

Moving Toward an Energy-Positive Water Sector!

Ed McCormick
President, Water Environment Federation

ENERGY POSITIVE WATER RESOURCE RECOVERY WORKSHOP
April 28-29, 2015

 **Water Environment
Federation**
the water quality people®



*East Bay Municipal
Utility District
Oakland, California,
United States*

*First North American
Water Resource Recovery
Utility to become a Net
Producer of Renewable
Energy - 2012*



East Bay Municipal Utility District

- *Regional water and wastewater public agency serving residents east of San Francisco Bay*
- *Service Population*
 - *0.65 million for wastewater*
 - *1.3 million for water*



*Japan
Meteorological
Agency*

October 2014



THE 10 LARGEST WASTEWATER TREATMENT PLANTS





Historical Roles for Wastewater Utilities



- *Protector of public health*
- *Protector of the environment*

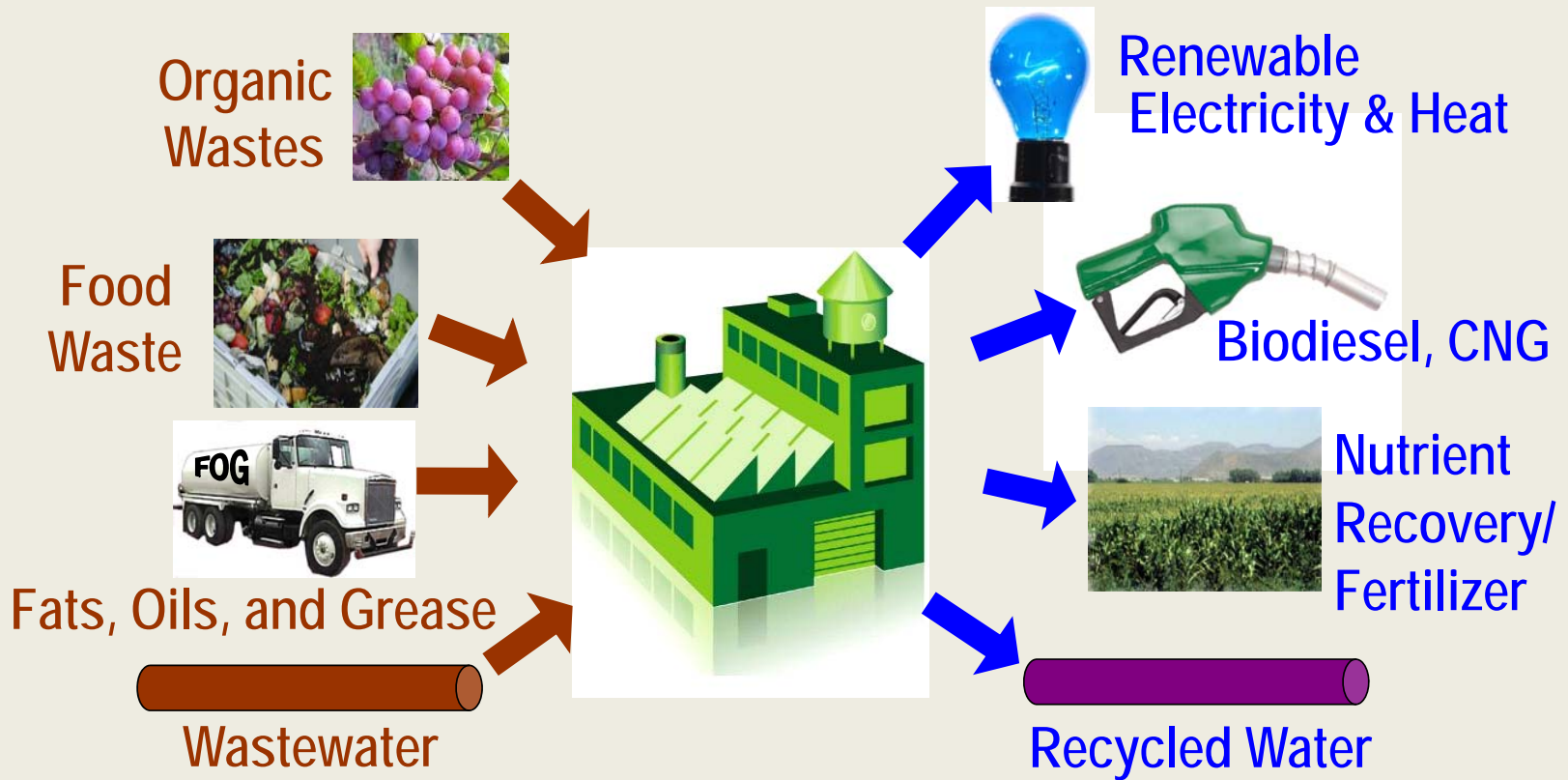
A photograph of an offshore wind farm at sunset. The sky is a mix of orange, yellow, and blue, with the sun low on the horizon. The water in the foreground is dark blue with some ripples. A solid orange horizontal band is overlaid across the middle of the image, containing the text "Resource Recovery" in white. The wind turbines are silhouetted against the sky on the left side of the image.

Resource Recovery

Changing the World View!

- *"Wastewater treatment plants" are **NOT** waste disposal facilities*
- *They are "**Water Resource Recovery**" facilities that produce clean water, recover nutrients, and have the potential to reduce the world's dependence upon fossil fuel through the production and use of renewable energy*

Utility of the Future



Water Resource Recovery Facility

Reinventing the WWTP as a “Green Factory”

- **An Emerging Role for WWTPs**

- Produce useful products for society

- **Driving Forces**

- Environmental/Sustainability focus
- Climate change
- Economic benefits



- Producing green products can help reduce a WWTP's carbon footprint

We Reduce Greenhouse Gas Emissions!



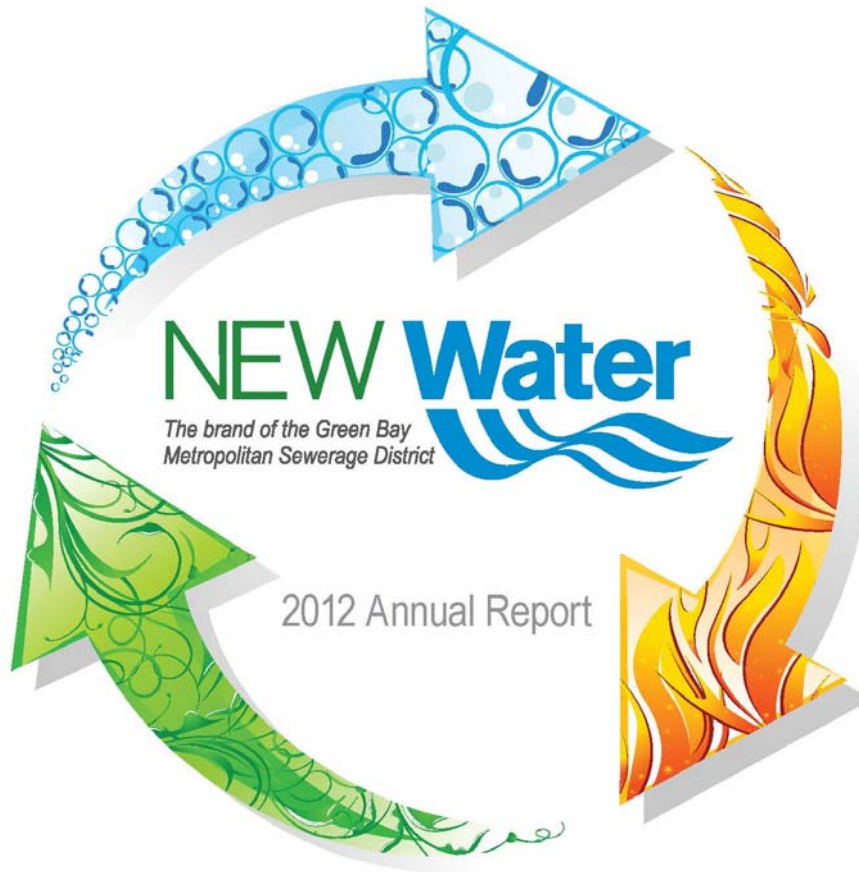


innovation

Resource Recovery



N E W = Nutrients, Energy, Water



NEW Water

The brand of the Green Bay
Metropolitan Sewerage District

2012 Annual Report

A CHANGE IN ATTITUDE





Traditional Renewable Energy

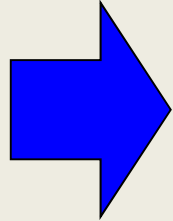


Courtesy of Peter Goldberg for Narragansett Bay Commission

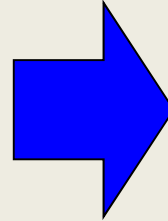


Biogas Cogeneration

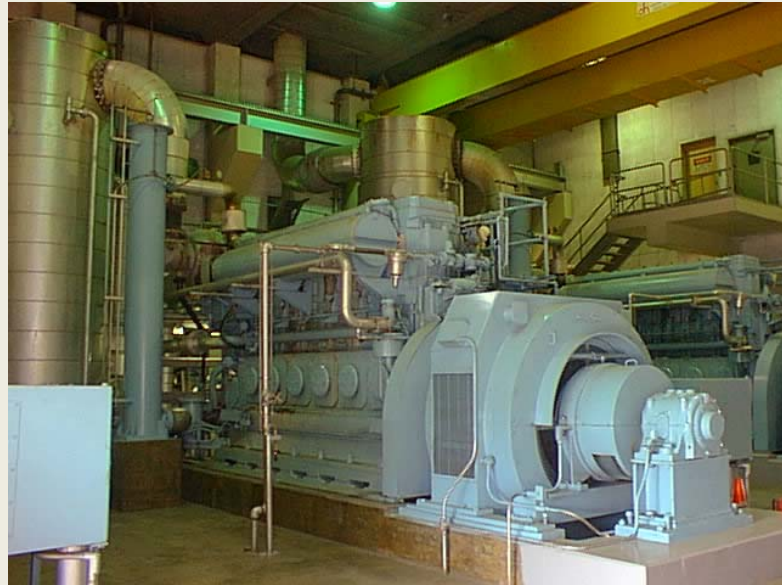
WASTE



BIOGAS



**ELECTRICITY
& HEAT**



Anaerobic Digestion & Biogas



Stevens Point, WI

Co-digestion

- *Fats, oils, grease*
- *Organic wastes*
- *Whey*



<http://www.appleton.org/>

Clean gas and use as transportation fuel



Energy Use in Water Sector

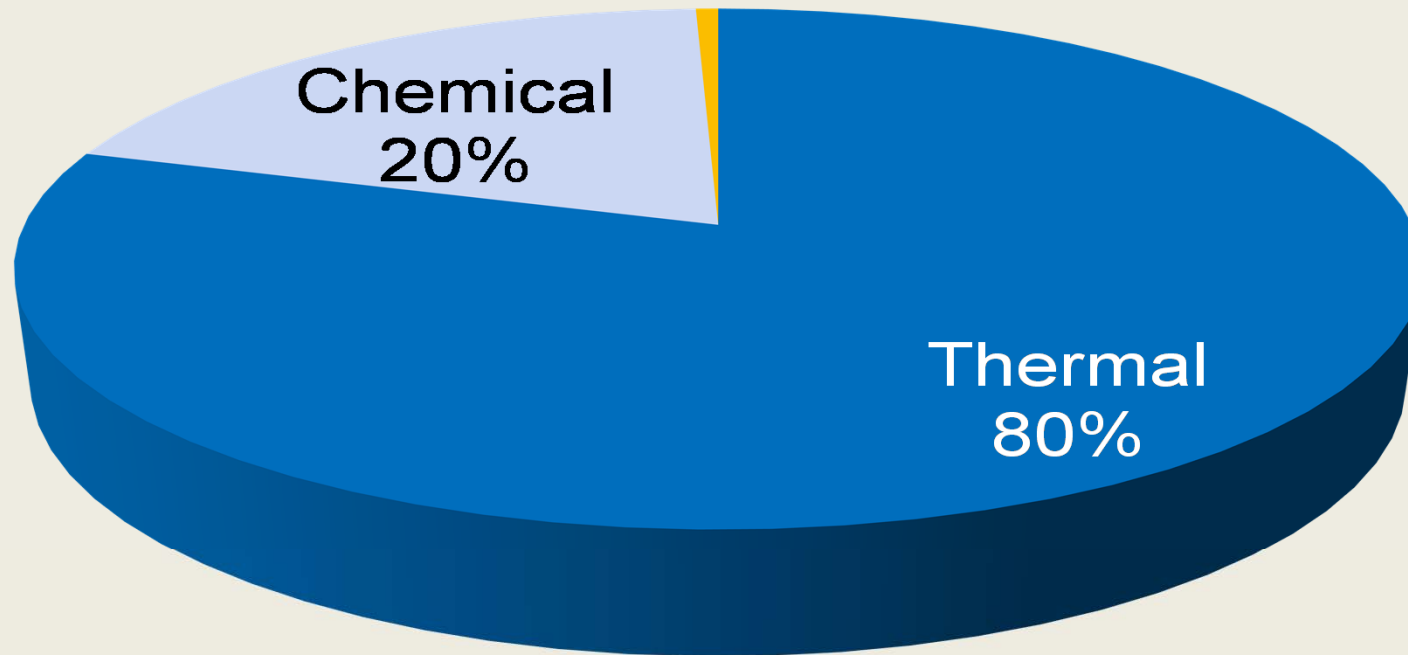
Drinking water and wastewater consume:

- 3-4% of U.S. electricity¹
- 7% of worldwide electricity¹
- 19% of California electricity²
 - Includes end use

1 Electric Power Research Institute (Burton 1996)

2 Energy Down the Drain: The Hidden Costs of California's Water Supply

Energy Content of Wastewater is 5x Energy Needed for Treatment!



■ Thermal ■ Chemical ■ Hydraulic

WERF Project ENER1C12a (2014)

エスロヒート下水熱
らせん型



WRRF Energy Use

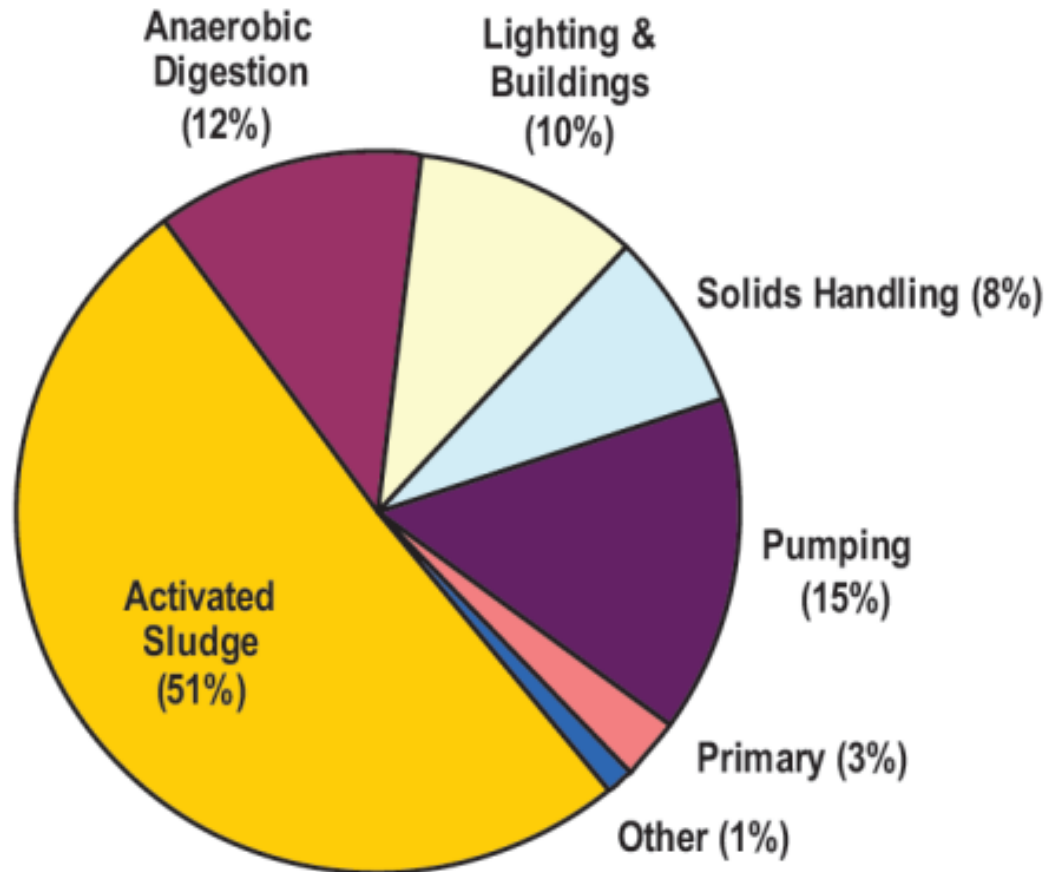


FIGURE 5.2 Typical energy use for an activated sludge secondary facility (SAIC, 2006; WEF, 2009).

Directions to the Water Resource Recovery Utility of the Future!





**THE ENERGY
ROADMAP**

innovation

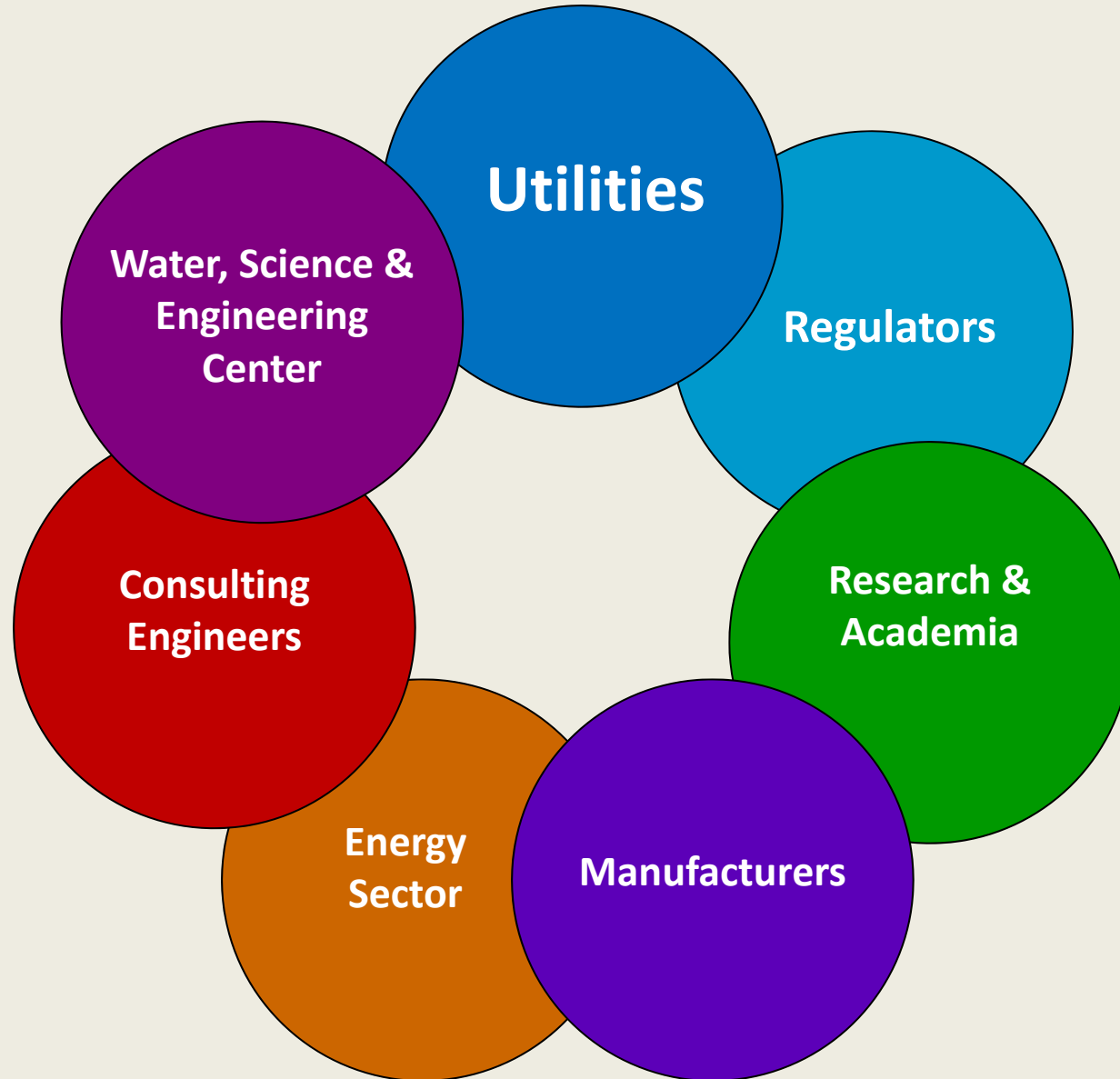
**A Water and Wastewater
Utility Guide to
More Sustainable
Energy Management**

Purpose of Roadmap:

To help utility managers effectively plan and implement efforts to enhance energy sustainability



Energy Summit Participants



Energy Summit

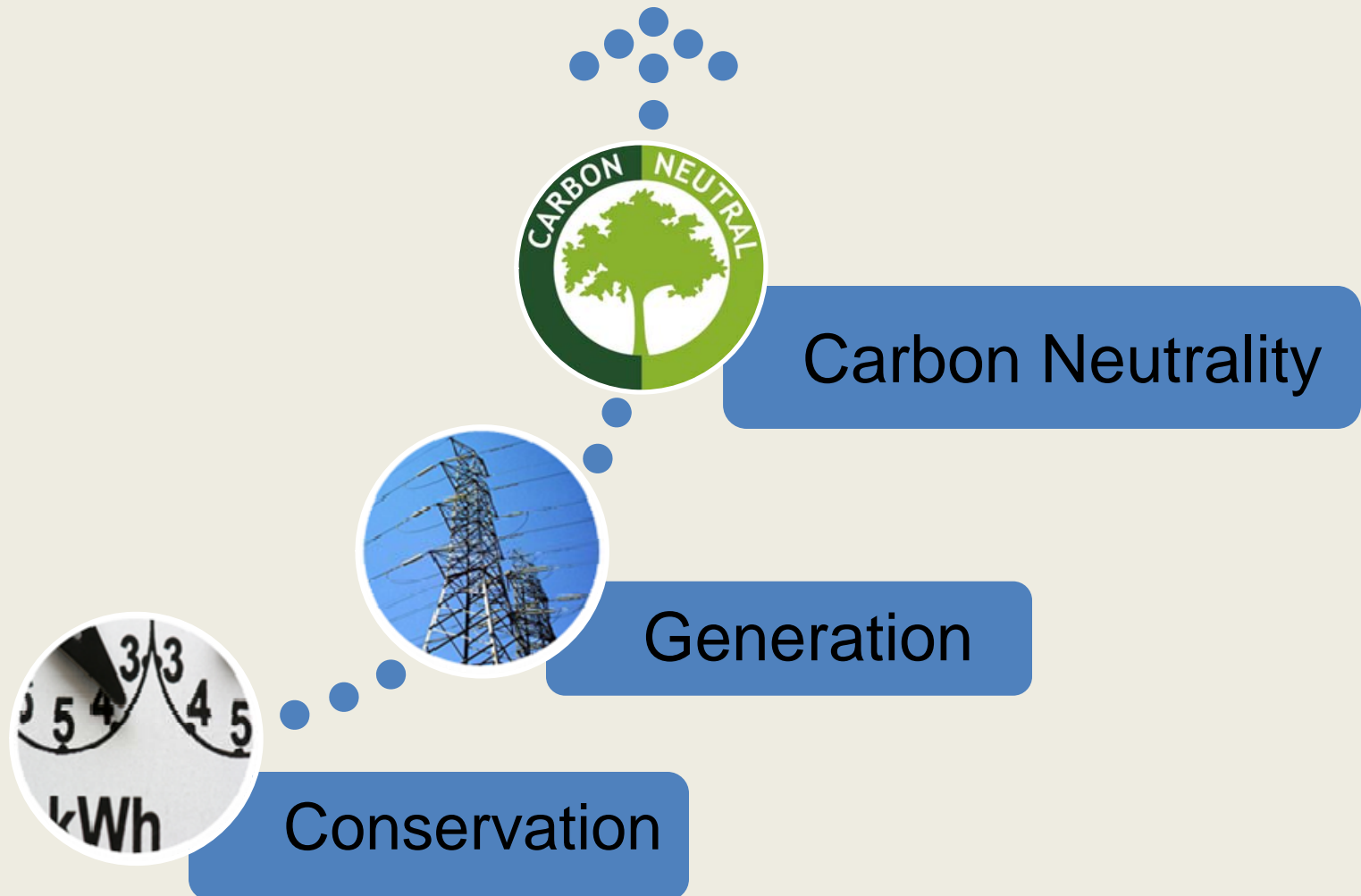
- Strategic Management
- Organizational Culture
- Demand Reduction – Conservation
- Renewable Energy Production
- Outreach & Communications
- Innovating for the Future!



Roadmap Elements

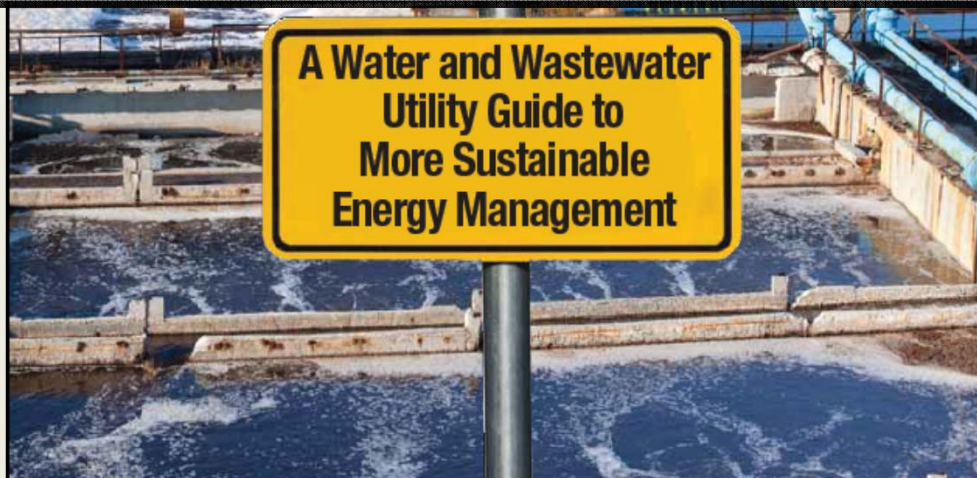
- *Six Energy Management Topic Area Sections*
- *Executive Summary*
- *Ten “Test Drives” (Case Studies)*

Energy Sustainability

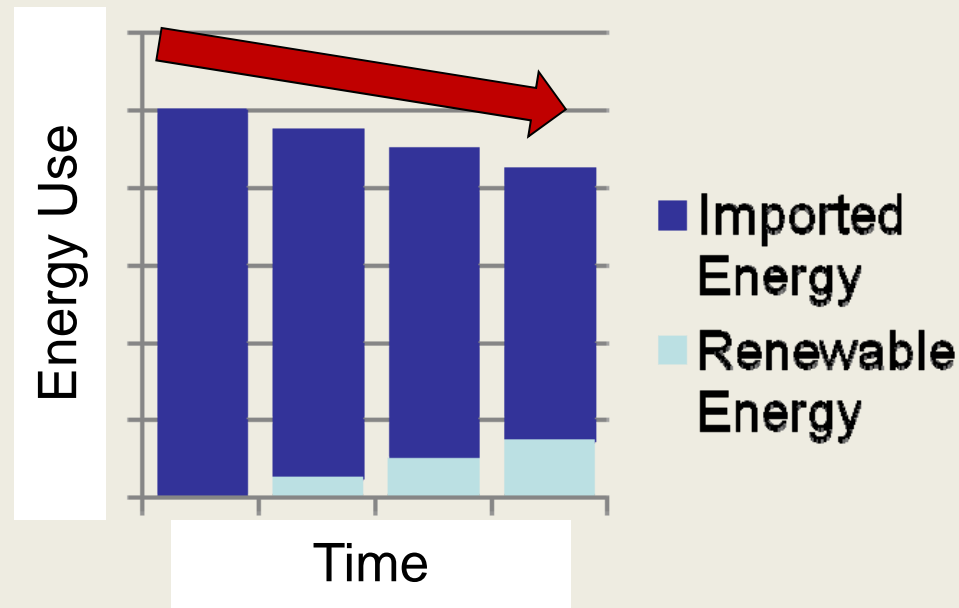




STRATEGIC MANAGEMENT

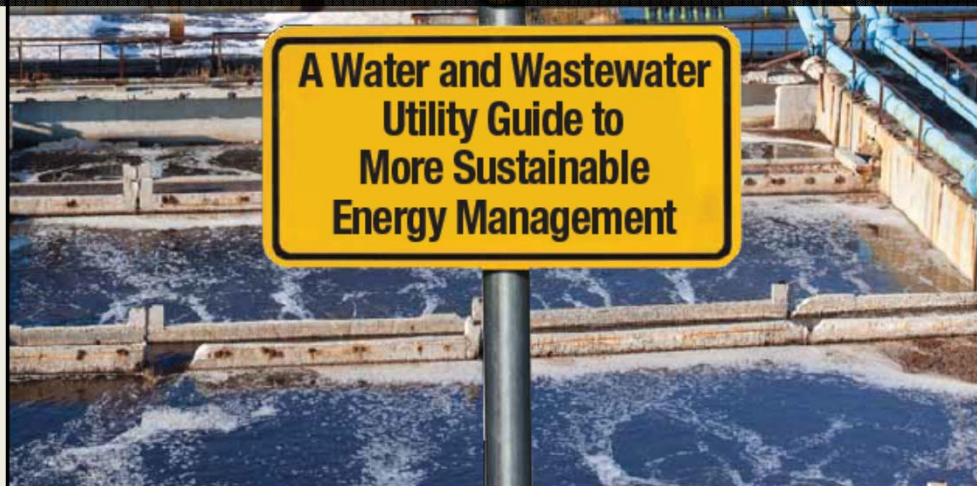


Strategic Direction





ORGANIZATIONAL CULTURE



Organizational Culture

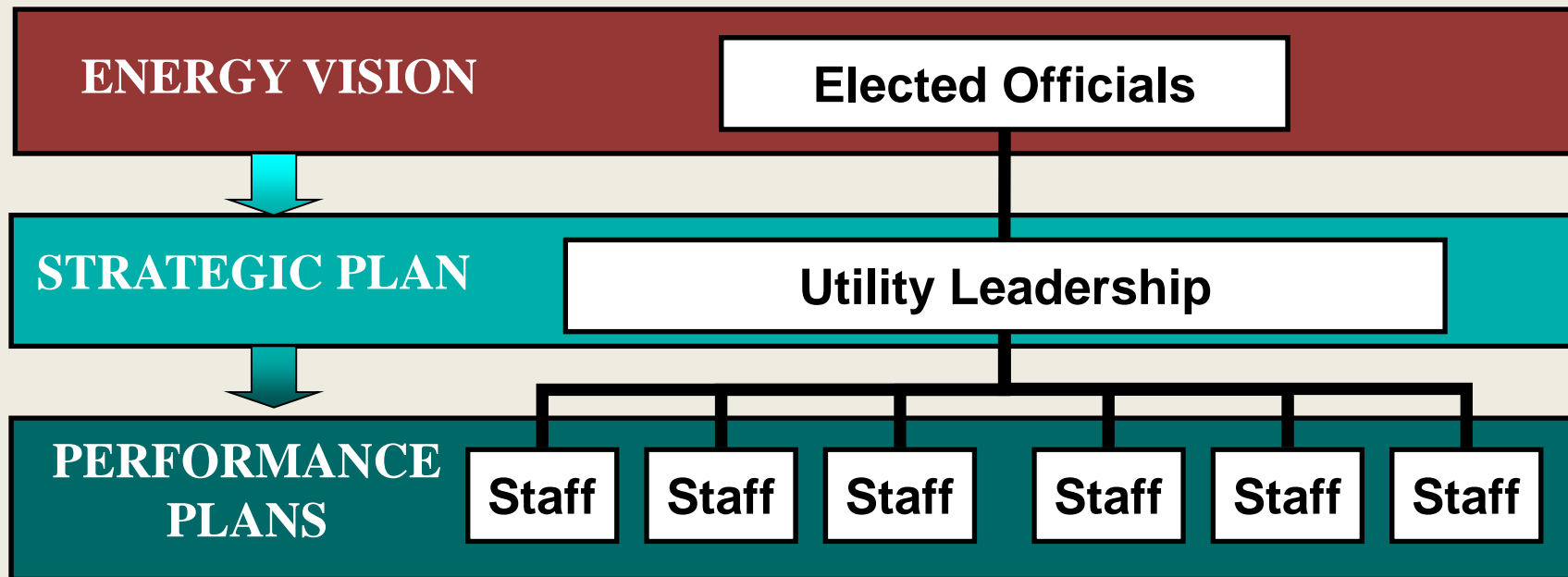
Themes

- *Energy Vision*
- *Energy Team & Champion*
- *Staff Development and Alignment*

“Culture eats strategy for breakfast”



Energy Vision



Energy Team

**FORM
TEAM**



**TAKE
ACTION
AND TRACK**



**EMPOWER
TEAM**



Track and Report On:

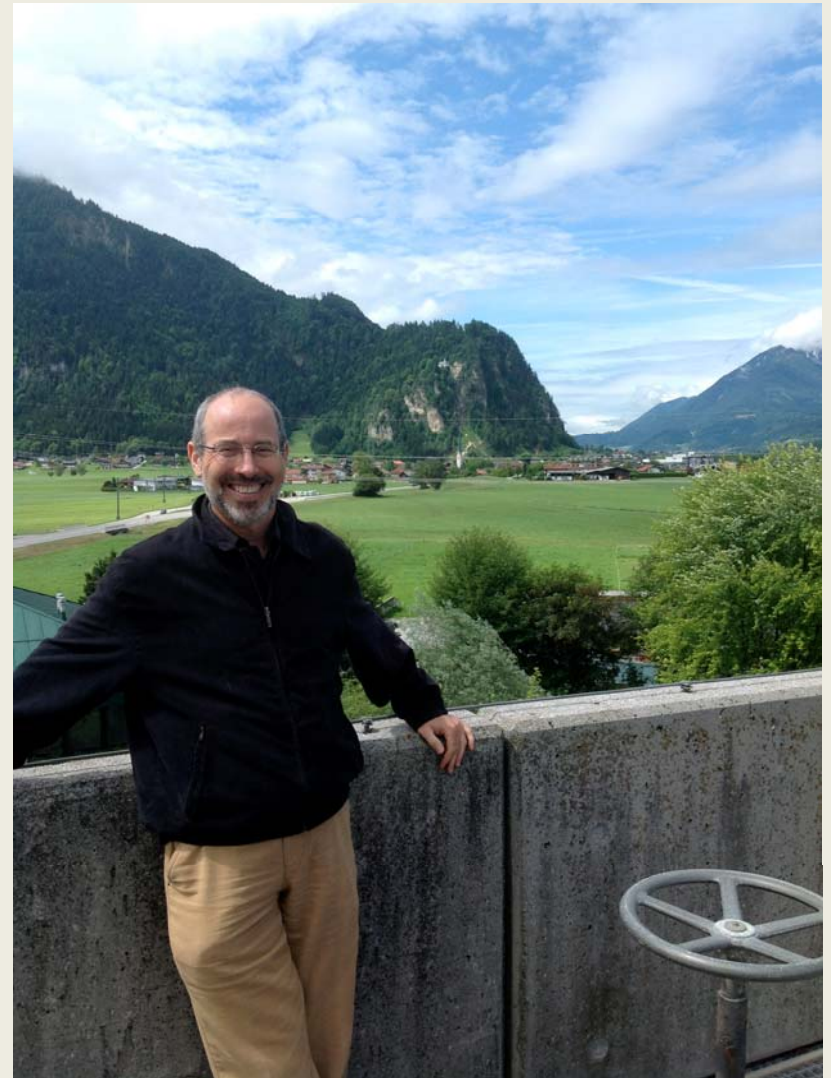
- Energy use
- Energy production
- Progress towards goals
- Project implementation



Case Studies & Test Drives

Utility	Location	Flow (mgd)	SM	OC	CO	DM	EG	IF
City of Stevens Pt.	Wisconsin	3.1		✓		✓	✓	
Washoe County	Nevada	3.5	✓	✓		✓	✓	✓
Palm Bay Utilities	Florida	5.7 (W) 3.0 (WW)	✓	✓	✓	✓		✓
Elmira Water Board	New York	6.5		✓		✓		
Kent County	Delaware	16.3	✓	✓	✓	✓	✓	✓

Strass Plant in Austria



Strass Plant Superintendant – Martin Hell



EBMUD

Oakland, California



EBMUD's "Green Factory" Model



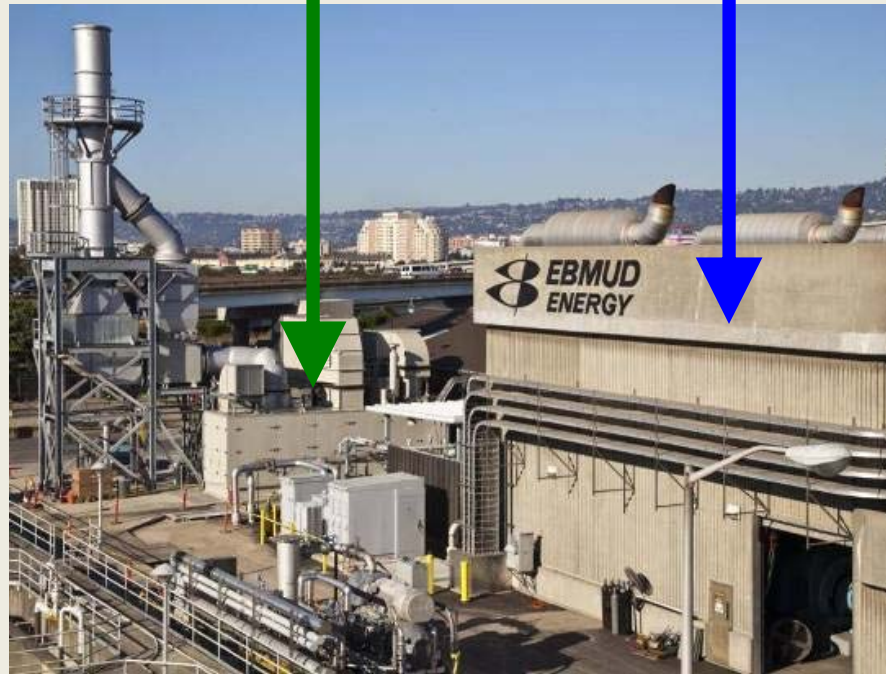
Power Generation Station Expansion Project

New Gas Turbine Plant
(4.6-MW Capacity)

Existing Engines
(6.6-MW Capacity)



New biogas turbine allows
EBMUD MWWTP to become
energy self-sufficient

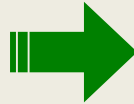


Three 2.2-MW engines
historically met 40% of
plant demand

Green Energy Project

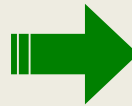
Food Waste Preprocessing

Food Waste Collection at
Local Restaurants



Contaminant Removal,
Size Reduction

Existing Food
Waste Processing
Facility at EBMUD



EBMUD's Anaerobic
Digesters

Biogas



EBMUD's Power
Generation Station



Currently occurs at off-site locations in
Vacaville, San Carlos, and Martinez



Solid and Liquid Waste Receiving Station



Food Waste to Energy

- **Commercial Food Waste**
 - Bay Area generates ~1,700 tons/day
 - Sustainable, local, high methane value feed stock



- **Significant interest from local communities regarding landfill diversion, renewable energy**
- **Greenhouse gas (GHG) emission credits via biogas use (compared to alternative)**

Program Benefits

- Provides a sound, environmentally-responsible discharge option for trucked organics
- Utilizes ratepayers' investments in existing infrastructure for financial and environmental benefits
- Key to “Fats, Oil and Grease” control
- Diverts waste from landfills
- Creates renewable “green” power



WEF's Mission

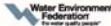
As a global water sector leader, our mission is to:



- ***Connect water professionals***
- ***Enrich the expertise of water professionals***
- ***Increase the awareness of the value and impact of water***
- ***Provide a platform for water sector innovation***





Driving Innovation Energy Resource Recovery

Energy and Water 2011
Efficiency, Generation, Management, and Climate Impacts

Conference: July 31 – August 3, 2011
Exhibition: August 1 – 2, 2011
Hyatt Regency McCormick Place
Chicago, Illinois, USA



This conference is held by the Water Environment Federation in cooperation with the American Council for an Energy Efficient Economy, the Consortium for Energy Efficiency, the Alliance to Save Energy, Imagine H2O, the Alliance for Water Efficiency, the Brook Water Environment Association, the Central States Water Environment Association, and the Water Environment Research Foundation.

www.wef.org/Energy

Energy and Water 2013
Integrated Solutions for Advancing Technology and Management

Conference: May 6–9 | Exhibition: May 6–8
Nashville Convention Center
Nashville, Tennessee

www.wef.org/Energy

Scan Now to Register!












This conference is held by the Water Environment Federation in cooperation with the Kentucky-Tennessee Water Environment Association, Water Environment Research Foundation, Alliance to Save Energy, American Council for an Energy-Efficient Economy, Imagine H2O, and the Alliance for Water Efficiency.

Water and Energy 2015:
Opportunities for Energy & Resource Recovery in the Changing World

coming to
Washington, DC
June 7-10, 2015



WEFTEC – Largest Annual Water Event in the World ***Chicago – September 26-30, 2015***



Water Resource Recovery “Green Factory”



Moving Toward an Energy-Positive Water Sector !

*Ed McCormick
President, Water Environment Federation*

Thank You!



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