Water/Energy Nexus Strategies
Overview

- EBMUD Energy Management
- EBMUD and PG&E Partnering
- W/E Technology Deployment Synergies
- Challenges & Opportunities
EBMUD Water System Facilities

- 2 Hydroelectric Plants (40 MW)
- 3 Aqueducts (90 mi)
- 7 Water Supply Reservoirs
- 6 Water Treatment Plants
- 25 Rate Control Valves
- 132 Pressure zones (5 - 1450 ft)
- 135 Distribution Pumping Plants
- 180 Distribution Reservoirs
- 4200 Miles of Distribution Pipelines
- 400,000 Meters

~ 1.34 million customers ~ 180 MGD Production
• EBMUD annual energy expense ~$11 million*

• 90% of water supply from Mokelumne River Watershed

• Pre-Drought – Approximately 220 MGD average water production

• Post-Drought – Approximately 180 MGD average water production

*Potable water treatment and distribution only
## Water System - Fiscal Year 2011

<table>
<thead>
<tr>
<th></th>
<th>Energy Use MWh</th>
<th>Cost (million $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution Pumping</td>
<td>44,000</td>
<td>$ 5.9</td>
</tr>
<tr>
<td>Water Treatment</td>
<td>20,000</td>
<td>$ 2.6</td>
</tr>
<tr>
<td>Raw Water Pumping</td>
<td>6,000</td>
<td>$ 0.9</td>
</tr>
<tr>
<td>Admin &amp; Maint.</td>
<td>7,000</td>
<td>$ 1.1</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>77,000</strong></td>
<td><strong>$10.5</strong></td>
</tr>
<tr>
<td>Water System</td>
<td>Normal Year</td>
<td>Dry Year*</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Supply/Conveyance</td>
<td>177</td>
<td>1,423</td>
</tr>
<tr>
<td>Treatment</td>
<td>156</td>
<td>1,610</td>
</tr>
<tr>
<td>Distribution</td>
<td>917</td>
<td>917</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,250</strong></td>
<td><strong>3,950</strong></td>
</tr>
</tbody>
</table>

* Dry Year Scenario: Includes Mokelumne supply, supplemental water supply, desalination, groundwater and recycled water

- Gravity Water Customers (~55%) = ~ 400 kWh / MG
- Pumped Water Customers (~45%) ~ 2000 kWh/ MG
Energy Management Strategy

- Water Conservation

- Energy Management Strategy
  - Diversify Energy Supplies
  - Minimize Energy Use
  - Minimize Energy Costs
  - Education and Information Sharing

- Ensure that energy related projects are prioritized based on best overall cost savings
Hydropower

- Two Hydropower Plants
  - Pardee 30 MW
  - Camanche 10 MW
- Average Annual Generation 185,000 MWh
- Average Annual Energy Use 100,000 MWh
- Net energy producer
Wastewater Cogeneration

- Renewable energy production doubled from 2 MW to 4.5 MW
- Power plant capacity expansion to 11 MW completed in 2010
- 2012 - “Net energy producer” generating more renewable electricity onsite than required for demand.
PV Power Purchase Agreements

- Purchase of electricity from a third party owned & operated PV system on District property
  - No capital investment or maintenance costs
  - Investors keep tax credits, Rebates, GHG and REC
  - Performance based, pay for power produced
# Diversify Energy Supplies

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
<th>Rev. Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydropower</td>
<td>40 MW Total Capacity @ Pardee and Camanche Power plants</td>
<td>$8.1 Million in FY 11</td>
</tr>
<tr>
<td>PV Generation (Solar)</td>
<td>430 kW @ Sobrante WTP 30 kW @ Adeline Maintenance Center</td>
<td>$850,000 saving over 25-year 10% offset of utility purchases</td>
</tr>
<tr>
<td></td>
<td>Power Purchase Agreements 5 District Sites 775 kW Total Capacity</td>
<td>$900,000 savings over 20-year contract</td>
</tr>
</tbody>
</table>
## Diversify Energy Supplies
### Future Plans

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
<th>Savings/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Area Power Administration (WAPA)</td>
<td>Add 4 distribution facilities to the existing WAPA contract</td>
<td>$900,000</td>
</tr>
<tr>
<td>Wind</td>
<td>Collect wind data at potential sites and monitor CEC grant programs</td>
<td>$5,000</td>
</tr>
<tr>
<td>PV PPA</td>
<td>Evaluated additional PPA opportunities</td>
<td>NA</td>
</tr>
<tr>
<td>In Conduit Hydro</td>
<td>Evaluate potential in-conduit hydro generation</td>
<td>NA</td>
</tr>
<tr>
<td>Energy Audits</td>
<td>Administration building energy audit</td>
<td>$0-$20,000</td>
</tr>
</tbody>
</table>
Minimize Energy Costs
Energy Optimization Software

- EBMUD: > 30% ~$1M savings over 4 years
- Interface with SCADA System
- State Estimator Data Scrubber
- Water Demand Forecast
- Water Quality Module
- Energy Cost Forecast
- Pump Schedule Optimization
- System Monitoring & Alarm

![Diagram showing electric rates and load over time]

**Medium Size Electric Accounts**

- $0.1000 / KWh
- $0.2000 / KWh
- $0.3000 / KWh
- $0.4000 / KWh

**Time of the Day**

- 04:00 08:00 12:00 16:00 20:00 24:00
- Load
- Electric Rates
# Minimize Energy Costs

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
<th>Savings/Yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Ramon Valley Energy Management</td>
<td>Optimization – shift energy use from peak to part peak and off peak</td>
<td>$370,000</td>
</tr>
<tr>
<td>Demand Response</td>
<td>PG&amp;E’s Peak Demand Pricing Program</td>
<td>$100,000</td>
</tr>
<tr>
<td>Natural Gas Contract</td>
<td>Gas purchases from California’s Dept of General services for microturbines</td>
<td>$65,000</td>
</tr>
<tr>
<td>Raw Water System Optimization</td>
<td>Maximize gravity flow on Moklumne Aqueducts and optimize operation of raw water pumping</td>
<td>$500,000</td>
</tr>
</tbody>
</table>
## Minimize Energy Use

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
<th>Savings/Yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas Microturbines</td>
<td>600 kW @ admin building</td>
<td>$125,000</td>
</tr>
<tr>
<td>WTP Lightning Upgrades</td>
<td>High efficiency lightning replacement at Lafayette, Orinda and Sobrante WTP</td>
<td>$44,000</td>
</tr>
<tr>
<td>Hybrid Fleet</td>
<td>Toyota hybrid fleet</td>
<td>$ 35,000</td>
</tr>
</tbody>
</table>
Energy Management Strategy Summary

- Net Energy Producer (157,000 MWh excess generation in FY11)

- Savings to Date
  - $1.2 million per year
  - PV Projects $1.8 million over 20/25 years

- Future Savings
  - Additional $1.0 million - $1.2 million per year
Energy use will continue to be a significant factor in the future

- Climate change may alter existing supplies and current energy use
- Supplemental supplies typically require more energy
- Cost of energy sources from fossil fuel difficult for water utilities to control
- Renewable energy projects and water conservation mitigate greenhouse gas emissions and stabilize energy use
EBMUD – PG&E Partnerships

- Water/energy rebate for clotheswashers
- Joint customer water/energy audits/referral program
- Joint research with Service Technology Center
  - Ice machines
  - Connectionless Steamers
  - Pre-Rinse Spray Valves
- Energy rebates for utility scale projects (PV, micro-turbines, biodiesel, in-conduit hydro, etc.)
• Demand management:
  – Off peak pumping
  – Water treatment optimization
  – Better facility sizing

• Water Loss Control
  – Leak detection
  – Pressure management
W/E Technology Deployment Synergies
Smart Metering Infrastructure

- Potential to share/integrate infrastructure and/or services
- Provide customers with integrated website/usage reports
- Pursue water/energy and embedded energy savings
Food Service & Hospitality Sectors
- Self-contained (connectionless) food steamers
- Commercial dishwashers
- Pre-rinse spray valves
- Air-cooled ice machines

Health Care/Medical Sector
- X-ray film & photo processors
- Steam sterilizers

General Application
- Weather-based irrigation controllers
- Hot water delivery systems
- Laundry equipment
- Car washing
- Gray water systems
W/E Technology Deployment Synergies

Landscape Irrigation Water Budgets

Thank you for participating in our Landscape Irrigation Water Budget Program. The following is your customized water usage profiles for the last two years. EBMUD records indicate that this account primarily serves landscape irrigation. The graphical description compares your measured water usage versus your budgeted water usage for each billing period.

Customer Name:
Service Address:
City: San Leandro
Account #: [Redacted]
Meter #: [Redacted]
Est. Irrigated Area (sq. ft.): 39,000

Water Budget Summary:

<table>
<thead>
<tr>
<th>Water Budget Summary</th>
<th>Used</th>
<th>Budgeted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yields used last 12 months</td>
<td>1,247,000</td>
<td>1,175,500</td>
</tr>
<tr>
<td>Yields used previous year</td>
<td>1,350,700</td>
<td>1,214,000</td>
</tr>
<tr>
<td>Percent of Budget last 12 months</td>
<td>110%</td>
<td></td>
</tr>
<tr>
<td>Percent of Budget previous year</td>
<td>111%</td>
<td></td>
</tr>
<tr>
<td>2 year “irrigation season” estimated savings in dollars</td>
<td>$3,342.76</td>
<td></td>
</tr>
<tr>
<td>2 year “irrigation season” estimated savings in gallons</td>
<td>0.09</td>
<td></td>
</tr>
</tbody>
</table>

* ET – Represents the estimated water used of each season grass (in inches) for each billing period. The Water Budget Calculation does not take into account typical irrigation systems can be turned off for the winter months of November, December, January, and February.

The Maximum Allowable Water Budget is calculated using 100% of Reference Evapotranspiration (ETr) of the irrigated area for each billing period. If you feel the irrigated area is not accurate or would like more information on the program, contact EBMUD at 510-666-7013.
Your Home Energy Report
Account number:
Report period: 07/13/10 - 09/11/10
We are pleased to provide this personalized report to help you save energy.

The purpose of the report is to:
• Provide information
• Help you track your progress
• Share energy efficiency tips

More information is available at www.pge.com/myenergy

Salvador Bloom
123 Main Street
Everytown, USA

Last 2 Months Household Comparison

YOUR HOME

Efficient Home Energy

Overall Score: 188

YOUR HOME manufactured water heater (57)

Efficient Home Energy

Overall Score: 188

Are we comparing you correctly?
Update your home information by visiting www.pge.com/myenergy

An Average Day Last Month

Turn on for savings

Your WaterScore

Your household uses 101 gallons of water per day.

Home Water Report

Service Account: 123 Main Street

Salvador Bloom
123 Main Street
Everytown, USA

It's easy to control your water use:
Go online and explore ways you can take action.

3 Suggestions For You

Stop a Leaking Toilet

Did you know a dripping faucet can waste up to 720 gallons of water per month?*

Seasonal Irrigation Tune-up

Check these:
• Sprinklers that aren’t working
• Blockages or clogged nozzles
• Check for clogged nozzles
• Watering thousands of gallons each month

Choose Plants Wisely

Waterwiser charming invaders, choose ones that require a lot of water.

For help, visit our online gardening resources.

Contact us: 1-888-46-EBMUD or wateruse@ebmud.com or www.ebmud.com/saveyourwater

Printed on Recycled Paper: 375 11th Street, Oakland, CA 94607. Financing: WaterSmart Software

10th ANNUAL WATER CONSERVATION SHOWCASE
Challenges

• Need to address efficiency gains and GHG/carbon credits double counting perceptions
• Cost of energy sources from fossil fuel difficult for water utilities to control
• Differential in water and energy costs and ROI

Opportunities

• Advance utility, market and consumer awareness
• Improve and expand on W/E data collection and metrics
• Analyze and promote incentive funding for cold and hot water efficiency programs that save energy
• Expand public-private efficiency partnerships