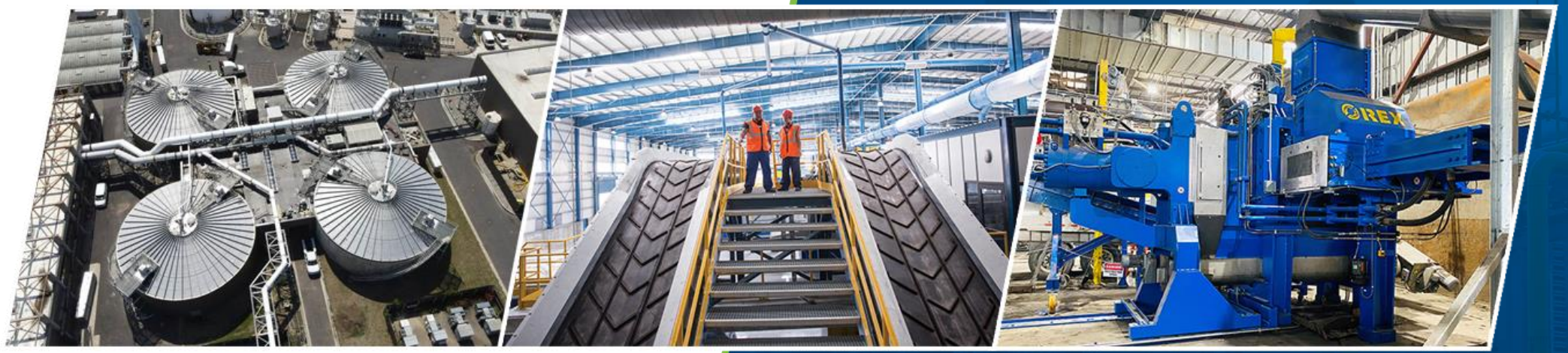
Converting Organic Waste from MSW into Carbon Negative RNG



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Anaergia

Breaking Barriers to Sustainability

Enabling a Zero Waste Future

Wastewater Biosolids

Source Separated Organics

Municipal Solid Waste

Food Processing Waste

Agricultural Waste

Integrated Solutions

Renewable Power

Renewable Gas

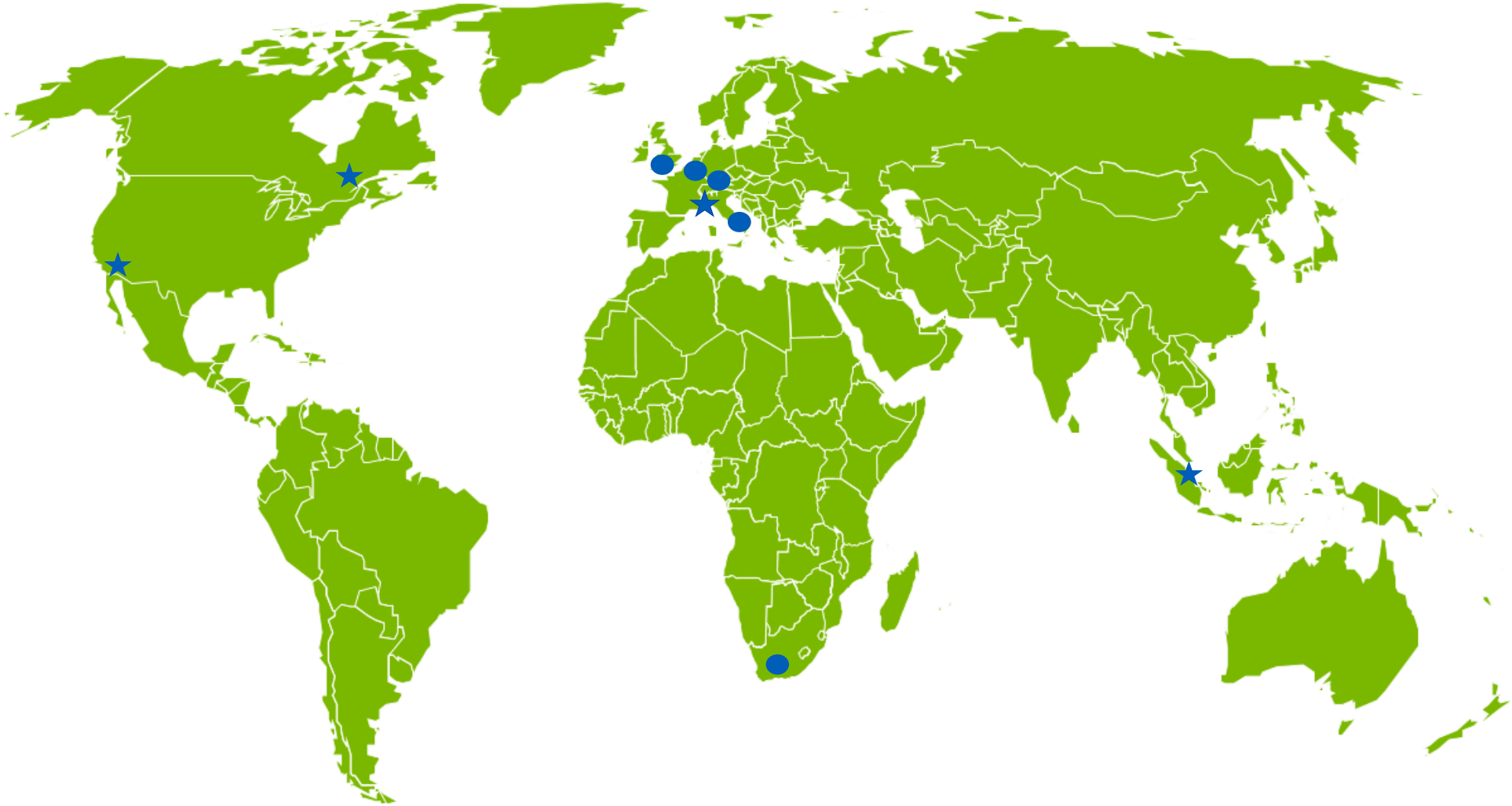
Recyclables

Fertilizer

Clean Water

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

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Anaergia's Capability Across Solid Waste and Wastewater

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Select North American Facilities

Flexible delivery combinations of Design Build Own Operate Finance (DBOOF)

Solid Waste

Client: South Bayside Waste Management Authority (SBWMA)
Location: San Carlos, California
Delivery: DB + Service

Client: Waste Management
Location: Sun Valley, California
Delivery: DB + Service

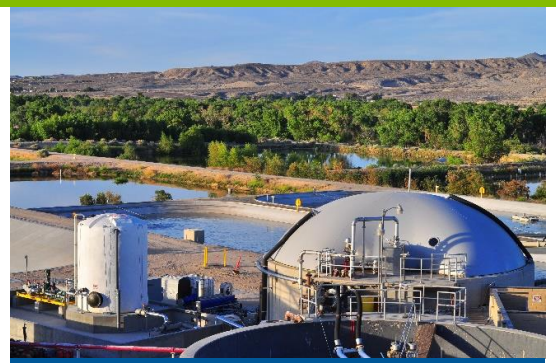
Client: City of Toronto
Location: Toronto, Canada
Delivery: Process + Supply + O&M

Client: Universal Waste Systems
Location: Los Angeles, California
Delivery: DB + Service

Wastewater

Client: Anaergia
Location: Rialto, California
Delivery: DBOOF

Client: East Valley Water District
Location: Highland, California
Delivery: Supply



Client: Victor Valley Water Reclamation Authority (VVWRA)
Location: Victorville, CA
Delivery: DBOOF

Client: Camden County Municipal Utilities Authority (CCMUA)
Location: Camden, NJ
Delivery: Supply + O&M

Client: Hale Avenue Resource Recovery Facility (HARRF)
Location: Escondido, CA
Delivery: DBOOF

California SB 1383: 75% organics diversion from landfill by 2025

Renewable Energy

Fertilizer

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California's 2045 Carbon Neutrality Goal Requires Carbon Negative Fuel

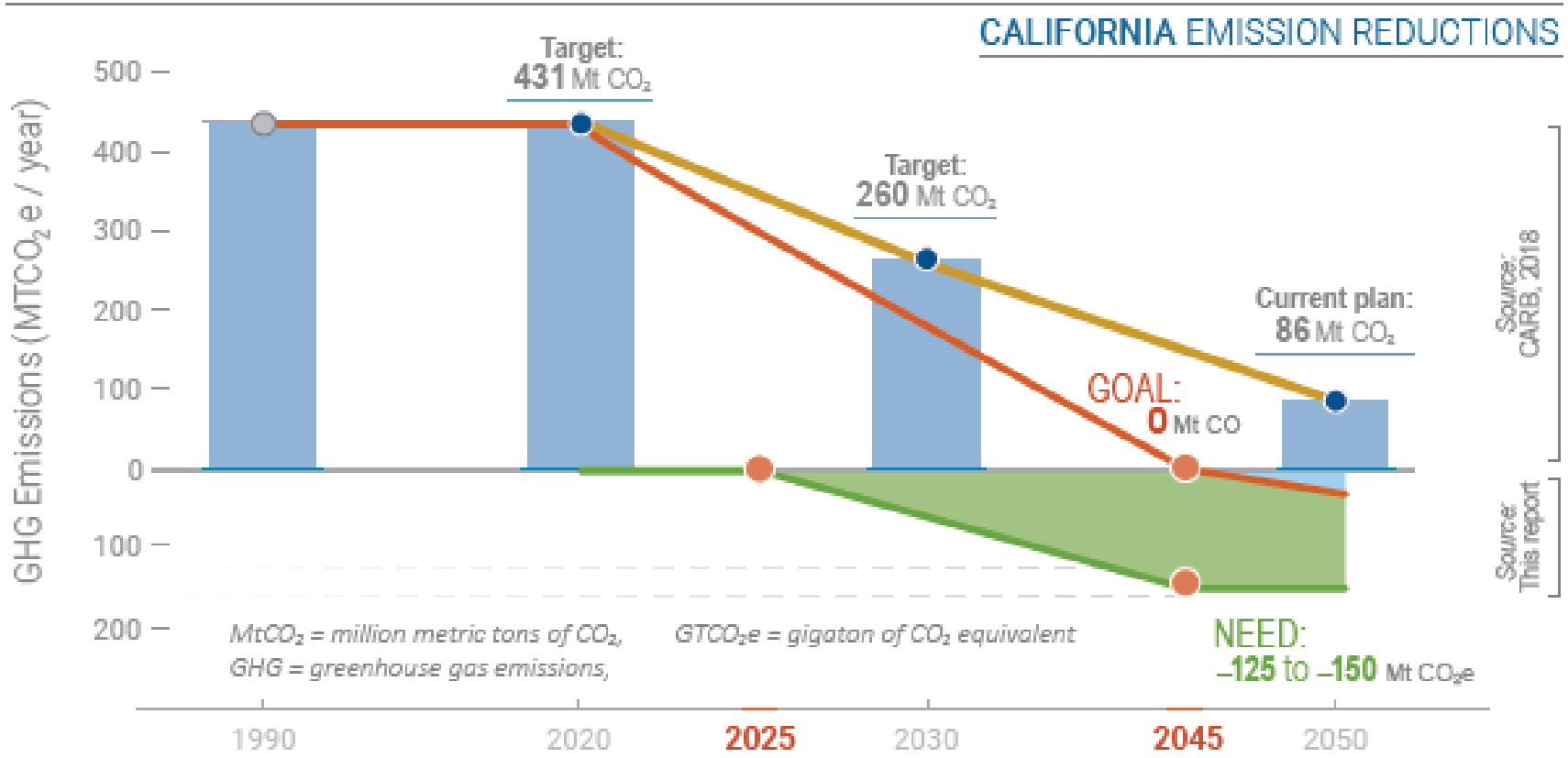

Figure ES-1. *Goals of California's emissions plan extrapolated to 2045 (CARB, 2017) with negative emissions estimates from this report.*

Carbon Negative Renewable Natural Gas From Solid Waste Will Play A Central Role In Carbon Neutrality

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7

Landfills - Largest Source of CH_4 Release

CalRecycle

CALIFORNIA AIR RESOURCES BOARD

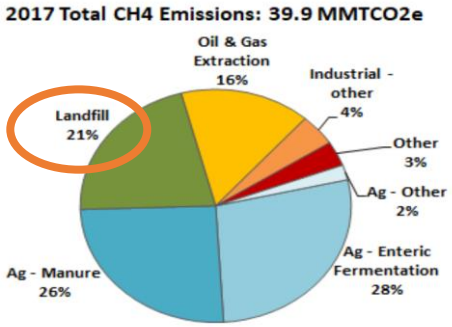
Landfills Are Third Largest Source of Methane in California

Organic waste in landfills emits:

- 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.



Help reduce your CH_4 em

CalRecycle
Landfill #3 Methane Source, 20% of State

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Article

California's methane super-emitters

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Vineet Yadav[1], Brian D. Bue[1], David R. Thompson[1], Stephen Conley[4], N
Christian Frankenberg[1,6], Ian B. McCubbin[1], Michael L. Eastwood[1], Ma
Jorn D. Herner[7], Bart E. Croes[7], Robert O. Green[1] & Charles E. Miller[1]

Methane is a powerful greenhouse gas and is targeted for emiss
US state of California and other jurisdictions worldwide[1,2]. Uniq
mitigation are presented by point-source emitters—surface feat
components that are typically less than 10 metres in diameter a
highly concentrated methane[3]. However, data on point-source e
and typically lack sufficient spatial and temporal resolution to g
and to accurately assess their magnitude[4]. Here we survey more
infrastructure elements in California using an airborne imaging
can rapidly map methane plumes[5–7]. We conduct five campaigns
from 2016 to 2018, spanning the oil and gas, manure-manageme
management sectors, resulting in the detection, geolocation an
emissions from 564 strong methane point sources. Our remote sensing approach
enables the rapid and repeated assessment of large areas at high spatial resolution for
a poorly characterized population of methane emitters that often appear
intermittently and stochastically. We estimate net methane point-source emissions in
California to be 0.618 teragrams per year (95 per cent confidence interval 0.523–
0.725), equivalent to 34–46 per cent of the state's methane inventory[8] for 2016.
Methane 'super-emitter' activity occurs in every sector surveyed, with 10 per cent of
point sources contributing roughly 60 per cent of point-source emissions—consistent
with a study of the US Four Corners region that had a different sectoral mix[9]. The
largest methane emitters in California are a subset of landfills, which exhibit
persistent anomalous activity. Methane point-source emissions in California are
dominated by landfills (41 per cent), followed by dairies (26 per cent) and the oil and
gas sector (26 per cent). Our data have enabled the
California's infrastructure that is responsible for th
with collaborating infrastructure operators has led
methane-emission activity[10].

NASA/JPL
Landfill #1 Methane Source, 41% of State

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

3 Cart

2 Cart

1 Cart

OR

SSO Facility (Compost)

High Diversion Organics Processing Facility (OREX)

High Diversion Facility Provides Compliance Solution for ***Any Collection Option***

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SB1383 organics recovery *without* High Diversion Organics Processing Facility (HDOPF)

New bin and new truck trip to every generator for collection

Residence

Institution

Multi-Family

Business

Must have <25% organics

Trash

Recycling

New

Food & Green Waste (to Compost)

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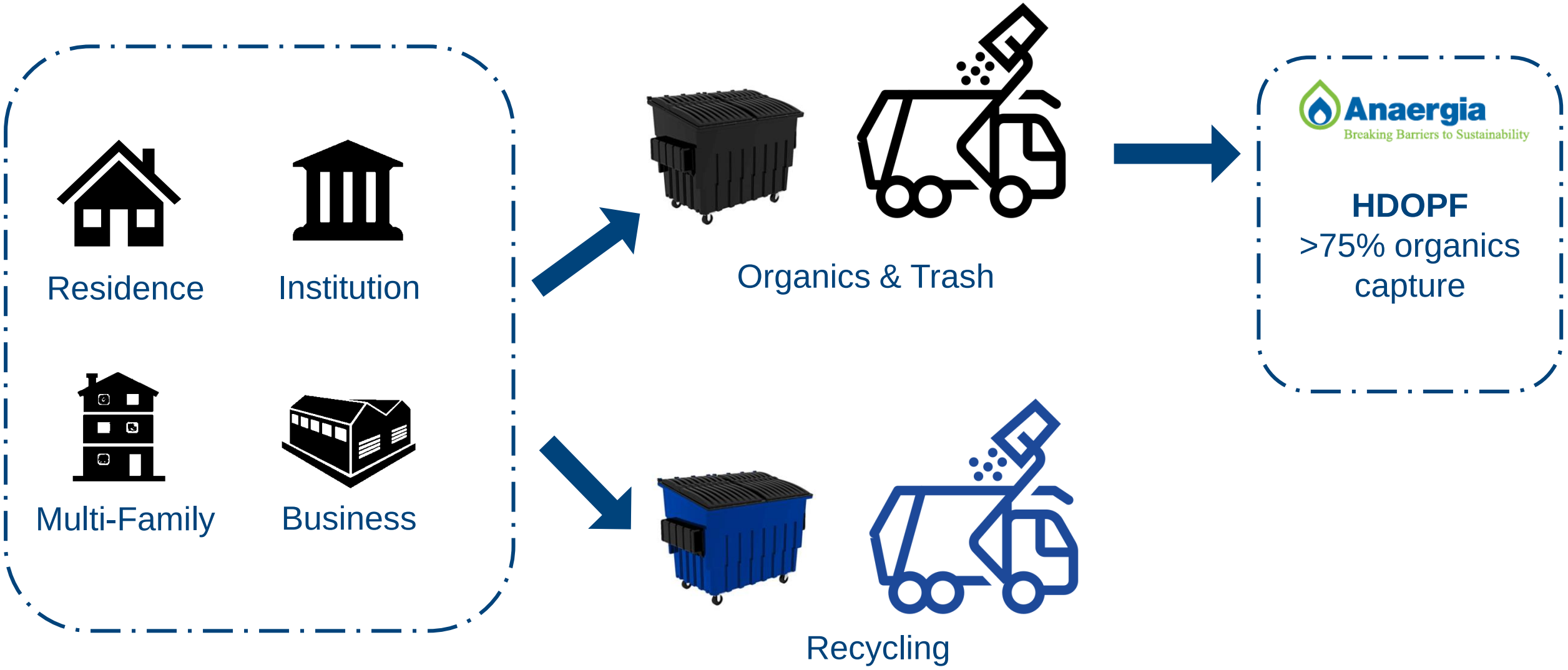
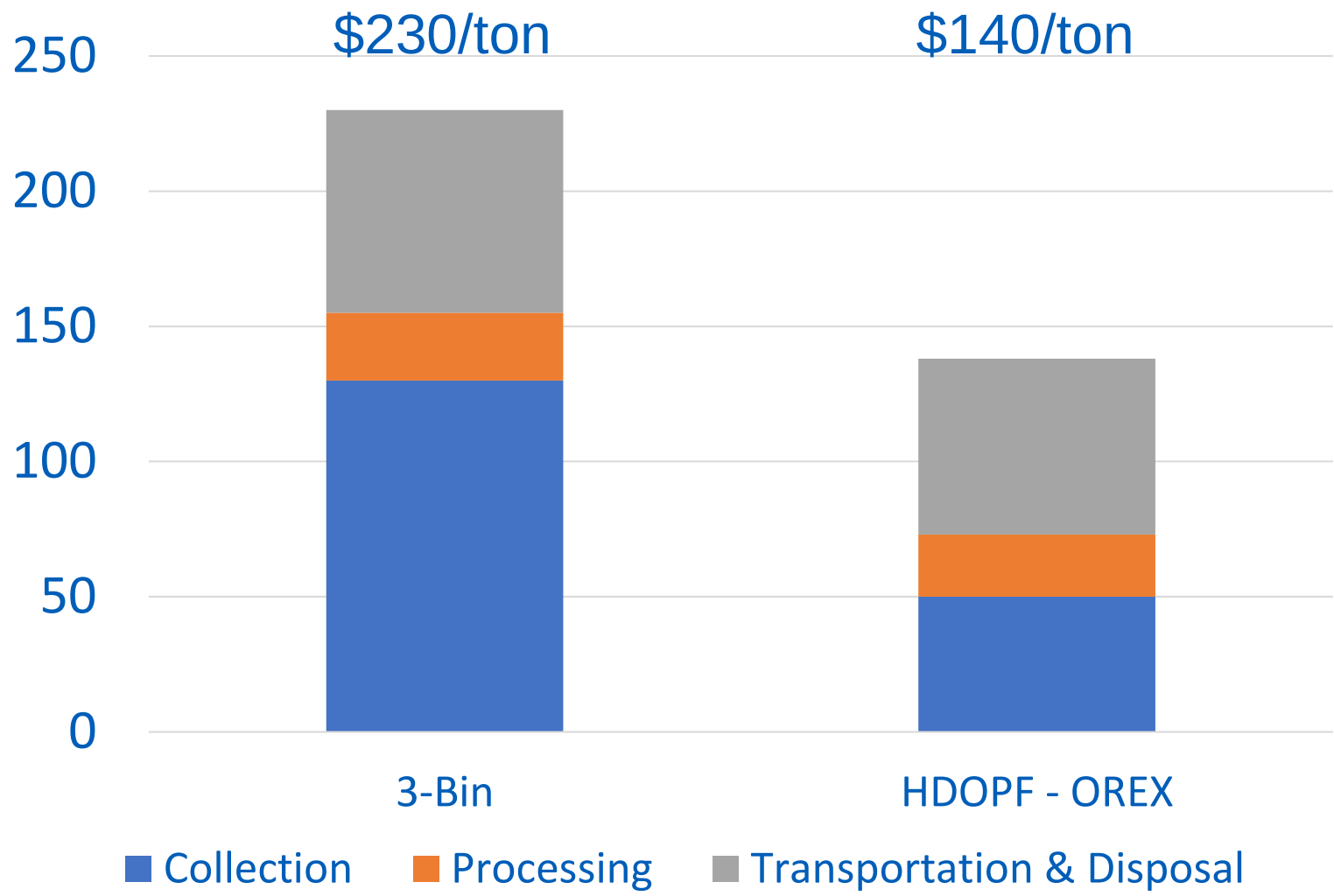
SB1383 organics recovery ***with*** HDOPF
Maintain collection scheme, no additional truck



Maintain collection scheme, no additional truck

Processing black bin trash through HDOPF using OREX offers 40% savings compared to 3-Bin collection



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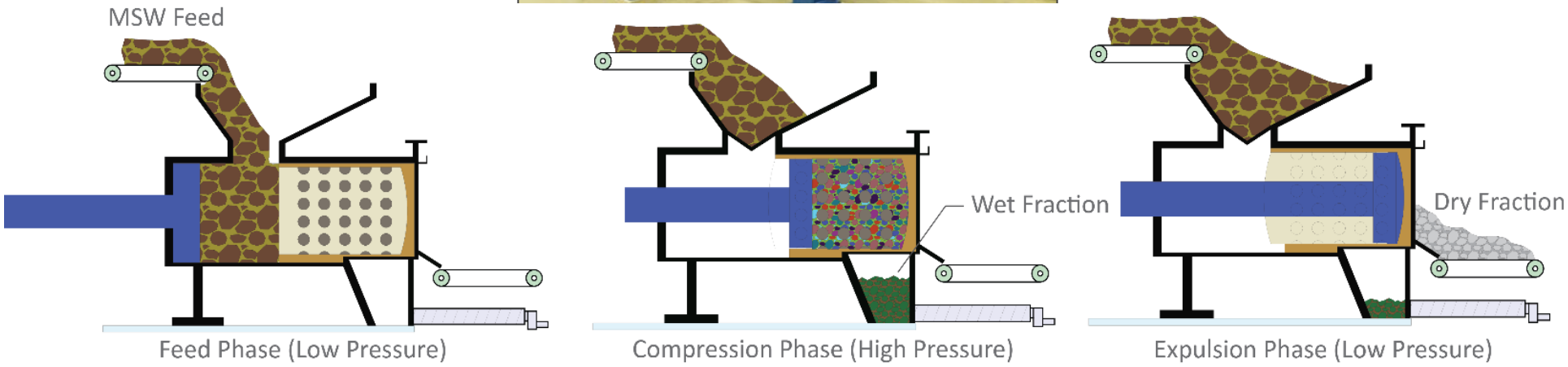
Organics Extrusion Press (OREX) Separates Organics from Municipal Solid Waste (MSW) to Produce Renewable Energy and Fertilizer with AD



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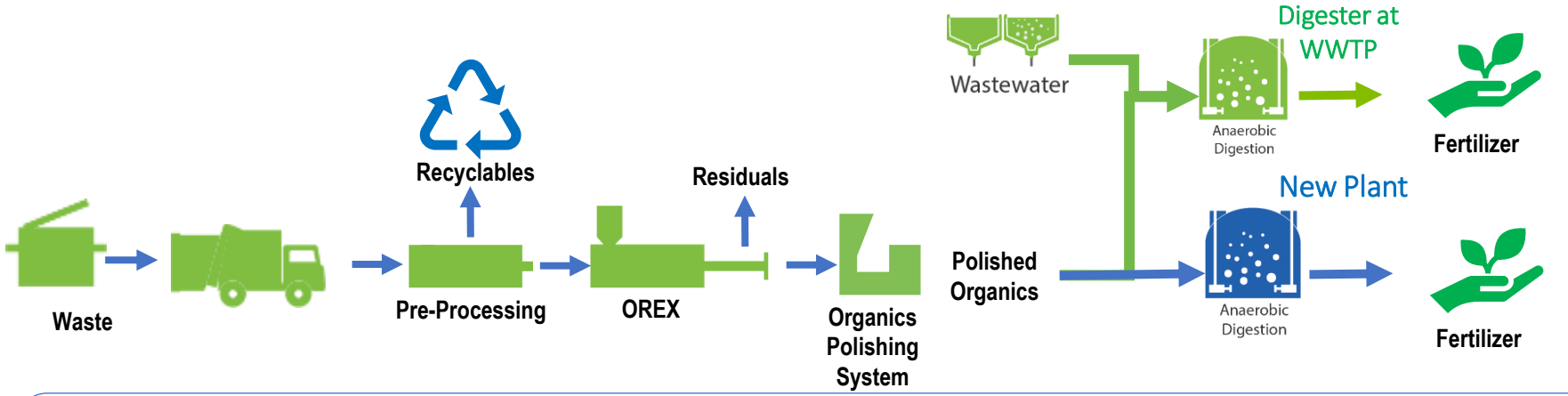
OREX + Organics Polishing System (OPS) Generates Digestible Organic Slurry



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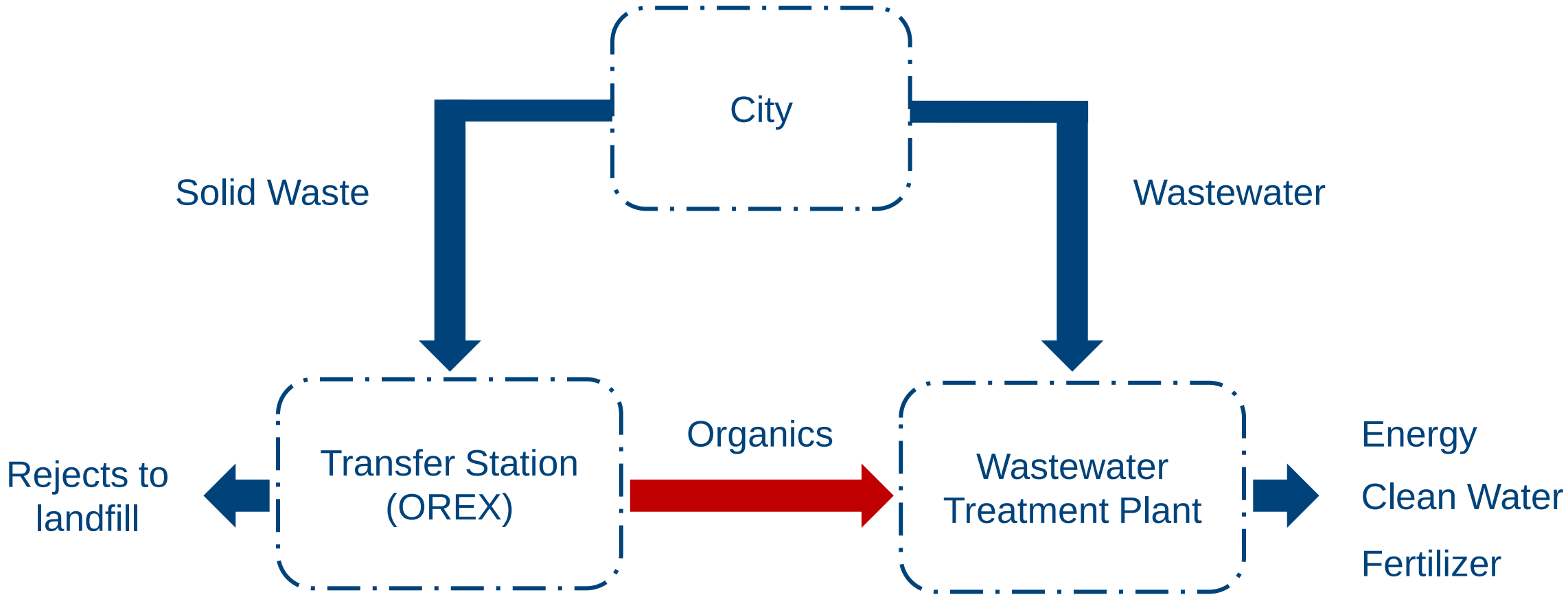
Anaergia provides cost effective outlet for organics to local AD infrastructure



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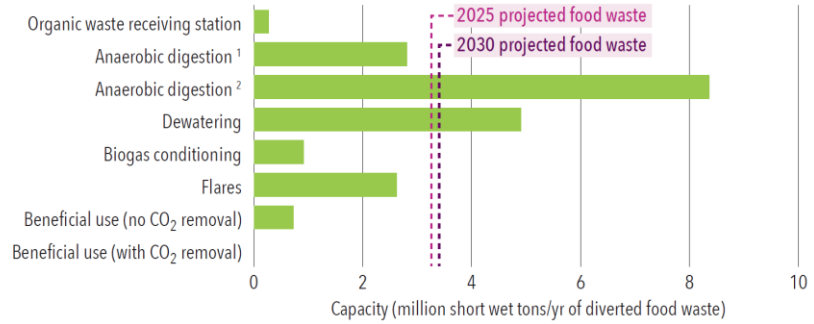
State Water Board: WWTP Co-Digestion is Key

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.

DIGESTING CALIFORNIA'S CO-DIGESTION CAPACITY

A new report assessed statewide co-digestion capacity at WWTPs, including AD capacity under two operating scenarios. Ancillary infrastructure such as waste pre-processing will require the most investment.



[1] Design solid residence time; largest unit out of service
[2] 15-day solid residence time; all units in service

Source: SWRCB

panies to develop third-party merchant facilities. Anaergia is developing a bioenergy facility in Rialto, CA, and is known to be targeting further BOO arrangements in the state (*see GWI April 2020, p28*).

While co-digestion at wastewater treatment plants could go some way towards meeting the state's landfill diversion tar-

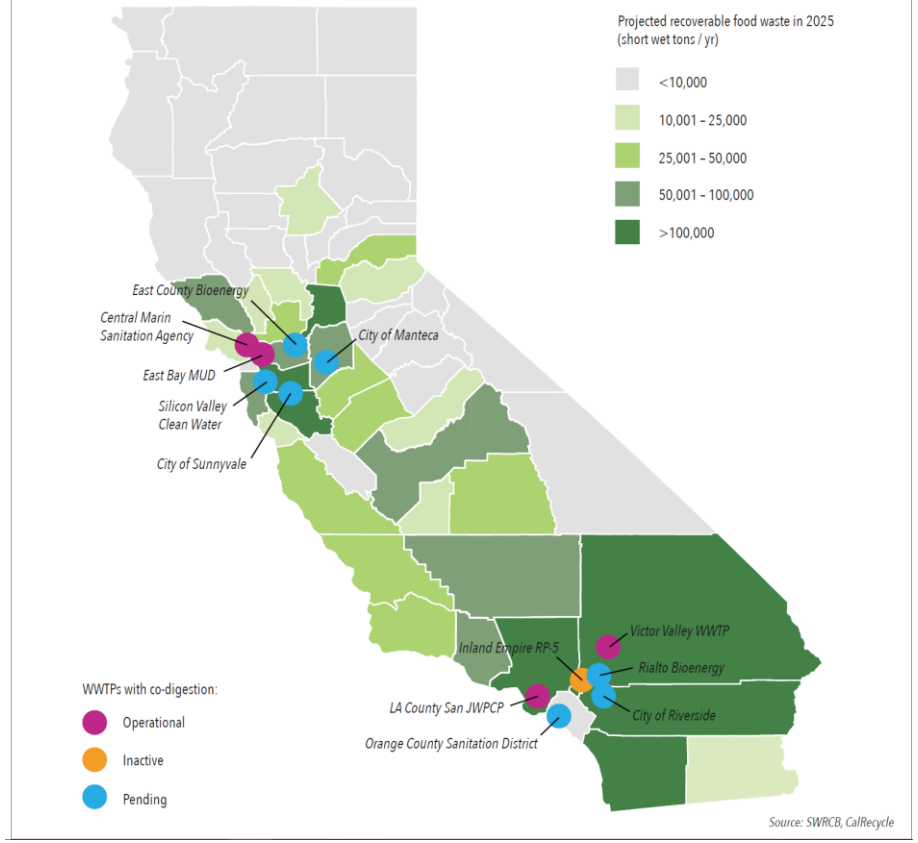
Synagro, for instance, currently has a series of merchant composting facilities in California that it is looking to permit for post-consumer food waste, the company's director of legislative and regulatory affairs, Layne Baroldi, told GWI this month.

Likewise, the processing of organic waste at wastewater treatment plants would

developed under SB1383 – which are due to be adopted later this year – will help ensure that land application of biosolids in California is unhindered by local ordinances. From January 2022, counties such as Stanislaus and San Joaquin will no longer be able to prohibit the land application of lower-quality 'Class B' biosolids. ■

MAPPING OUT CO-DIGESTION IN CALIFORNIA

A dozen wastewater and organic waste co-digestion schemes are either underway or in the planning stages in California. WWTPs have the advantage of already being located where food waste is generated.



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Rethink Waste: Recycling organics from solid waste with WWTP

OREX

OPS

WWTP

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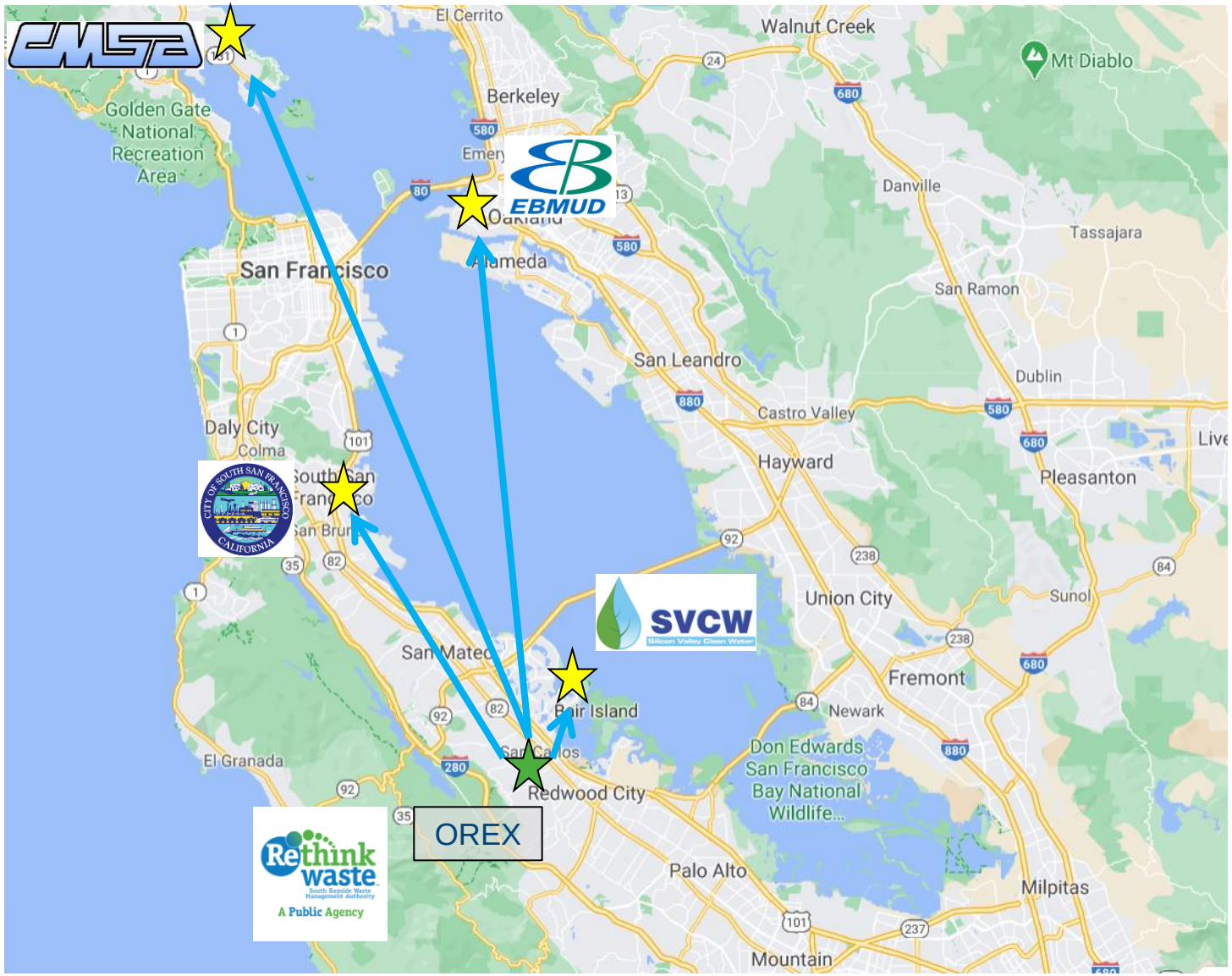
WWTP plants with existing AD infrastructure act as organics outlets



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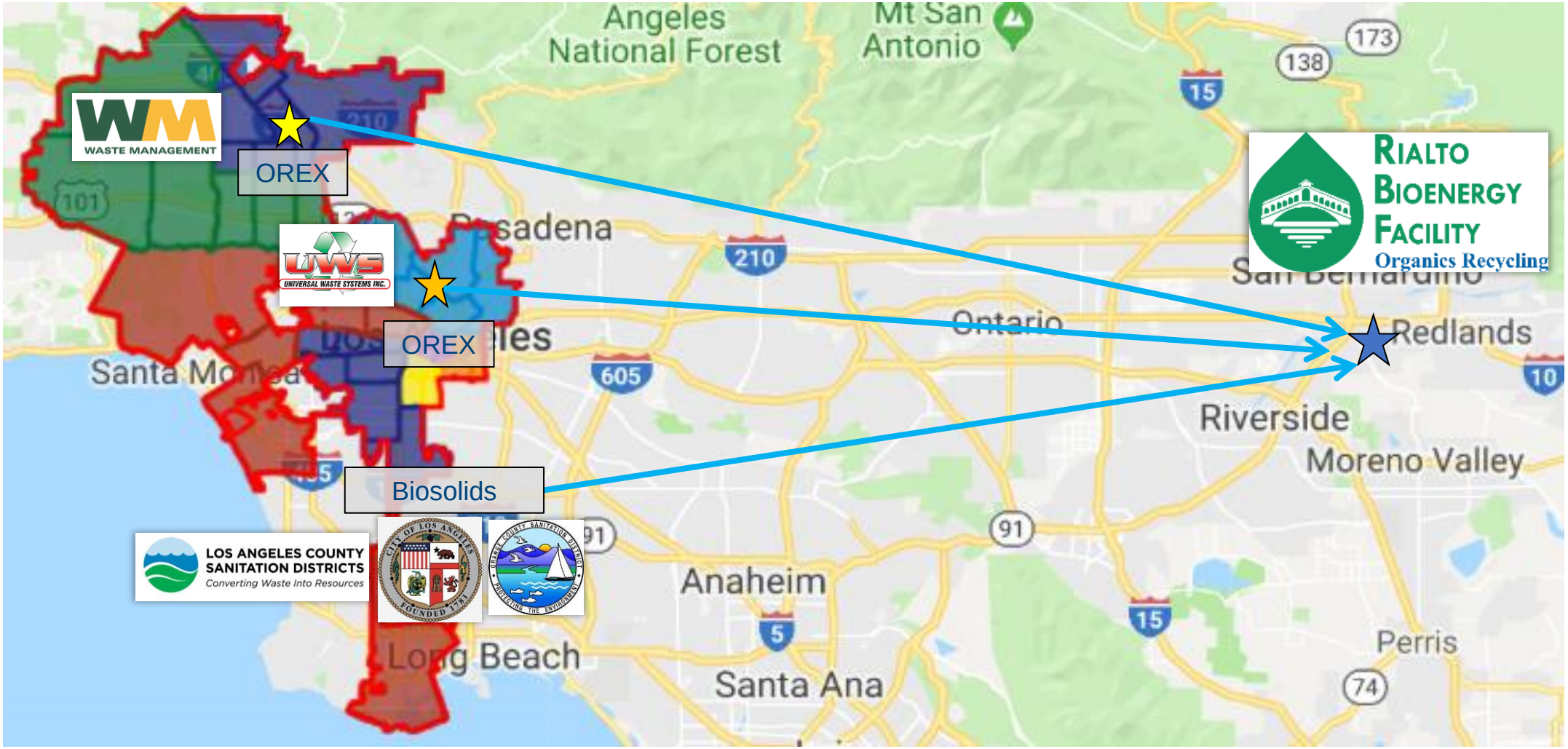
Anaergia AD Plant (Rialto Bioenergy Facility) acts as organics outlet



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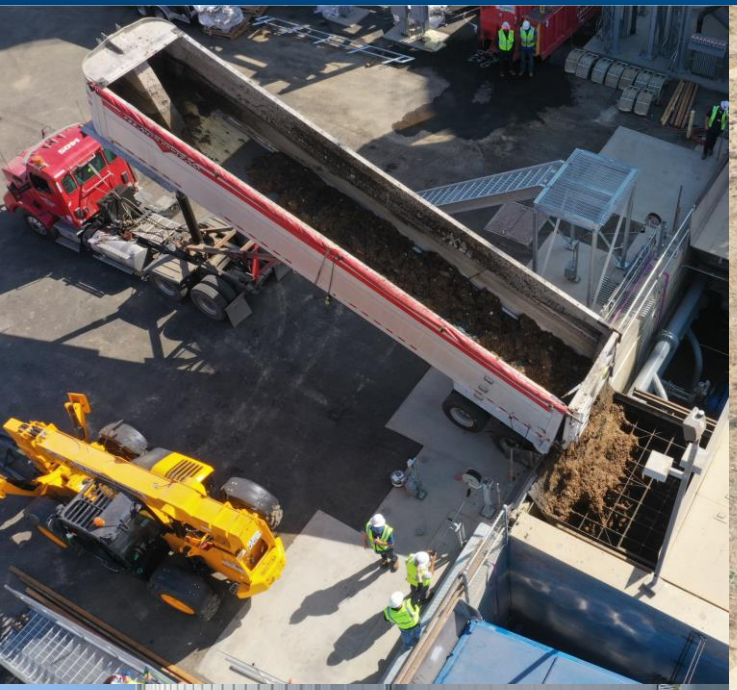
Sun Valley CA, Commercial SSO & MSW Processing Line

Sun Valley CA, Commercial SSO & MSW Processing Line

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



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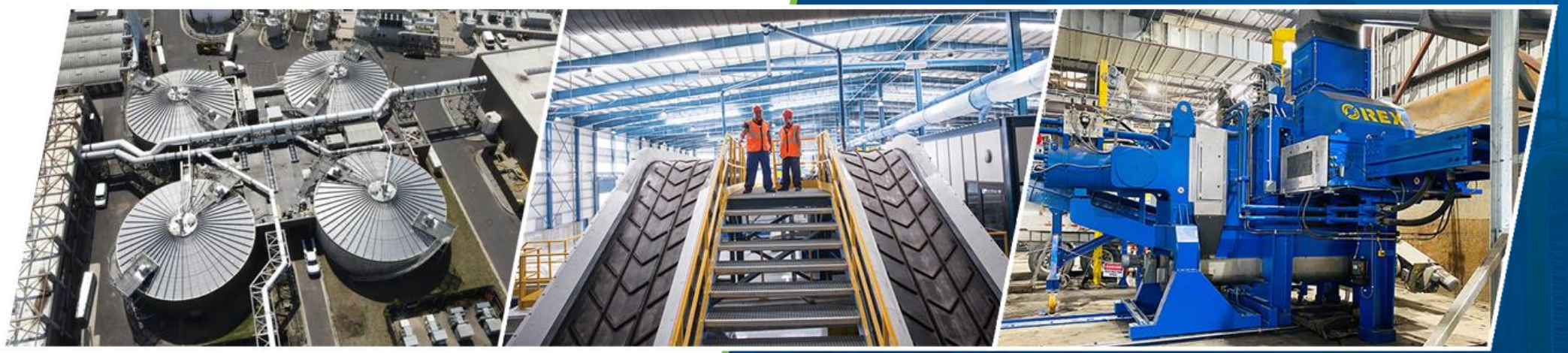
Thank you



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