Marin Sanitary Service &
Central Marin Sanitation Agency

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

Biosolids and Renewable Energy Specialty Workshop

May 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**
- **Engine/Generator**
- **CO₂**
- **Biosolids**
- **Soil Amendment and Fertilizer**
- **Electricity for CMSA and future sale**
F2E Processing @ MSS and CMSA
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

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
CLEAN FEEDSTOCK
MSS Tipping Floor
MSS Processing Equipment
Loading materials onto the conveyor
Hopper, Belts, and Magnet
MSS 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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</thead>
<tbody>
<tr>
<td>Customers</td>
<td>104</td>
</tr>
<tr>
<td>Collection Days</td>
<td>6</td>
</tr>
<tr>
<td>Avg. Route HRS</td>
<td>4.1</td>
</tr>
<tr>
<td>Avg. Cart Weight</td>
<td>132 lbs.</td>
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<tr>
<td>Avg. Daily Weight</td>
<td>4.5 tons</td>
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## F2E Tonnage

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<tr>
<th>Month</th>
<th>2014</th>
<th>2015</th>
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<tbody>
<tr>
<td>January</td>
<td>37.26</td>
<td>88.12</td>
</tr>
<tr>
<td>February</td>
<td>81.46</td>
<td>91.85</td>
</tr>
<tr>
<td>March</td>
<td>95.45</td>
<td>101.2</td>
</tr>
<tr>
<td>April</td>
<td>81.66</td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>77.4</td>
<td></td>
</tr>
<tr>
<td>June</td>
<td>98.37</td>
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<tr>
<td>July</td>
<td>118.83</td>
<td></td>
</tr>
<tr>
<td>August</td>
<td>110.78</td>
<td></td>
</tr>
<tr>
<td>September</td>
<td>102.53</td>
<td></td>
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<tr>
<td>October</td>
<td>105.91</td>
<td></td>
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<tr>
<td>November</td>
<td>89.29</td>
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<tr>
<td>December</td>
<td>106.3</td>
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<tr>
<td>March</td>
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<td>April</td>
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</tr>
</tbody>
</table>

*Graph showing the tonnage data for 2014 and 2015.*
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: 7MGD (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
F2E/FOG Facility
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**:
  - 68% for Additional Food Waste (20 tons of Food Waste)
  - 54% for FOG & Food Waste (5,000-gal FOG and 20 tons of Food Waste)
  - 27% for WW Solids

- **Biogas**
  - 2nd Cogen unit, fuel cell, or Microturbine

- **Export Power Above 600 kW Plant Load**:
  - 68% for Additional Food Waste
  - 54% for FOG & Food Waste
  - 27% for WW Solids

- **600 kW (Plant load)**
- **750 kW (Existing Cogen capacity)**

- **Electrical Power to Plant**
First FOG Load – November 2013
First Food Waste Load – January 2014
MSS regulated by CalRecycle, and CMSA is regulated by both the San Francisco Bay Regional Water Board and CalRecycle.

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/ F2E
Program Metrics and Benefits
FOG and Food Waste Program

Metrics

- **Amounts Received**
  - FOG: up to 15,000 gallons per day, 6 days a week
  - Food waste: average 4.5 tons/day, up to 6 days a week

- **Biogas generation increase from 127,000 ft$^3$ (5-yr average) to over 225,000 ft$^3$/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)
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

Pipeline injection for other local uses.

Send electricity back to the grid.

Fuel vehicles

POTENTIAL EXCESS ENERGY AND METHANE
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