

US EPA ARCHIVE DOCUMENT

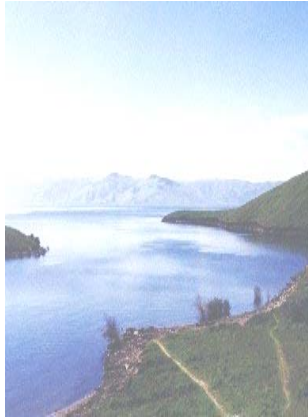


Energy Management Opportunities @ Wastewater Facilities

Innovative Energy Management Workshop - Sacramento

by US EPA Region 9

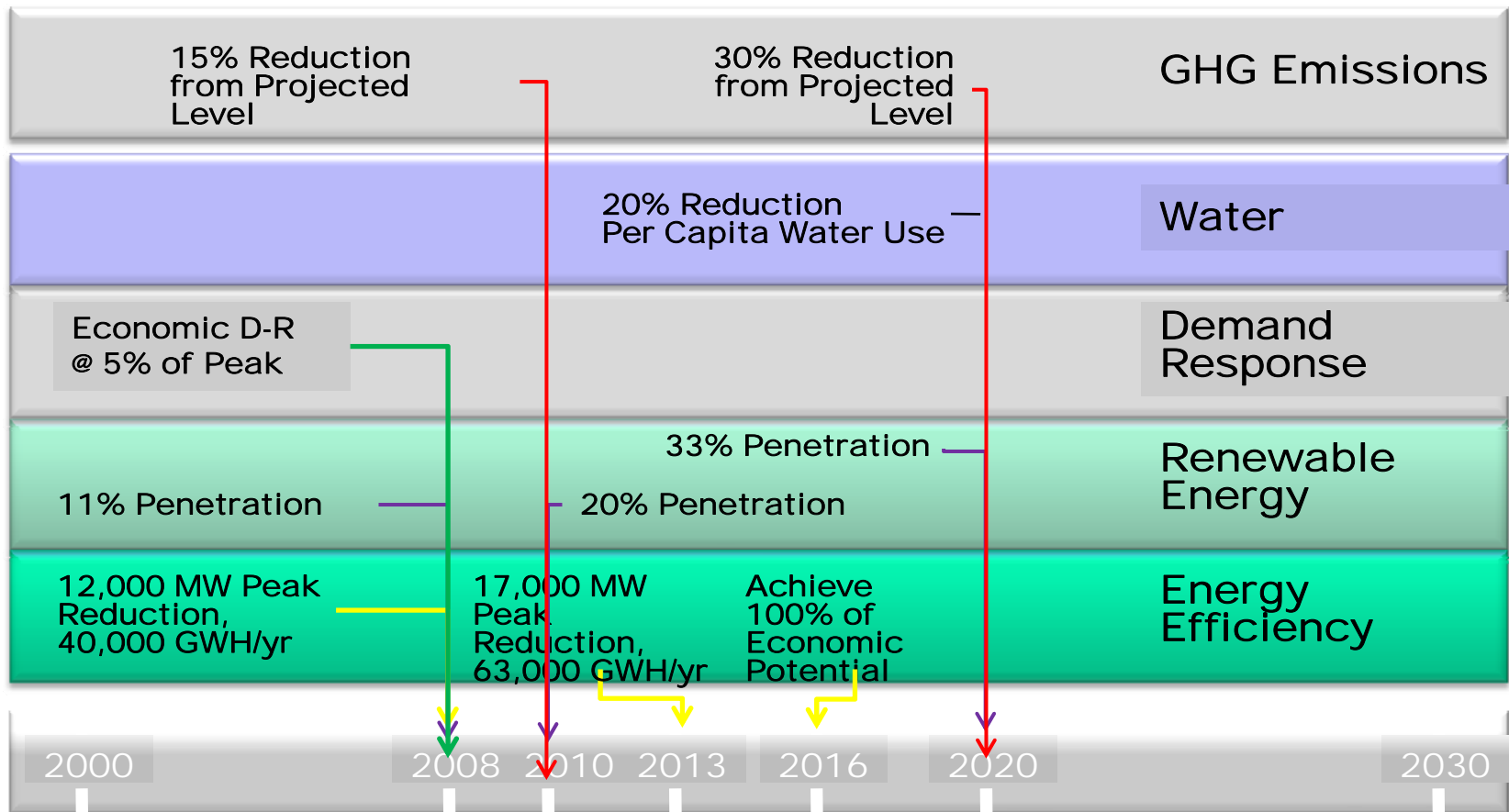
Shahid Chaudhry
California Energy Commission
Dec. 16, 2008





California Energy Commission

- California's Energy & Water Policy and Implementation Time Lines





- **Energy Consumption* @ WWTF**

kWh / lb BOD Removed: 0.4 – 2.6**

kWh / MG WW Treated: 508 – 2,428**

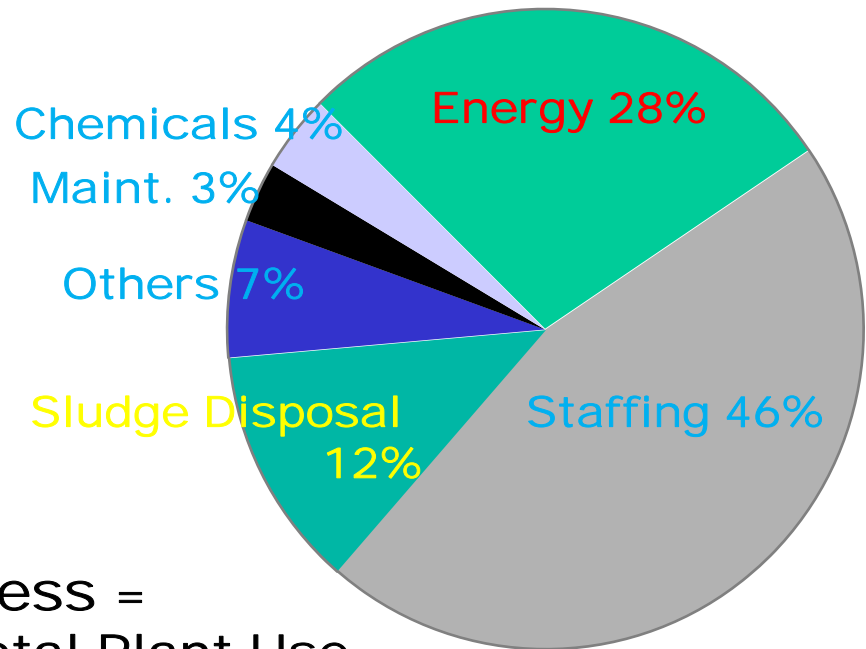
kWh / MG***

WW Treated:

1,073 – 4,630

OTE, %: 2.6 – 83

Energy Consumption
for Secondary Process =
27 – 60% of Total Plant Use



* PG&E Study, 2002

** Secondary WW Treatment Process Only

*** Total Plant Basis



- **Pumping Energy**

Water Treatment 90%

WW Treatment

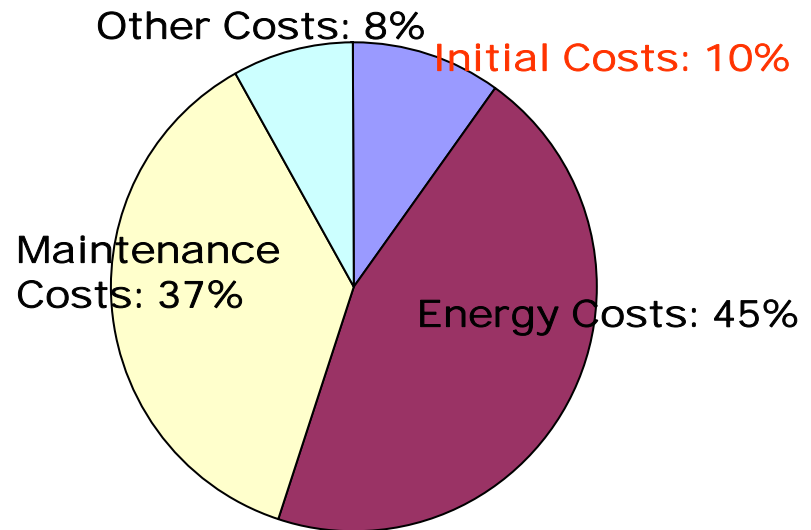
Aeration 55%

WW Pumping 14%

Solids Handling 14%

Others (lighting, belt press, clarifiers, return sludge handling etc)

Life Cycle Pumping Costs





- Pump-Motor Systems

Generally Most Inefficient

Efficiency	5 - 80%	→	Motor	85 - 95%
			Drive	20 - 98%
			Pump	30 - 85%

Survey of ~ 1,700 Pumps @ 20 Process Plants:

Avg. Pumping Efficiency < 40%

Over 10% pumps run below 10% efficiency,

Major factors affecting pump efficiency -

Throttled valves & over-sizing

Seal leakage causes highest downtime & cost.

- Oxygen Transfer Efficiency (OTE)

Mechanical Aerators, Coarse Bubble & Fine Bubble Aerators

- Use of Control Systems



- Importance of CH₄ / Digester Gas

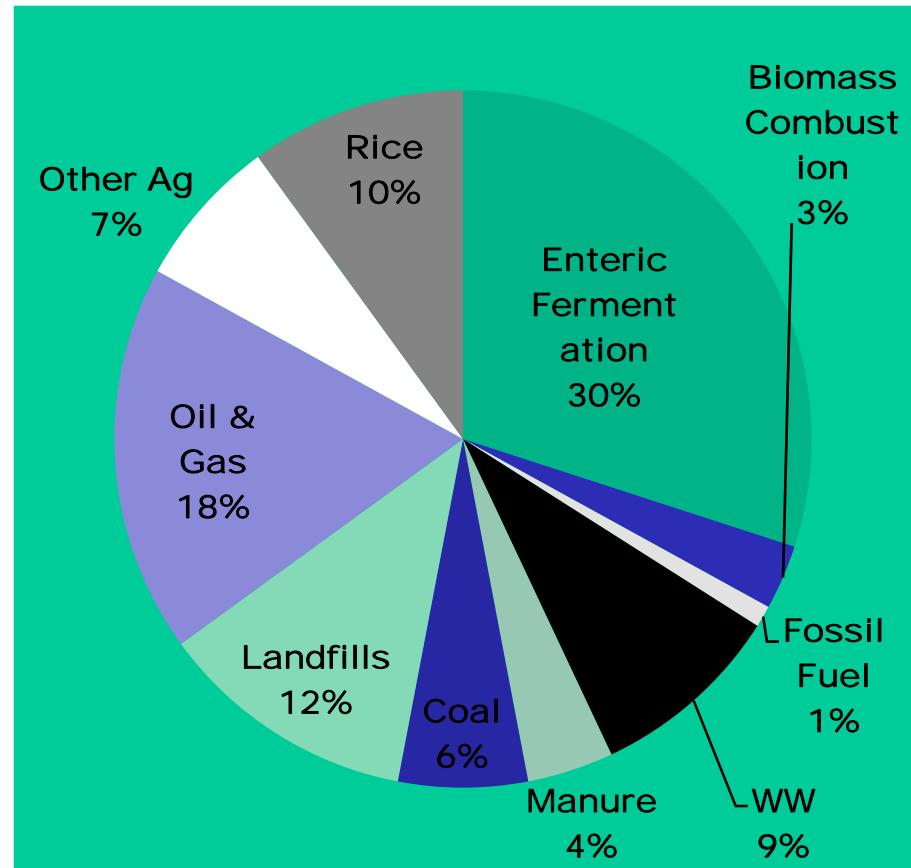
Methane - 16% of GHG Emissions Globally

Primary
Composition of
Natural Gas

Potent GHG – 20
Times More Effective
than CO₂ in Trapping
Heat

Much Shorter
Atmospheric
Lifetime than CO₂
(12 ~ 200 yrs)

DG -- A Valuable /
RE Energy Sources
(~500 BTU/cu. ft)



Pie Chart – Data from US Methane to Markets
Partnership Accomplishments



- Use of Digester Gas
 - About 40 MW @ WW Treatment Facilities
 - ~ 40 MW More Can be Generated
- Potential Barriers
 - Quality of Digester Gas / Pretreatment Issues
 - Cost of Conversion
 - Lack of Stable Long Term Incentives
 - Permitting Issues
 - Uncertainties in Equipment Performance
 - Limited Availability of Skilled Force



- **Examples of Using WWTP Digester Gas**

City of Merced

Refurbished IC Cogeneration System, 325 kW @ \$369 / kW

City of San Mateo

Refurbished IC Cogeneration System, 500 kW @ \$1,048 / kW

City of San Diego

Converted Diesel Generators to Diesel & Digester Gas 1,200 kW @ \$262 / kW

North San Mateo County

Installed Six 30-kW Micro-turbines @ \$3,015 / kW

Big Bear Area Regional Wastewater Agency

Replaced Diesel Generator with Gas IC Generator, 600 kW @ \$1,070 / kW

City of Benicia

Replaced Diesel Generator with Gas IC Generator, 1,000 kW at \$1,094 / kW



- California Feed-In Tariffs

Feed-In Tariffs –

Long Term Prices for the Electric Utilities to Buy Renewable Energy from Their Customers

Approved on Jan. 31, 2008 by CPUC

Require:

Long-Term Contract for 5, 10, or 15 Years

Tariffs Range from 8 cents to 31 cents / kWh
Depending on Power Generation Time

Facilities Earning the Tariff Can't Participate in State Incentive Programs

Public Water & Wastewater Facilities

Statewide Capacity: 250 MW

Distributed Among 7 Utilities According to Their Size



California Energy Commission

- CPUC's Initiative on Water-Energy Conservation
- CPUC's Savings by Design Program
- CEC's Programs

RE Generation Rebates (Net Metering Basis)

Public Interest Energy Research -- \$62 million/yr.

Efficiency Services and Loan Programs

Energy Efficiency Partnership Program

Energy Efficiency Financing Program