Massachusetts Water Resources Authority

Deer Island Treatment Plant

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MWRA Service Area

- MWRA provides wholesale water and wastewater services to over 2.5 million customers in 61 communities (34% of population of MA)
- On average, MWRA delivers 203 million gallons per day to its water customers
- MWRA collects and treats an average of 360 million gallons of wastewater per day, with a peak capacity of 1.3 billion gallons
Deer Island Wastewater Treatment Plant

• Result of $3.8 Billion Construction Project
• 2nd Largest Wastewater Treatment Plant in the United States
• Treatment Capacity:
  – Maximum
    • 1.3 Billion Gal/Day combined sewer system
    • Up to 700 MGD by Secondary Treatment
  – Average Daily Flow:
    • 360 Million Gal/Day
• Built on 210 Acres
  – Includes 60 acres of public access area

The ultimate Recycling Facility:
Water – Cleaned and returned to Water Cycle
Solids removed - Anaerobically Digested – Produce Heat & Power
Remaining Solids – converted to Fertilizer Pellet

Power is Critical to DI TP Operations

Pumping Operation & Secondary Treatment are the major electricity demands at Deer Island

Total energy demand
• 145M kWh/yr

Total on-site generation:
• 44.2M kWh/yr (30%)
• 41.0 M kWh Green (28%)
Renewable Energy At Deer Island

Massachusetts Water Resources Authority
Deer Island Wastewater Treatment Plant and Public Access Area

Digas/Steam – 20-22%, Hydro – 4%, Wind – 1.2%, Solar – 0.6%. Total Renewable – 26-28%

DITP – Green Energy Production (FY17)

**Green Energy Assets:**
- Digas – STG/BPSTG – 32.4 M kWh
- Hydro Power – 5.9 M kWh
- Wind Power – 1.9 M kWh
- Solar – 0.85 M kWh

Maximizing On-Site Green Energy Production is a priority for MWRA
- 26-28% of DITP’s total energy demand met by green energy
- 64% of DITP’s energy needs (heat + power) met by Digester Gas
Renewable Energy at MWRA

Green Energy through Wastewater Treatment: Anaerobic Digestion
**DI TP – Digester Gas Generation & Use**

- **Anaerobic Digestion:**
  - 240 dtpd solid in, 100 dtpd to FRSA for pellet conversion
  - Digas - 188 kscfh generated on average @ 62-65% methane

- **OSTPP: Bottom-Cycle Generation**
  - Digas – 98+% utilized
  - 95+% of heat demand met by Digas (remainder by Fuel Oil, 250 Kgal)
  - 32.4 M kWh generation from Steam Turbine

**Combined Heat & Power Process – Currently Used by DI TP**

- **Bottom Cycle Generation**
  - Heat First – 60% efficient
    - Generate Steam then Hot Water
  - Power Second – 9% efficient
    - Generate Electricity from Steam

- New BPSTG / Steam Bypass Valve improves steam to electricity conversion process by extracting more heat per unit steam
### Hydroelectric Power

- Energy Recovery from Plant Effluent
- Two 1 MW Hydroelectric Generators
- Electricity Production – 6M kWh/yr

### Wind Turbines

- Two, 190-foot turbines installed in August 2009
  - Generate 1.9 million kWh per year
- Ogin Experimental 100 kW unit
  - Claim to be 33% more efficient than traditional turbines
  - Fully funded by Ogin
  - Engineering prototype
Solar Power

- 100 kW photovoltaic system completed in May 2008
- 180 kW photovoltaic system completed in February 2010
- Solar through Power Purchase Agreement partially funded through ARRA
  - Total Installation of PPA - 450kW
    - Grit roof – 220kW
    - Parking lot ground – 230kW

Operations/ Process Control - EE Efforts

COMPLETED

- Main Pump Station Shaft Height Adjustments
  - No cost
  - 4.5M kWh/yr savings

- Lighting
  - Phases 1, 2, 4 (A, B), R/T, 5, 6 Exterior Roadway Phase 1-3
  - $2.2M total cost
  - $700k incentive provided
  - 3.5M kWh/yr savings
**Operations/ Process Control - EE Efforts**

**COMPLETED**

- Secondary Optimization
  - Shut off last stage aerator
    - 3.4M kWh/yr savings (No cost)
  - DO Probe Installation/Reduction of Cold Box Operation
    - $234k total cost
    - $148k incentive provided
    - 3.5M kWh/yr savings

- Reduce Second Channel Blower Run Time
  - 320,550 kWh, $30k (no cost)
- Low Pressure Plant Water System Set point Adjustment
  - 158,250 kWh, $15k (no cost)
- Operate One Cooling Tower
  - 397,300 kWh, $37k (no cost)
- Second Digester Pump only in winter months
  - 525,600 kWh, $50k (no cost)

**FUTURE**

- More Lighting

- Secondary Optimization (completed in early FY17)
  - Installation of VFD’s in Stage 5 & 6 reactors
    - 18 VFDs on 100 hp mixer motors – saving 3.4 MkWh annually

- Odor Control – fan controls

- Instrument Air Compressors

- More Water reduction / conservation efforts

- Pump Systems Optimization
Thank you.
Questions?