationary Combustion	Natural Gas	5,102,952	therms	26,998	3.60%
	Diesel	341,981	gallons	3,457	0.50%
Mobile Combustion	Gasoline	2,409,305	gallons	22,591	3.00%
	Diesel	401,922	gallons	4,053	0.50%
Purchased Electricity	Electricity	1,089,424,091	kWh	691,011	92.40%
<b>Total Emissions</b>				<b>748,110</b>	<b>100.00%</b>

Emissions in metric tons CO<sub>2</sub>e includes CO<sub>2</sub>, N<sub>2</sub>O and methane emissions

Emissions from flared methane gas and HVAC were both <0.5%

## Tracking AW Fuel and Electricity Use

- Monthly Electricity, Natural Gas, and Stationary Fuel use:

Database maintained by our Energy Management group, facilitated by our Centralized Procurement process (Itron)

- Monthly Water Production Data:

AW's Operating Parameters Database

- Monthly Vehicle Fuel Use:

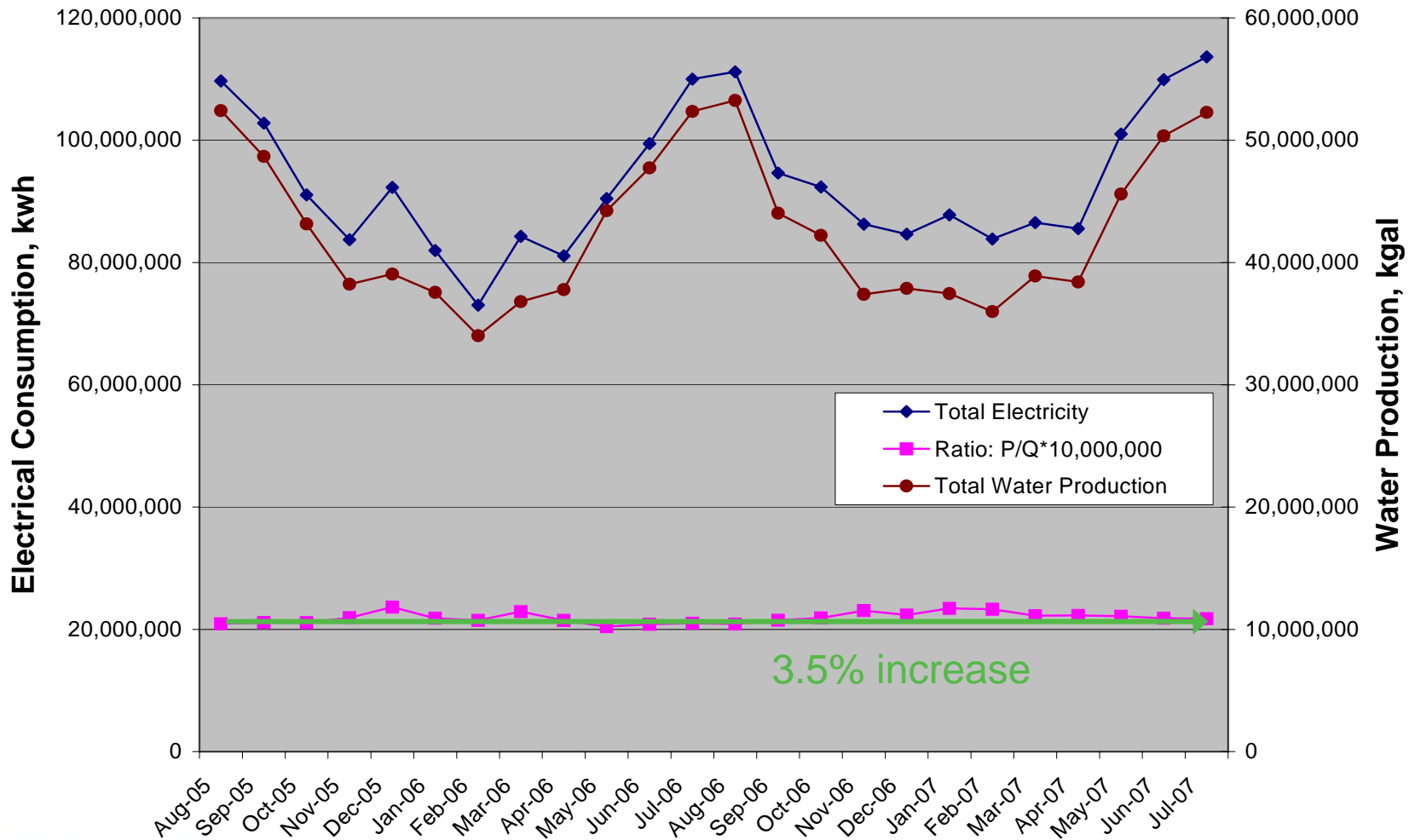
AW fuel purchase and use database maintained by Automotive Resources International (ARI).



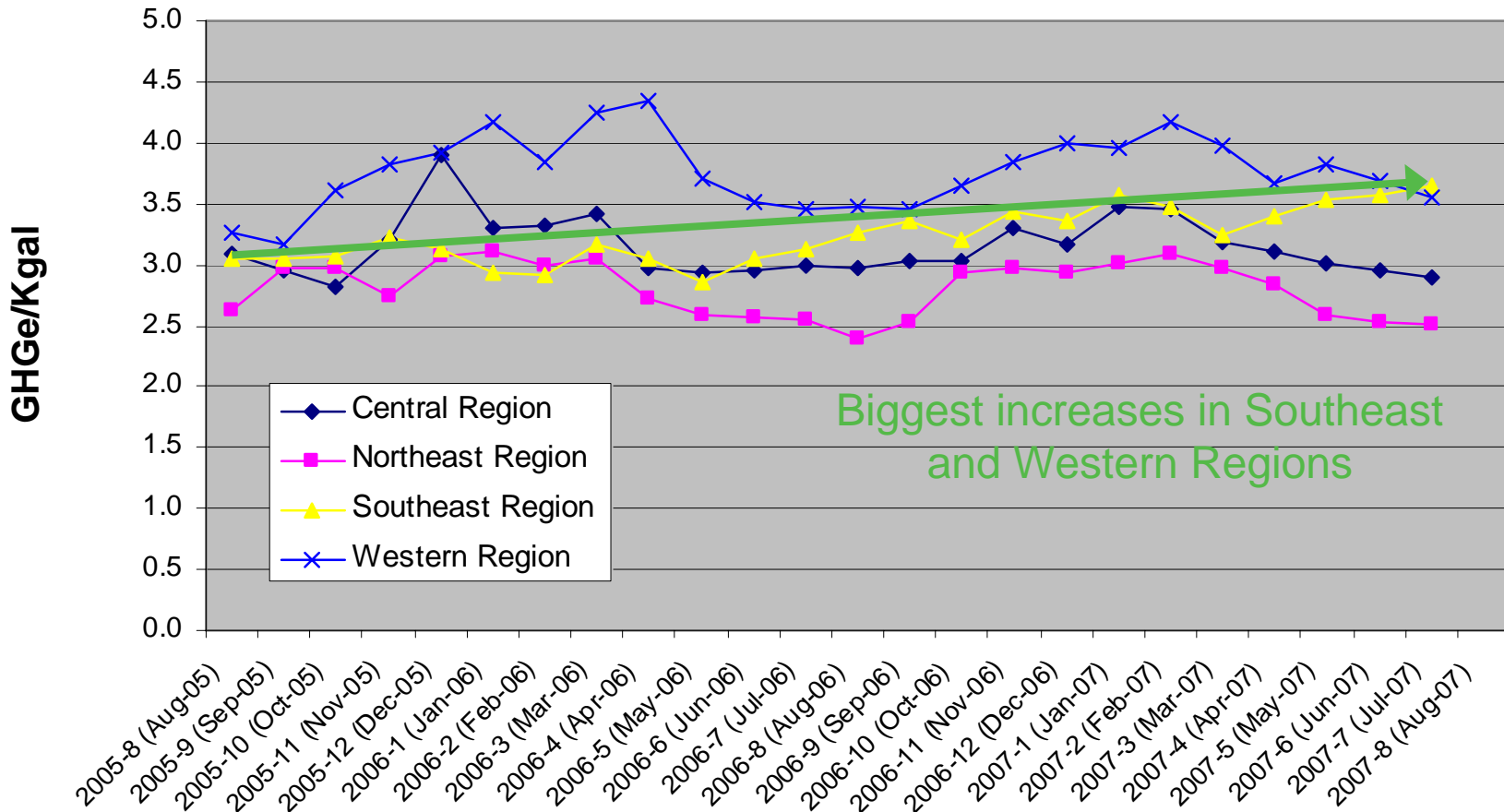
## Strategies to Reduce Energy and GHGe Intensity

- **Decreasing Non-Revenue Water (NRW) decreases water pumped = lower electrical use**
- **Increase Pumping Efficiency**
  - Conduct pump tests and optimize efficiency by trimming or replacing impellers
  - Install VFDs to maximize pump efficiency at each pump demand
  - Install new high efficiency pumps and motors
- **Upgrade lighting to latest generation florescent lighting**
- **Optimize HVAC systems to provide only that level of cooling or dehumidification that is needed**

# Developing a Baseline - Electricity



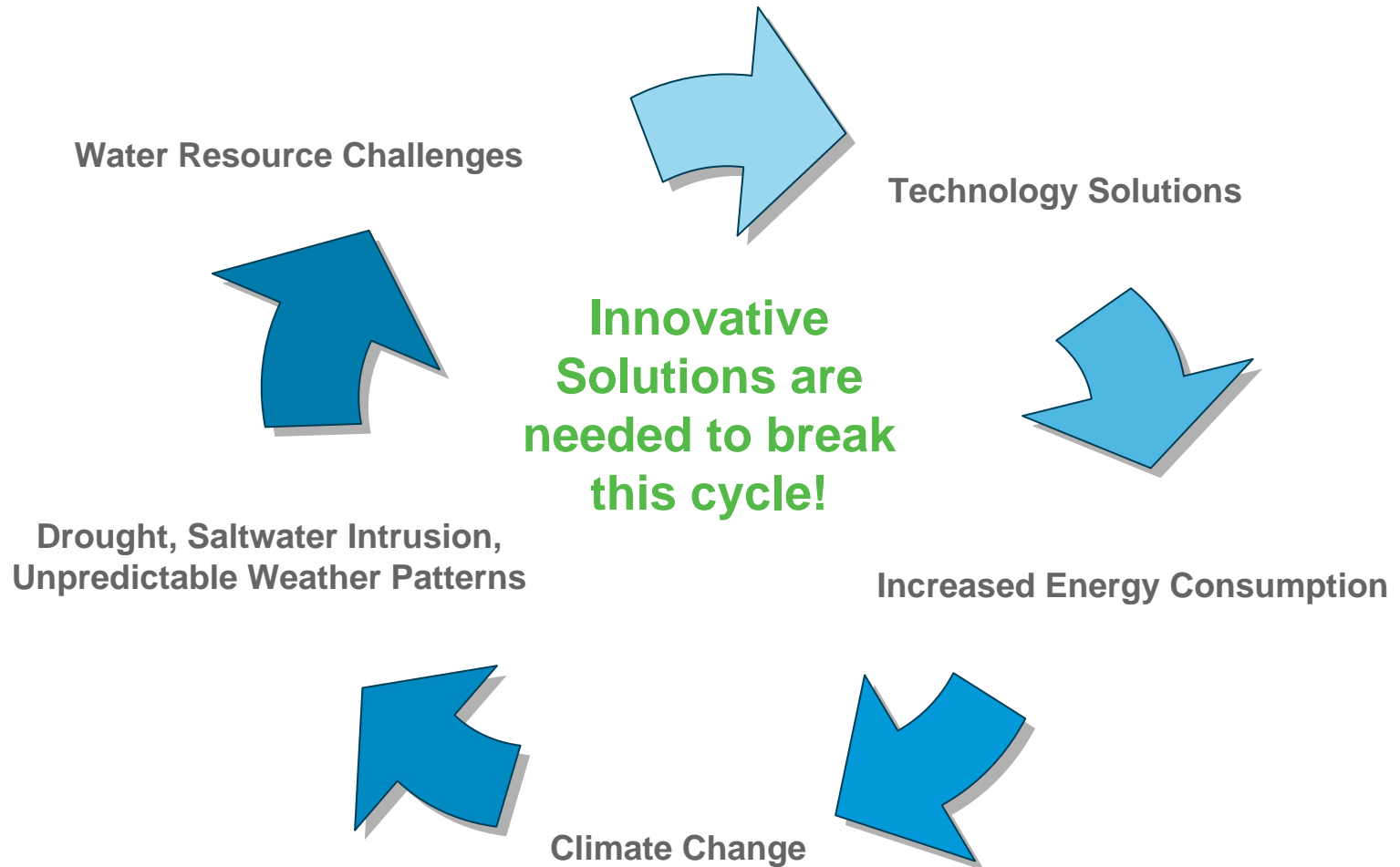
# GHGe Intensity - Electrical



## Possible Sources of Variation in Energy and GHG Intensity

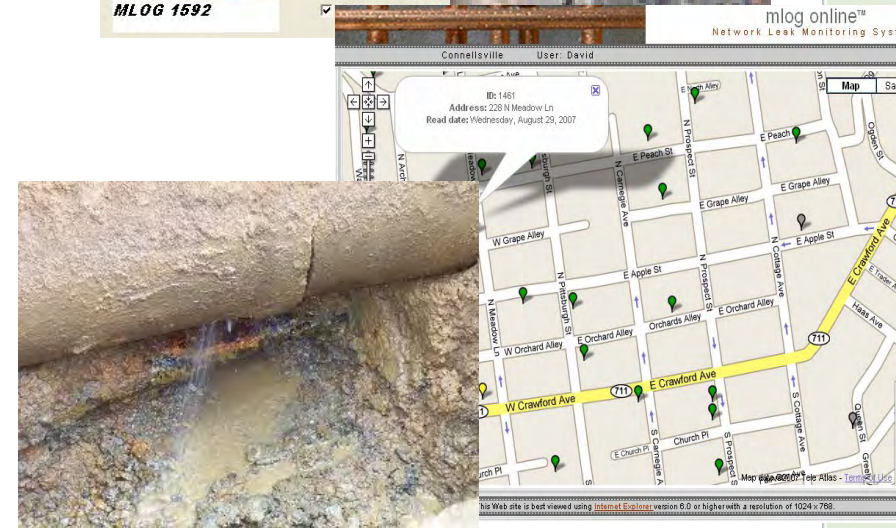
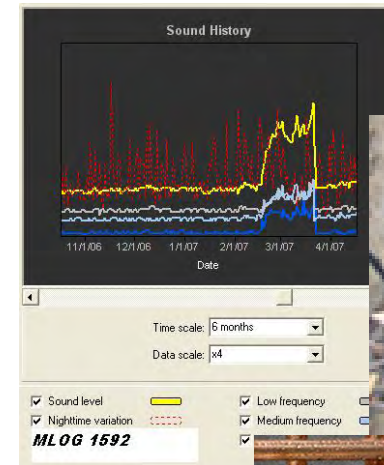
1. **Changes in Treatment Process: UV, Ozone, Membranes?**
2. **Changes in ratio of Purchase Water?**
3. **Variation in Water Sources?**
4. **Variation in usage: Pumping to storage? Aquifer Storage Recovery?**
5. **Increases the amount of wastewater treatment?**
  - WW treatment uses 10% more electricity per kgal than water treatment
6. **Impacts of Pressure Management: Increasing distribution system pressure increases energy intensity.**
7. **Unknown???**

# Water Resource Solution Cycle



## Non-Revenue Water

- American Water has a goal of reducing non-revenue water
- Need to track and translate NRW reductions into GHG reductions
- Research on acoustic leak detectors (M-LOG) in Connellsville, PA has resulted in a 12% reduction in NRW over the past year
- Pressure management to reduce surges that lead to leaks



# Water Conservation / Reuse

- **Maximize conservation efforts**
  - Education
  - Conservation tariff structures
- **Need to maximize reuse opportunities**
  - Annually AW recycles nearly 2 billion gallons of water
  - On-going research on reuse water quality
- **WaterSense**
  - In Camden, NJ we are working with the Carpenter's Society to demonstrate water saving appliances and fixtures



# Operations

- **Increase pump efficiencies**
  - More VFDs
  - High efficiency pumps & motors
  - Pump tests: trim or replace impellers
- **SCADA and energy optimization**
- **Pumping/storage management**
- **Lighting**
  - New generation T8 lighting
- **Energy audits**

$$P = Q\gamma h/\eta \quad \text{where:}$$

P =	power required
Q =	volumetric flow rate
$\gamma$ =	unit weight of the water pumped
h =	pump head
$\eta$ =	pump efficiency



## Energy Audits

### Typical AW & Industry Findings

### Improvements with acceptable payback (typ. < 6 years)

- Trim or replace pump impellers
- Add a VFD (variable frequency drive)
- Install new fluorescent lighting- replacing existing lighting just 2 or 3 years old often has a payback of less than two years!
- Shift a portion of pumping to times with lower energy costs
- Modify HVAC operations; e.g. temperature settings

# Results of Previous Energy Audits (2003-2006)

## Recommended Improvements (E.g. replace impellers, install VFDs, install high efficiency lighting)

PAAW System	Capital Cost (\$)	Annual Savings (\$/yr)	Payback (years)
PITTSBURGH	\$673,500	\$197,561	3.4
MECHANICSBURG	\$148,500	\$64,305	2.3
NEW CASTLE	\$17,400	\$58,454	0.3
MILTON/WHITE DEER	\$78,000	\$40,777	1.9
INDIANA	\$32,000	\$31,460	1.0
HERSHEY	\$12,000	\$28,700	0.4
ELLWOOD	\$33,500	\$24,569	1.4
BUTLER	\$3,000	\$12,249	0.2
<b>Total =</b>	<b>\$1,992,800</b>	<b>\$903,901</b>	<b>2.2</b>

# Procurement

- **Green Energy Production**
  - Solar Generation
  - Tax Incentives
- **Green Energy Procurement**
  - Wind Power



## Canal Road Solar Array



**590 kW ground-mounted photovoltaic system**

**Produces 687,000 kilowatts of energy / year**

**Eliminates 721,245 pounds (327 metric tons) of CO<sub>2</sub>e per year**

## Other Programs

- **Fleet management**
  - Hybrid cars
  - Bio-diesel trucks
- **Forestry programs for sequestration**
- **Employee involvement**
  - Lights off in unoccupied rooms,
  - Computers/monitors in sleep mode
  - Vehicle “no idle” policy
- **Wastewater**
  - Methane generation/combustion
  - Landfill methane generation
  - N<sub>2</sub>O reduction by process modification



## Conclusions

- Addressing climate change makes good business sense
- Water utilities are not just the recipients of the effects of climate change, *they are also part of the problem!*
- Climate Leaders (and similar programs for municipal systems) provide a structured mechanism for documenting and reducing GHGe
- For American Water, 92.4% of GHGe is indirect from electrical use and 3.5% from vehicle fuels
- Multiple mechanisms exist to reduce GHGe including leak reduction, conservation, pump efficiency improvements, energy audits, pressure management, procurement, fleet management, efficient lighting and air conditioning.

