

Leveraging Energy Efficiency to Deliver Water Savings

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Overview

- Saving energy and water are important
- Energy and water are linked in many ways
 - Use water to produce power
 - Use energy to deliver water
 - Use energy and water together in homes, buildings, industry
- Many opportunities to save water through energy efficiency programs
 - Focus on similar products
 - Focus on similar market segments
- Key options to explore within energy efficiency programs
 - Role for ENERGY STAR program

Energy and Water Challenges

Energy

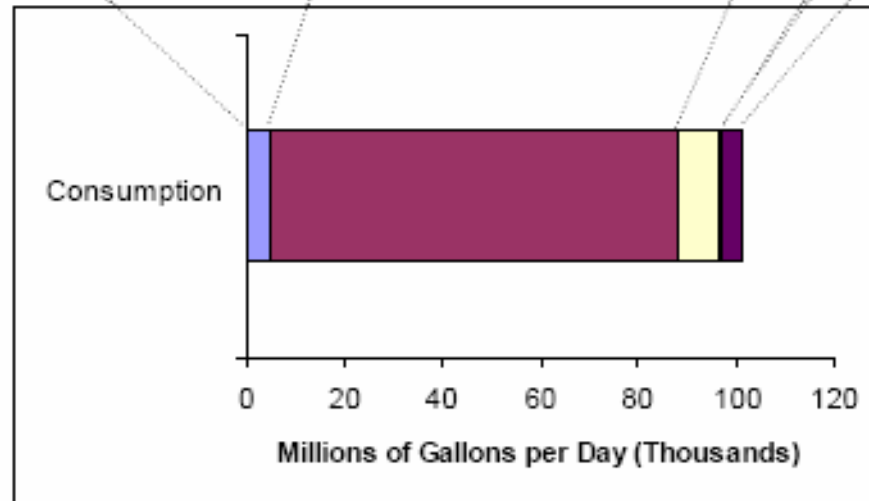
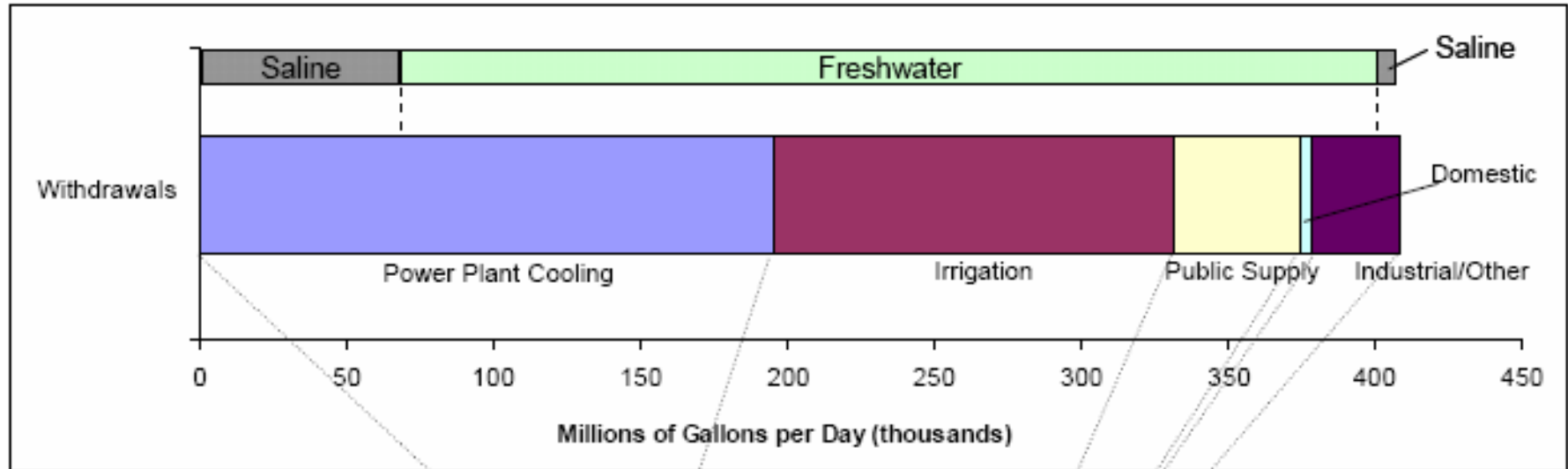
- Reliable supply
- Reduce emissions
- Limit global warming
- Low costs
- Limit natural gas prices/volatility

Water

- Adequate supply
 - Domestic, industry, agric.
- Safe drinking water
- Healthy ecosystems:
 - Wetlands
 - Coastal waters
 - Rivers and lakes
 - Groundwater
- Effective Public water systems

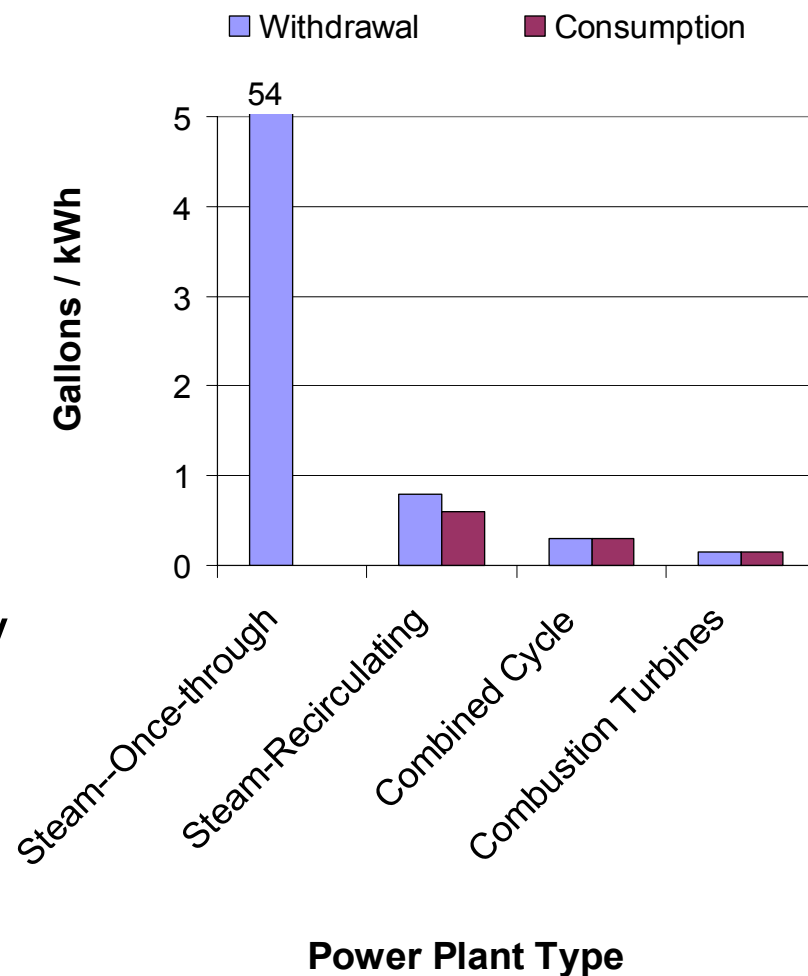
Cost-effective efficiency solutions meet all objectives

Water Withdrawals and Consumption – 2000



Water used to Produce Electricity

- Principal use is cooling water
 - Single largest water withdrawal
 - 48% of total
 - 136,000 mgd of freshwater
 - 5% of annual water consumption
 - About 1,000 mgd of freshwater
 - Recirculating systems most common built today
- Water consumption varies by type of power generation
- Water needs may grow due to need for inland power plants (EPRI)



Strategies for Reducing Power Plant Cooling Water

- Energy efficiency
 - Cutting demand growth in half by 2025
 - 1,100 million gallons per day (mgd)
- Dry cooling
 - Hybrids
 - Watch energy penalty
- California
 - (getting more information)

Urban Water Systems and Energy

Water supply and Waste Water Treatment

Water	43,300 mgd (11% of total) withdrawn annually Demand growing with population growth (per capita demand flat for last twenty years)
Energy	About 50 billion kWh annually; single largest expense for many municipalities Large portion is pumping energy (90% supply, 10% WW)
Many Issues	Limited access to new supply in many areas Increasing treatment requirements Financial stresses

Significant Savings Possible in Water Supply / Treatment

- Water
 - About 8% unaccounted for (UAF) nationally
 - Leak repair programs demonstrating savings

City	UAF Water %		
	1994	2001	Change
Denver, CO	6.3%	4.4%	-1.9%
El Paso, TX	11.6%	10.2%	-1.4%
Grand Junction, CO	18.2%	10.3%	-7.9%
Highlands Ranch, CO	1.1%	4.7%	3.6%
Las Vegas, NV	9.4%	4.6%	-4.7%
Phoenix, AZ	12.4%	9.7%	-2.7%
Tempe, AZ	3.0%	4.5%	1.5%
Average	9.1%	6.7%	2.4%

- Energy
 - Options include optimizing existing infrastructure, energy-efficient motors and pumps
 - Pleasanton, California: with energy-efficient pumps and motors, saved 34 percent of annual energy costs in 1 ½ years. (EPRI, 1997)
 - Madera Valley, California. with variable frequency drives (VFDs) and programmable logic controllers, saved 15 percent in energy costs despite 22 percent increase in water delivery. (CEC, 2004a).

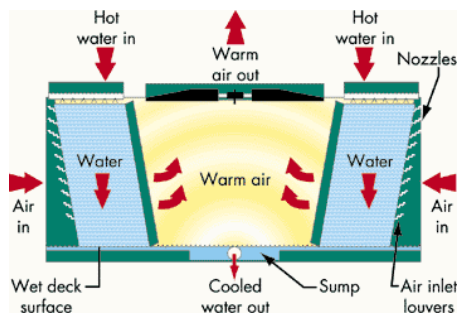
Energy / Water Efficiency Strategy for Water Supply/Treatment

- Improved energy and water management
 - use energy cost-savings motivation
 - energy use benchmarking and tracking
 - best practices for energy and water savings
 - peer exchange
- Substantial savings possible
 - 5% energy savings means 2 billion kWh
 - 5 – 20% reduction in actual losses means 225 - 925 mgd water savings
- Program in process of development
 - Announce formation of ENERGY STAR industrial focus – March '05
 - full roll out in one year

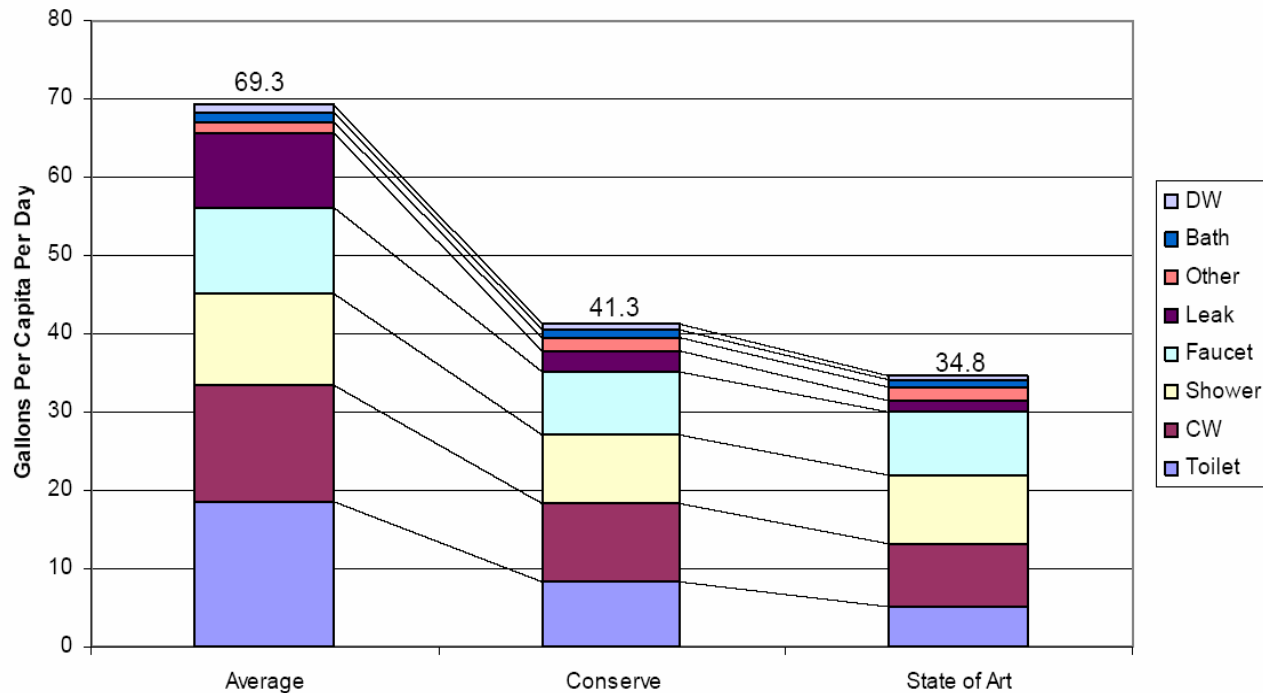
Water and Energy Used Together

- Residential
 - Appliances
 - Showers, faucets
- Commercial
 - Cooling systems
 - Commercial Kitchens
 - Laundries

Hot Water Cooling Processes

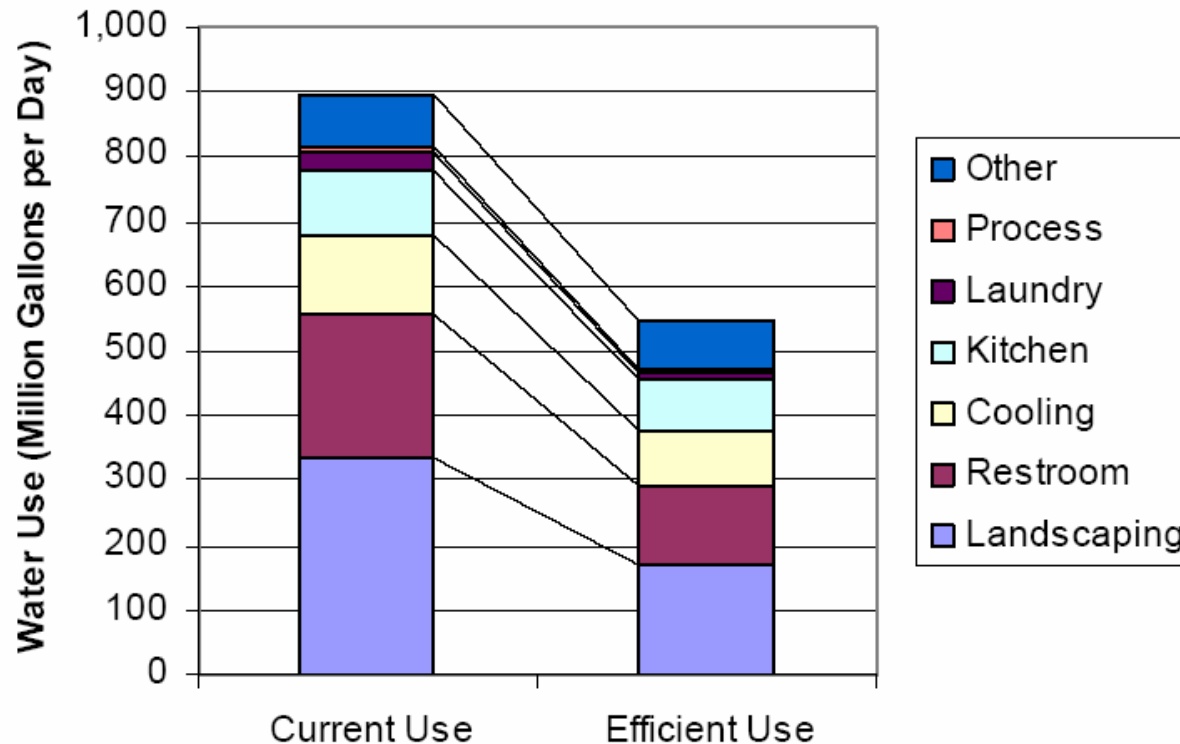


Average Indoor Residential Water Use



- Residential water is about 2/3rds of water delivery
 - Indoor water use is about 2/3rds of residential use
 - Varies regionally
- 40% indoor savings possible with available technologies
 - EPACT compliant plumbing fixtures
 - Resource efficient CW and DW
 - Leak reduction

Commercial Water Use



- 40% or more savings available
- Varies by building type/market segment
- Landscaping varies substantially regionally

Key Water Savings Opportunities

Commercial

- Commercial cooling
- Commercial cooking
- Commercial laundry
- Showerheads/faucets
- Toilets/urinals
 - meeting EPACT
 - more highly efficient
- Outdoor landscaping

Residential

- Appliances
- Showerheads/faucets
- Leak detection
- Toilets/urinals
 - meeting EPACT
 - more highly efficient
- Outdoor landscaping

Need to look at cost-effectiveness

- *for utility, for consumer*
- *for products, product bundles, for market segments*

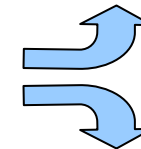
Commercial Water Conservation Strategies with Energy Links

Commercial Measure	Peak Season Savings (mgd)	Lifetime of Measure	Peak Season Level'd Cost (\$/ccf)
Plumbing			
-- Install 1.6 gpf toilets	1.35	20	\$1.31
-- Install 1.0 gpf urinals	0.41	20	\$1.78
-- Install waterless urinals	0.33	20	\$2.36
Cooling			
-- Switch to air cooling	4.30	10	\$2.26
-- Improve cooling tower performance	1.15	10	\$1.00
Laundry			
-- Recycle laundry wash water	0.39	20	\$1.93
-- Water-efficient washers	0.29	10	\$1.65

Note: Peak cost of water is \$2.41 / ccf

Switch to Air Cooling

- Single-pass, water-cooled ice machines and coolers
- Single-pass, water-cooled air conditioning heat pumps
- Liquid ring vacuum pumps
- Single-pass, water-cooled industrial equipment



Improve Cooling Tower Performance

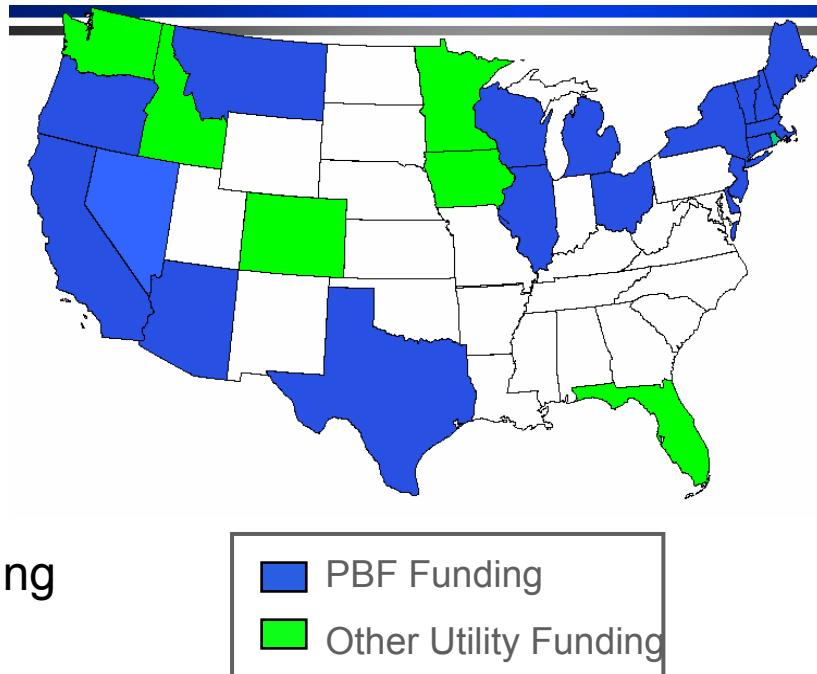
- Auditing cooling towers to reduce bleed rates
- Installing conductivity controllers
- Adjusting water treatment chemical concentration or chemical type to allow higher cycles of concentration

Common Commercial Market Segments and Measures

Measures	Market Segments
Plumbing --ULFT --Urinals --Leak Reduction	Office Buildings Hotels / motels Colleges / Universities
Cooling --Air cooling --Cooling Tower	Primary / secondary education
Laundry --Water efficient washers	Mulifamily Hospitals

Energy Efficiency Programs Offer Leverage

- EE Program spending is substantial
 - Over \$1.6 billion / year
- SBCs for gas being considered
 - New England
 - CA
- Significant results
 - ENERGY STAR linked activities saving 4% of energy nationally
 - Greater results across broader set of programs
- EE and Water programs target similar market segments / end-uses



Residential Energy Efficiency Measures

Selected Measures from California Potential Study

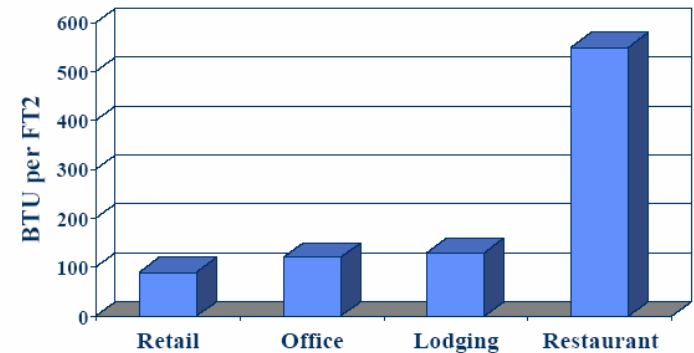
<i>Gas</i>				<i>Electric</i>			
Measures	Mth Savings	Cumulative Mth Savings	Levelized Energy Cost \$/Therm	Measures	GWH Savings	Cum. GWH Savings	Levelized Energy Cost \$/kWH
Water Heater Blanket	105	105	\$0.08	Water Heater Blanket	126	126	\$0.008
Pipe Wrap	20	125	\$0.17	HE Tube Fluorescent	324	475	\$0.017
Low-Flow Showerhead	39	164	\$0.29	dbl Pane Windw , Low -E	976	1,450	\$0.023
Faucet Aerators	24	188	\$0.34	Low Flow Show erhead	45	1,495	\$0.026
Programmable Thermostat	15	223	\$0.69	HE Pool Pump and Motor	1,152	2,648	\$0.029
HVAC Testing And Repair	60	284	\$0.78	Faucet Aerators	28	2,676	\$0.031
HE Water Heater	76	366	\$0.93	CFLs	6,523	9,199	\$0.036
Horiz Access Clothes Washer	322	688	\$0.93	HE Clothes Washer	654	9,852	\$0.043
Wall Insulation	152	839	\$0.98	HE Freezer	181	10,131	\$0.064
Ceiling Insulation	84	923	\$1.07	Refrigerator-Early Replace	4,313	14,444	\$0.065
Duct Repair	40	963	\$1.70	Heat Pump Space Heater	419	14,864	\$0.085
ENERGY STAR Dishwasher	79	1,042	\$1.99	Energy Star Dishwasher	199	15,063	\$0.086

Plumbing fixtures and appliances are cost-effective strategies due to hot water savings

Commercial Programs

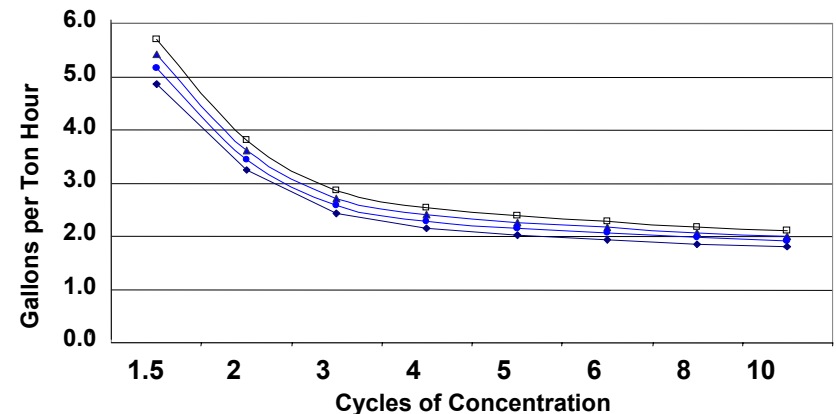
- Targeted building improvements
- Commercial Kitchens
 - Fryers
 - Steamers
 - Holding Cabinets
 - Reach-in Refrigeration
 - Pre-rinse spray valves
 - Commercial dishwashers
- Commercial Cooling
 - Significant use of energy and water
 - Water savings are from increased concentration cycles / monitoring
 - More efficient buildings also reduce cooling water demand
 - Opportunity to merge strategies

Foodservice is energy intensive ...



...and Water Intensive!

300 - 3000 gallons per day



□ 1.25 kW/ton ● 0.75 kW/ton ▲ 1.00 kW/ton ◆ 0.50 kW/ton

Exploring Efficiency Program Options Including ENERGY STAR

- Efficiency programs currently delivering water savings
 - ENERGY STAR -- 100 mgd through CW, DW, building improvement efforts
 - Expected to double over next ten years – with current approaches
- More opportunities
 - Residential
 - Appliances: CW, DW
 - Plumbing: Showerheads, faucets, toilets
 - Home programs -- retrofit and new construction
 - Multifamily
 - Commercial
 - Extension of Strategic Energy Management
 - Target sectors -- Offices, Food Service, Hotels, Hospitals, Schools
 - Products/Practices
 - Cooling Towers / Equipment
 - Commercial kitchen
 - Plumbing fixtures

Timeline for ENERGY STAR Products (products that use energy and water)

Product Category	Status
<p>Residential</p> <p>Clothes washers</p> <p>Dishwasher</p>	<p>Draft specification with a Water Factor as of 3/05; final specification effective 1/07 (DOE)</p> <p>Reevaluation expected in mid 2005 (DOE)</p>
<p>Commercial</p> <p>Pre-rinse spray valves</p> <p>Commercial dishwasher</p> <p>Ice machines</p> <p>Commercial clothes washers</p> <p>Softserve machines</p> <p>Autoclaves/Sterilizers</p> <p>Steam Cookers</p> <p>Other products</p>	<p>Draft specification available. Final expected by 9/05</p> <p>Draft specification expected by 6/05</p> <p>Options paper by Summer/Fall 05</p> <p>Market and engineering research by early '06</p> <p>Market and engineering research by early '07</p> <p>Market and engineering research by early '07</p> <p>Periodic reevaluation</p> <p>Continued investigation</p>

Residential Opportunities to Explore

- Home Performance with ENERGY STAR
 - Whole house retrofit program
 - Certified home professionals / quality assurance
 - Piloted in CA, NJ, NY, TX, MO. and WI
 - Add plumbing fixtures (toilets, showerheads, and faucet aerators) to home audit / improvement projects
 - Need organizations to develop materials / pilot efforts
- New Construction
 - Exploring cost-effective options for 2009 ENERGY STAR spec
 - Additional energy/water savings opportunities
 - Hot water on demand / structured plumbing
- Multifamily
 - Add to energy benchmarking

Commercial Opportunities

- Build upon Corporate Energy Management in key sectors
- Integrate water bill tracking / benchmarking / goal setting into EPA national energy performance rating system
 - Tracking capability – year 1
 - Benchmarking – year 2-3
- Provide guidance on savings opportunities
 - Cooling tower improvements
 - Plumbing recommendations / cost-effectiveness
 - Commercial kitchens
 - Air-cooled versus water cooled equipment

ENERGY STAR Commercial Program – Target Markets

Market Segment	ENERGY STAR Partner Commitments: Square Feet (% of market)	Status of National Energy Performance Rating System (Portfolio Manager)
Office -- General. Courthouses, Banks, Financial Centers	4.1 billion (32%)	20% of buildings rated
Retail -- Drug Stores, Discount Stores, Home Centers, Department Stores	2.0 billion (15%)	expected 2005
Education -- K-12 and Higher Education	1.2 billion (13%)	13% of schools rates
Healthcare -- Acute Care Hospitals, Medical Office Buildings, and Clinics	380 million (13%)	34% of hospitals rated
Lodging	740 million (16%)	9% of hotels rated
Food Service -- Fast Food Restaurants	185 million (10%)	exploring
Food Sales – Grocery and Convenience Stores	377 million (37%)	21% of supermarkets
Multifamily		exploring approaches with HUD

The Next Ten Years: Potential savings from energy/water savings strategies

Measure	Direct Water Savings (mgd)	Energy Savings	
		Direct (kWh)	Total (kWh)
Clothes Washers 5 million	80	530	580
Dishwashers 4 million	9	280	286
Pre-rinse Spray Valves 0.25 million	55	2450	2483
Commercial Toilets (EPACT) 2 million	240	--	140
Residential Toilets (EPACT) 5 million	85	--	50

Source: EPA Draft Paper

Working Together

- Energy efficiency saves water
 - Cutting demand growth in half by 2025 could save 1,100 mgd
- Water/wastewater treatment industries
 - Improved energy/water management could save 225 to 925 mgd
- Link energy and water efficiency efforts for end-users
 - Home appliances
 - Plumbing fixtures
 - Commercial kitchens
 - Promoting efficiency in the C&I market
- Determine how to meet energy and water objectives
 - Ice machines, etc
 - Power plant cooling
- Explore other areas