Marin Sanitary Service &

Central Marin Sanitation Agency

Central Marin Commercial Food-to-Energy (F2E) Program

EPA Sustainable Materials Management Webinar

March 12, 2015
Presentation Outline

- Central Marin’s Commercial Food-to-Energy (F2E) Initiative
  - What is F2E?
  - Public-Private Partnership – CMSA and Marin Sanitary Service

- Marin Sanitary Service F2E Program
  - About MSS
  - Transfer Station Improvements
  - MSS outreach, training, services, and collection statistics

- CMSA F2E Program
  - About CMSA
  - Treatment plant F2E/FOG facility
  - Anaerobic digestion and energy production

- Program Metrics, Benefits, and Reasons for Success

- Questions
Commercial Food Waste to Energy Program
Commercial Food Waste to Energy

Central Marin Food Waste → Process: Anaerobic digestion → Biogas (methane)
What is Food to Energy?

Solid Food Waste

Food Waste Receiving and Separation at MSS Transfer Station

Anaerobic Digesters at CMSA

Methane

CO₂

Engine/Generator

Electricity for CMSA and future sale

Biosolids

Soil Amendment and Fertilizer
F2E Processing @ MSS and CMSA

New Food Waste Separation Facility at Solid Waste Transfer Facility

Food Waste Collection and Dumping
- Cans, Plastics, Bottles
  - Conveyor
  - Debris Box
- Sorting Process
- Shredding Process
- Sorted and Shredded Food Waste
- Bin is lifted onto the bed of the truck
- 20T-Transfer Truck
  - To Receiving/Processing Facility at Wastewater Treatment Plant

New Receiving/Processing Facility at Wastewater Treatment Plant

Food Waste from Transfer Facility up to ± 25% Solids
- 20T-Transfer Truck
  - Fats, Oil, Grease (FOG)
  - Covered Slurry Tank
  - Rock Trap/Grinder
  - Mixing Pumps
  - Odor Scrubber
  - Fan
- 10% Solids
- Drum Screen Paddle Finisher
- Debris Box (plastics-fibers 10% of total)
- Peristaltic Pumps
- Slurry Wet Well
- FOG/Food Waste

Existing and New Facilities at Wastewater Treatment Plant

- Biogas
  - (E) Anaerobic Digester No. 1
  - (N) Membrane Cover
- Heat
  - (E) Engine Generator
- Electrical Energy
- Energy Recovery

Volume Reduction

- Solids Reduction and Disposal (20-25% Solids)
  - (E) Centrifuges
  - Digested Sludge to Landfill or Compost

Digester Improvement

- (N) Pump Mixing
  - (N) Membrane Cover
  - (E) Anaerobic Digester No. 2
- (N) SulfaTreat Scrubber
- (E) Gas Conditioning
Why Go After Food Waste?

- Food is the second **largest source of waste in California**
  - ~16% percent of the Commercial waste stream
  - ~25% of the Residential waste stream

- A 2014 Waste Characterization study found ~**29%** of residential solid waste sent to Landfill by MSS, is **food waste**. For commercial customers it was ~**39%**.
Public-Private Partnership

Marin Sanitary Service
CONSERVATION – OUR EARTH, OUR MISSION, OUR JOB

Central Marin Sanitation Agency
Public Private Partnership

Key Elements

- Concept development (2008)
- Methane Capture Feasibility Study - project by CMSA, San Rafael, and MSS (2008/2009)
- Presentations to cities, towns, and Board of Supervisors (2009 and 2012)
- Food Waste Processing and Disposal Agreement executed in 2013
- Public tours at MSS and CMSA
- Presentations to environmental groups and press
- Delivery of FOG and food waste began in late 2013/early 2014
MSS F2E Program
Public-Private Partnership

- **Marin Sanitary Service (MSS)** a private company
  - Provides curbside solid waste collection, recycling, and organics services to Marin County since 1948.
  - Serves nine jurisdictions within the County of Marin
  - Serves ~30,000 residential and 3,000 commercial/multifamily dwellings.
  - Process approximately 250,000 tons of solid waste, organics, and recyclables annually
First Line in Quality Control

- Customer Enrollment: pre-consumer food waste
- Staff Training & Monitoring
- Tools for Success
  - Labeling & Signage
  - Kitchen Layout
  - Internal and External collection containers
Second Line in Quality Control: Contamination Removal Protocol

- Removes contaminants after tipping on floor
- Removes visible contaminants from cart prior to dumping
- Removes visible contaminants from cart as contents tipped into truck
MSS Tipping Floor
MSS Processing Equipment
Loading materials onto the conveyor
Hopper, Belts, and Magnet
Program Details

- **Customer Enrollment**
  - Pre-consumer commercial food waste would be collected and then transferred to the MSS Transfer Station for processing to remove contamination and then transported to CMSA.
  - Eventually include post-consumer food waste

- **Roll-out plan**
  - Recruit up to 250 commercial food waste producers
    - Continue adding more participants incrementally (3-yr plan)
  - Program outreach
    - Kitchen staff training
    - Frequent monitoring
## F2E Collection Statistics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Customers</td>
<td>95</td>
</tr>
<tr>
<td>Collection Days</td>
<td>6</td>
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<tr>
<td>Avg. Route HRS</td>
<td>4.1</td>
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<tr>
<td>Avg. Cart Weight</td>
<td>132 lbs.</td>
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<tr>
<td>Avg. Daily Weight</td>
<td>4.3 tons</td>
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### 2014 Food Waste (Tons)

<table>
<thead>
<tr>
<th>Month</th>
<th>Tons</th>
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<tbody>
<tr>
<td>January</td>
<td>37.26</td>
</tr>
<tr>
<td>February</td>
<td>81.46</td>
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<tr>
<td>March</td>
<td>95.45</td>
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<tr>
<td>April</td>
<td>81.66</td>
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<tr>
<td>May</td>
<td>77.4</td>
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<tr>
<td>June</td>
<td>98.37</td>
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<tr>
<td>July</td>
<td>118.83</td>
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<tr>
<td>August</td>
<td>110.78</td>
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<tr>
<td>September</td>
<td>102.53</td>
</tr>
<tr>
<td>October</td>
<td>105.91</td>
</tr>
<tr>
<td>November</td>
<td>89.29</td>
</tr>
<tr>
<td>December</td>
<td>106.3</td>
</tr>
</tbody>
</table>
CMSA FOG/F2E Program
Central Marin Sanitation Agency - CMSA

- Regional Wastewater Agency in San Rafael, Marin County
- Serves about 120,000 people and San Quentin State Prison
- Joint Powers Agency (JPA) with four satellite collection agencies
- Wide range of influent flows: 7 MGD (ADWF) to 116 MGD (PWWF)
- Contract services:
  - Collection system O&M for San Quentin Village
  - Pump station O&M for SQ prison and Corte Madera
  - P2 for six local agencies
Drum Screen Paddle Finisher
Digestion - Anaerobic Digesters
Biogas Purification – Step 1
Biogas Purification – Step 2
750 kW (1000 hp) Engine Generator
CMSA Capacity for FOG and Food Waste

Digester Solids Treatment Capacity

100%

Excess Capacity

Additional Food Waste

68%

Excess Capacity

Additional Food Waste

54%

FOG & Food Waste

20 tons of Food Waste

5,000-gal FOG and 20 tons of Food Waste

WW Solids

27%

Biogas

2nd Cogen unit, fuel cell, or Microturbine

750 kW (Existing Cogen capacity)

600 kW (Plant load)

Export Power Above 600 kW Plant Load

Electrical Power to Plant

Cogen
First FOG Load – November 2013
First Food Waste Load – January 2014
Permitting and Operation

- MSS regulated by CalRecycle, and CMSA is regulated by both the San Francisco Bay Regional Water Board and Cal Recycle.

- CalRecycle’s Local Enforcement Agency (LEA) approved a Limited Volume Transfer Operation permit for CMSA, and a Solids Waste Transfer Station Permit amendment for MSS.

- CMSA Notified SFRWB that the facility is operational
  - NPDES permit Standard Operation Procedure (SOP) developed

- LEA is performing quarterly inspections at CMSA until CalRecycle regulations change to exempt POTWs that receive organics for co-digestion.

- Digester health has remained stable and has not been affected by the new organic loading

- Minimal operational issues with new facilities and equipment
FOG and Food Waste Program Metrics

- **Amounts Received**
  - *FOG*: up to 15,000 gallons per day, 6 days a week
  - *Food waste*: average 4.2 tons/day, up to 6 days a week

- **Biogas generation increase from** $127,000 ft³ (5-yr average) to over $225,000 ft³/per day average.

- **Volatile Solids Ave:** 91% for *FOG*; 91% for *food waste*

- **Digester Hydraulic Residence Time Ave:** 35 days +/-

- **Cogenerator runtime on biogas increased from approximately from** 7-9 hours/day up to 16 hours/day.

- **Program Expenses:**
  - CMSA facility cost: $2 million ($1.9 for construction)
  - MSS equipment cost: $530,000
  - MSS operating costs: $315,000 (collection, processing, disposal, outreach)
Biogas Gas Production - Oct 2013 to Dec 2014
Benefits of F2E Program

- A local renewable energy project
- Increases CMSA’s energy self-sufficiency
- Utilization of existing CMSA asset capacity
- Potential for CMSA to export energy (future)
- Reduces greenhouse gas emissions – about 2,000 metric tons per year (Cap and Trade value?)
- Reduces landfilling of food waste; reject material is composted
- Helps achieve local agency and County of Marin zero-waste goals
Why a Success?

- CMSA and MSS Board support
- Marin Sanitary Service partnership
- Support from Board of Supervisors, central Marin town and city councils, and regulators
- Digester and cogenerator unused capacity
- Unanticipated Revenue Bond proceeds
- EBMUD facility and process used as a model
- CMSA & MSS staff contributions during facility design, testing, and start-up, daily facility operation and maintenance, and on-going program administration.
FUTURE OF F2E

POTENTIAL EXCESS ENERGY AND METHANE

Pipeline injection for other local uses.

Send electricity back to the grid.

Fuel vehicles
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