Converting Organic Waste from MSW into Carbon Negative RNG

Yaniv Scherson
Chief Operating Officer, Anaergia
yaniv.scherson@anaergia.com
Our mission is to convert waste into useful resources, protect the environment, and sustain life for generations to come.
Anaergia’s Global Footprint

1,700+ Projects, 10 Offices, 3 Factories, 4 Continents
Anaergia’s Capability Across Solid Waste and Wastewater
Select North American Facilities
Flexible delivery combinations of Design Build Own Operate Finance (DBOOF)

Solid Waste

- SOUTH BAYSIDE WASTE MANAGEMENT AUTHORITY
  - San Carlos, CA
  - DB + SERVICE

- WASTE MANAGEMENT
  - Sun Valley, CA
  - DB + SERVICE

- CITY OF TORONTO
  - Toronto, Canada
  - PROCESS + SUPPLY + O&M

- UNIVERSAL WASTE SYSTEMS
  - Los Angeles, CA
  - DB + SERVICE

Wastewater

- ANAERGIA
  - Rialto, CA
  - DBOOF

- EAST VALLEY WATER DISTRICT
  - Highland, CA
  - SUPPLY

- VICTOR VALLEY WATER RECLAMATION AUTHORITY
  - Victorville, CA
  - DBOOF

- CAMDEN COUNTY MUNICIPAL UTILITIES AUTHORITY
  - Camden, NJ
  - SUPPLY + O&M

- HALE AVENUE RESOURCE RECOVERY FACILITY
  - Escondido, CA
  - DBOOF
**Annual Global Methane Emissions (2018)**

~8.3M metric tons of CO₂ equivalent

Methane ($\text{CH}_4$) traps heat 84X more than Carbon Dioxide ($\text{CO}_2$)

Source: CAIT Climate Data. CO2 equivalent based on 20-Year Global Warming Potential (GWP) per IPCC Fifth Assessment Report.
Degradation of organics at landfills is responsible for fugitive emissions of methane
Organic Waste is Largest Fraction of Landfilled Municipal Solid Waste (MSW)
Anaergia’s solutions divert organics from landfill, prevent fugitive methane emissions, and produce carbon negative RNG.
Renewable Natural Gas –
The Only Carbon Negative Fuel

Converting methane-emitting waste into renewable natural gas produces a carbon negative fuel

Source: California Air Resources Board

Weighted Average Carbon Intensity of Competing Transportation Fuels in 2019 (gCO₂e/MJ)¹

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Weighted Average Carbon Intensity (gCO₂e/MJ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol</td>
<td>53.2</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>35.9</td>
</tr>
<tr>
<td>Bio-CNG</td>
<td>34.6</td>
</tr>
<tr>
<td>Renewable diesel</td>
<td>26.9</td>
</tr>
<tr>
<td>Biodiesel</td>
<td>17.5</td>
</tr>
<tr>
<td>Electricity</td>
<td>101.1</td>
</tr>
<tr>
<td>Diesel</td>
<td>101.7</td>
</tr>
<tr>
<td>Gasoline</td>
<td>-50 to -150</td>
</tr>
</tbody>
</table>

¹ California Air Resources Board
Landfills - Largest Source of CH₄ Release

Organic waste in landfills emit:
- 20% of the state's methane, a climate super pollutant 84 times more potent than carbon dioxide.
- Air pollutants like PM 2.5, which contributes to health conditions like asthma.

Organics like food scraps, yard trimmings, paper, and cardboard make up half of what Californians dump in landfills.

Reducing Short-Lived Climate Super Pollutants like organic waste will have the fastest impact on the climate crisis.

California's methane super-emitters

Methane is a powerful greenhouse gas and is targeted for emission reduction in the state of California and other jurisdictions worldwide. Using remote sensing and other data sources, this study identifies California’s most significant sources of methane emissions. The analysis reveals that landfills and manure management are the largest sources of methane emissions in the state, accounting for 40% of total state emissions. This highlights the importance of focusing mitigation efforts on these sectors to reduce greenhouse gas emissions.

**CALRECYCLE**

**LANDFILL #3 METHANE SOURCE, 20% OF STATE**

**NASA/JPL**

**LANDFILL #1 METHANE SOURCE, 41% OF STATE**
Landfills - Largest Source of CH$_4$ Release

Greenhouse gas emissions from Maryland’s municipal waste landfills in 2017 were four times higher than previously thought. In 2017, these landfills released about 500,000 tons of carbon dioxide and 51,500 tons of methane. This methane has the same greenhouse gas effect as 4.4 million tons of carbon dioxide over a 20-year period.

Contrary to the official state estimate, landfills are the leading source of methane in Maryland relative to other sectors, contributing 37 percent of the state’s methane, rather than 13 percent.

The EPA has "been understating methane emissions from landfills by a factor of two," said Susan Thorneloe, a senior chemical engineer at the EPA who has worked on the agency’s methane estimation methods since the 1980s.
California’s 2045 Carbon Neutrality Goal Requires Carbon Negative Fuel

Carbon Negative Renewable Natural Gas From Solid Waste Will Play A Central Role In Carbon Neutrality
California Renewable Natural Gas Standard SB 1440

- IOU must procure 75M MMBTU/year
- 15 year fixed price offtakes
- Priority for RNG from landfilled diverted organic waste
- California generated RNG
California SB 1383: 75% organics diversion from landfill by 2025

Renewable Energy

Fertilizer
SB1383 allows for 3-cart, 2-cart, or 1-cart collection

- 3 Cart
- 2 Cart
- 1 Cart

OR

High Diversion Organics Processing Facility (OREX)

OREX - contaminated SSO
Compost - clean SSO
SB1383 organics recovery *without* High Diversion Organics Processing Facility (HDOPF)

*New bin and new truck trip to every generator for collection*

- Must have <25% organics
- Trash
- Recycling
- New
  - Food & Green Waste (to Compost)
SB1383 organics recovery with HDOPF
Maintain collection scheme, no additional truck

Maintain collection scheme, no additional truck
OREX is compatible with various organic waste streams

OREX can process SSO

OREX can process MSW
Organics Extrusion Press (OREX) Separates Organics from Municipal Solid Waste (MSW) to Produce Renewable Energy and Fertilizer with AD
OREX + Organics Polishing System (OPS) Generates Digestible Organic Slurry

Waste → Pre-Processing → OREX → Organics Polishing System → Polished Organics

- Recyclables
- Residuals
- Wastewater
- New Plant
- Fertilizer
- digestion

SSO or MSW

OREX “Wet Fraction”

Polished Organics

30 - 70% Contamination

2% Contamination

<0.2% Contamination
Anaergia provides cost effective outlet for organics to local AD infrastructure

- **Solid Waste**
  - Transfer Station (OREX)
    - Organics
      - Wastewater Treatment Plant
        - Energy
        - Clean Water
        - Fertilizer
  - Rejects to landfill
- **Wastewater**
  - City
Key Takeaways:

- Wastewater plants have half the capacity needed for 1383.
- Wastewater community can play key role in landfill diversion of organics.
- Retrofitting infrastructure can increase capacity and resiliency.
- Largest hurdle is pre-processing for feedstock security.
SBWMA / RethinkWaste
(South Bayside Waste Management Authority)

- Public Agency / JPA Solid Waste Utility
- Provides waste services for 11 Peninsula cities
  - 500,000 residents & 10,000 businesses
- Handles 500,000 tons/year (50% diversion rate)
- Owns the Shoreway Environmental Center
- Contractual oversight of Collection Services and Shoreway Operations
- Manages all recycling, disposal, and processing contracts
- Directs and manages public outreach efforts

Member Agencies:
- Burlingame
- Hillsborough
- San Mateo
- Foster City
- Belmont
- San Carlos
- West Bay
- Redwood City
- Menlo Park
- Atherton
- San Mateo County
- East Palo Alto
Rethink Waste: Recycling organics from solid waste with WWTP

OREX

OPS

WWTP

Anaergia
Rethink Waste: Recycling organics from solid waste with WWTP
OREX Extrudes Organic Fraction from Waste
Producing a Clean Feedstock for WWTP AD
WWTP plants with existing AD infrastructure act as organics outlets
VVWRA Background

Founded in 1978
Serves 279 square mile area
Treats 10.7 million gallons of wastewater per day
Objective: Convert biogas from sludge and external organic waste into pipeline RNG.

Approach: Expand upon successful co-digestion program with P3 delivery model to fund plant infrastructure needs.

P3 Delivery Model Benefits:

- Leverage private financing
- Faster timeline for project delivery
- Leverage industry technology and RNG expertise
- De-risk with long term partnership between agency and company with mutual benefit
- Improve plant infrastructure: redundancy, capacity, operational control.

Project Goals
Victor Valley Wastewater Reclamation Authority, Victorville, CA: RNG P3 Transforms Energy-Neutral Facility to Net Energy Exporter

**RNG Project**

- Biogas: up to 1,200 scfm
  - 220 scfm sludge
  - 900 scfm liquid

- RNG: 1,110 scfm
  - 320,000 MMBTU

**Anaerobic Digestion**

- 70,000 gpd sludge
- 60,000 gpd liquids

**Wastewater Treatment**

**High Strength Waste**
Anaergia AD Plant (Rialto Bioenergy Facility) acts as organics outlet
Sun Valley CA, Commercial SSO & MSW Processing Line
Sun Valley CA, Commercial SSO & MSW Processing Line
RBF Converting Organics from MSW to RNG and Biosolids to Biochar Fertilizer

Waste Management MRF
Sun Valley, CA

Solid Waste

OREX

Organics
200,000 TPY

Storage silo

Anaerobic Digestion

Biogas Treatment

Renewable Gas Injection

Vehicle Fuel
855,000 - 985,000 MMBTU/yr

Digester Cake Fertilizer
31,000 TPY

WWT

Treated Effluent to Groundwater Recharge
91M GPY

Waste heat

Dewatering

Biochar Fertilizer
10,000 TPY

Los Angeles County Sanitation District
+ Orange County Sanitation District

Biosolids
100,000 TPY

Storage silo

Biosolids Dryer

Pyrolysis

CHP
4.6 MW

For parasitic load

Rejected
Rialto Bioenergy Facility: Largest Organic Waste to RNG Digester Facility in North America
Thank you

Yaniv Scherson
Chief Operating Officer, Anaergia
yaniv.scherson@anaergia.com