Moving Toward an Energy-Positive Water Sector!

Ed McCormick
President, Water Environment Federation

ENERGY POSITIVE WATER RESOURCE RECOVERY WORKSHOP
April 28-29, 2015
East Bay Municipal Utility District
Oakland, California, United States

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
THE 10 LARGEST WASTEWATER TREATMENT PLANTS

- **Los Angeles**: Capacity per day: 450-million-gallons. Hyperion Sewage Treatment Plant.
- **Detroit**: Capacity per day: 930-million-gallons. Detroit Wastewater Treatment Plant.
- **Boston**: Capacity per day: 1.27-billion-gallons. Deer Island Sewage Treatment Plant.
- **Cairo**: Capacity per day: 449-million-gallons. Gabal El Asfar Wastewater Treatment Plant.
- **Shanghai**: Capacity per day: 528-million-gallons. Bailonggang Wastewater Treatment Plant.
- **Chicago**: Capacity per day: 1.44-billion-gallons. Stickney Water Reclamation Plant.
- **Washington, D.C.**: Capacity per day: 370-million-gallons. Blue Plains Wastewater Treatment Plant.
- **Paris**: Capacity per day: 449-million-gallons. Seine Aval Plant.
- **Hong Kong**: Capacity per day: 450-million-gallons. Stonecutters Island Sewage Treatment Works.
- **Tokyo**: Capacity per day: 460-million-gallons. Morigasaka Wastewater Treatment Plant.
Historical Roles for Wastewater Utilities

- Protector of public health
- Protector of the environment
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

- Organic Wastes
- Food Waste
- Fats, Oils, and Grease
- Wastewater
- Nutrient Recovery/Fertilizer
- Biodiesel, CNG
- Renewable Electricity & Heat
- Recycled Water

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!
Resource Recovery

N E W = Nutrients, Energy, Water
Traditional Renewable Energy

Courtesy of Peter Goldberg for Narragansett Bay Commission
Biogas Cogeneration

WASTE ➔ BIOGAS ➔ ELECTRICITY & HEAT
Anaerobic Digestion & Biogas

Co-digestion
- Fats, oils, grease
- Organic wastes
- Whey

Clean gas and use as transportation fuel

Stevens Point, WI

http://www.appleton.org/
WELCOME TO KOBE

Kobe biogas created from sewage
Energy Use in Water Sector

Drinking water and wastewater consume:

• 3-4% of U.S. electricity\(^1\)
• 7% of worldwide electricity\(^1\)
• 19% of California electricity\(^2\)
  ➢ 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!

WERF Project ENER1C12a (2014)
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!
Purpose of Roadmap:

To help utility managers effectively plan and implement efforts to enhance energy sustainability.
Energy Summit Participants

Utilities

Water, Science & Engineering Center

Regulators

Consulting Engineers

Research & Academia

Energy Sector

Manufacturers
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

Carbon Neutrality

Generation

Conservation
Strategic Direction

1. SET GOALS
2. GATHER SUPPORT
3. PRIORITIZE AND IMPLEMENT

Bar chart showing Energy Use over Time with categories for Imported Energy and Renewable Energy.
ORGANIZATIONAL CULTURE

Organizational Culture

Themes

• Energy Vision
• Energy Team & Champion
• Staff Development and Alignment

“Culture eats strategy for breakfast”
Energy Vision

ENERGY VISION

STATEGIC PLAN

Utility Leadership

PERFORMANCE PLANS

Staff Staff Staff Staff Staff Staff Staff
Energy Team

Track and Report On:
• Energy use
• Energy production
• Progress towards goals
• Project implementation
## Case Studies & Test Drives

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Strass Plant in Austria
Strass Plant Superintendent – Martin Hell
EBMUD
Oakland, California
EBMUD's “Green Factory” Model

- Organic Wastes
- Food Waste
- Fats, Oils, and Grease
- Wastewater

Wastewater Treatment Plant

- Renewable Electricity
- Biodiesel
- Biosolids Fertilizer
- Recycled Water
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

New Food Waste Pre-processing Facility at EBMUD

EBMUD’s Anaerobic Digesters

EBMUD’s Power Generation Station

Biogas

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

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

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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