



**CALIFORNIA  
ENERGY COMMISSION**



**CALIFORNIA  
natural  
resources  
AGENCY**

California Energy Commission  
Clean Transportation Program

## **FINAL PROJECT REPORT**

# Phase 2 Biomethane for Waste Management Refueling

**Prepared for: California Energy Commission**

**Prepared by: Rialto Bioenergy Facility, LLC**

**Gavin Newsom, Governor**

**December 2021 | CEC-600-2024-028**

# California Energy Commission

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## **DISCLAIMER**

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# PREFACE

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program, formerly known as the Alternative and Renewable Fuel and Vehicle Technology Program. The statute authorizes the California Energy Commission (CEC) to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013) reauthorizes the Clean Transportation Program through January 1, 2024, and specifies that the CEC allocate up to \$20 million per year (or up to 20 percent of each fiscal year's funds) in funding for hydrogen station development until at least 100 stations are operational.

The Clean Transportation Program has an annual budget of about \$100 million and provides financial support for projects that:

- Reduce California's use and dependence on petroleum transportation fuels and increase the use of alternative and renewable fuels and advanced vehicle technologies.
- Produce sustainable alternative and renewable low-carbon fuels in California.
- Expand alternative fueling infrastructure and fueling stations.
- Improve the efficiency, performance, and market viability of alternative light-, medium-, and heavy-duty vehicle technologies.
- Retrofit medium- and heavy-duty on-road and nonroad vehicle fleets to alternative technologies or fuel use.
- Expand the alternative fueling infrastructure available to existing fleets, public transit, and transportation corridors.
- Establish workforce-training programs and conduct public outreach on the benefits of alternative transportation fuels and vehicle technologies.

To be eligible for funding under the Clean Transportation Program, a project must be consistent with the CEC's annual Clean Transportation Program Investment Plan Update. The CEC issued solicitation number GFO-19-606 for low carbon biofuel production facilities to increase production capacity. In response to GFO-15-606, the recipient submitted an application that was proposed for funding in the CEC's Notice of Proposed Awards on February 17, 2017 and the agreement was executed as ARV-17-019 on May 28, 2017.

# ABSTRACT

The Recipient, Rialto Bioenergy Facility, LLC, in cooperation with a project team consisting of W.M. Lyles Co., Anaergia Technologies, LLC, and Momentum, sought to expand the capacity of the existing Rialto Bioenergy Facility (Facility). When fully operational, this new commercial-scale system will produce 2.5 million diesel gallon equivalent per year of carbon negative renewable natural gas (RNG) for use in waste collection and transport vehicles across the greater Los Angeles metropolitan area. The Recipient has executed feedstock agreements and offtake agreements to both receive required feedstock for the project and sell the RNG produced at the facility. When operational, the Facility will convert 85,800 tons/yr of regionally available food / organic waste from municipal solid waste sourced from processing facilities such as Waste Management's Sun Valley Recycling Park into carbon negative RNG for use as a transportation fuel.

The Facility has successfully started operations and, with agreement of the California Energy Commission, has begun collecting preliminary data, including throughput, operating hours, Class A soil production, and RNG production. Upon completion of the data collection process, the Recipient will update this abstract and the full report with conclusions and lessons learned.

**Keywords:** renewable natural gas, renewable fuel, biofuel, solid waste, Anaheim Energy, Anaergia, Clean Transportation Program

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# EXECUTIVE SUMMARY

The Rialto Bioenergy Facility (Facility) is a project funded by several state agency grants along with private investment from the recipient Rialto Bioenergy Facility, LLC. The Facility is part of a three-phase project, funded in part by the California Energy Commission (CEC). ARV-17-019 was the initial phase that revitalized a mothballed bioenergy facility; the purpose was to replace old equipment with new, proven technology with the end goal to produce 880,000 diesel gallon equivalent (DGE) per year of renewable natural gas (RNG). ARV-18-029, the second phase, sought to expand the goals of the initial phase by expanding the system to add a second biogas conditioning skid and produce an additional 1.62M DGE—for a total of 2.5M DGE/yr of RNG. LCF-19-004, the third phase, continued the expansion of the Facility by adding additional capacity with a third biogas conditioning skid that will produce 2.4M DGE of RNG for a total of 4.8M DGE. Because the projects are interconnected, the data collected will be distributed proportionally to each grant based on the DGE goals of each grant.

**Figure 1: Rialto Bioenergy Facility**



Source: Rialto Bioenergy Facility, LLC

This report solely focuses on the aspects of the project funded by Rialto Bioenergy Facility, LLC (Recipient) and the ARV-18-029 grant; it is referred to throughout the report as Rialto Bioenergy Facility Phase 2 (RBF Phase 2). The Recipient received \$2,916,620 in funding through contract #ARV-18-029 from the Energy Commission and matched that with \$2,916,620 in cost share, for a total project budget of \$5,833,240. Construction started in Q1 2018 and ended in Q2 2020. Commissioning of the equipment purchased was completed in Q4 2020.

## **ARV-18-029: RBF Phase 2 Summary**

The Recipient, in cooperation with a project team consisting of W.M. Lyles Co. (WML), Anaergia Technologies, LLC, and Momentum, sought to expand the capacity of the existing Rialto Bioenergy Facility in the second phase of a three-part project. In a previous grant ARV-17-019, the Recipient along with its affiliate Anaheim Energy, LLC initiated a multi-phase project to

restore and upgrade a mothballed bioenergy facility. ARV-17-019 helped fund the initial biogas conditional skid with the capacity to produce 880,000 DGEs of RNG. In this project, RBF Phase 2, the project team expanded upon the existing Facility to install new equipment that can produce RNG from municipal solid waste (MSW). When fully operational, this new commercial-scale processing system will produce 2.5M DGE per year of carbon negative RNG for use in waste collection and transport vehicles across the greater Los Angeles metropolitan area. By expanding the facility, RBF Phase 2 aligns directly with the Alternative and Renewable Fuel and Vehicle Technology Program’s funding initiatives and meets SB 1383 requirements that communities and recycling services divert 75 percent of the state’s organic waste from landfills by 2025. The objectives of RBF Phase 2 were to:

- Utilize 85,800 tons/yr food / organic waste feedstock available under the Recipient’s existing feedstock supply agreement with Waste Management;
- Produce 2.5 million DGE/yr of biomethane;
- Transfer 2.5 million DGE/yr of biomethane under the Applicant’s existing offtake agreement with Waste Management for use as a vehicle fuel;
- Offset 2.5 million DGE/yr of fossil fuel consumption;
- Offset 42,002 MT CO2e/yr of greenhouse gas emissions;
- Stimulate at least \$10 million in local economic activity; and
- Provide 30 permanent operating and 200 indirect jobs and other key community benefits to a disadvantaged community suffering from excessive pollution, poverty, and pollution related health concerns.

**Figure 2: Top View of the Anaerobic Digester**



Source: Rialto Bioenergy Facility, LLC

The objectives of RBF Phase 2 were partially met as follows:

- Installed and commissioned an additional biogas upgrading skid to increase the capacity of the Facility to 2.5M DGEs of biomethane per year.
- Produced biomethane from organic waste for transportation fuel.

- As of October 2021, the Facility diverted 16,790 tons (total) of organic waste from landfills (5,527.8 tons associated with ARV-18-029). This number is expected to reach 42,900 tons (total) by the end of 2021 as the project ramps up (14,183.3 tons associated with ARV-18-029) and will reach full capacity at 182,000 tons per year starting in 2022 (60,171.4 tons associated with ARV-18-029). Based on the ramp-up schedule, the Facility is expected to achieve its full commercial design potential.
- As of October 2021, 84,728.25 DGE of RNG has been produced. Projected production for 2022 is 1.2M DGE.
- As of October 2021, 1,478 MTCO<sub>2</sub>e has been offset, with a projected offset of 16,084 MTCO<sub>2</sub>e.
- Stimulated \$180M in local activity through design and construction.
- As of October 2021, provided 24 permanent operating jobs.

This expansion on this flagship project continues to establish California as the epicenter of RNG production from the organic fraction of MSW. The CEC funding of this project was critical to its success. The investment by the state into the project at the beginning phases of a larger multistage project demonstrated the potential of converting organic fraction of MSW into RNG and was critical in attracting more traditional private funding. In addition to aligning with the current goals of SB 1383, this project is an example that producing RNG from feedstocks such as MSW is an impactful and viable solution that will help California thrive in the current climate crisis.

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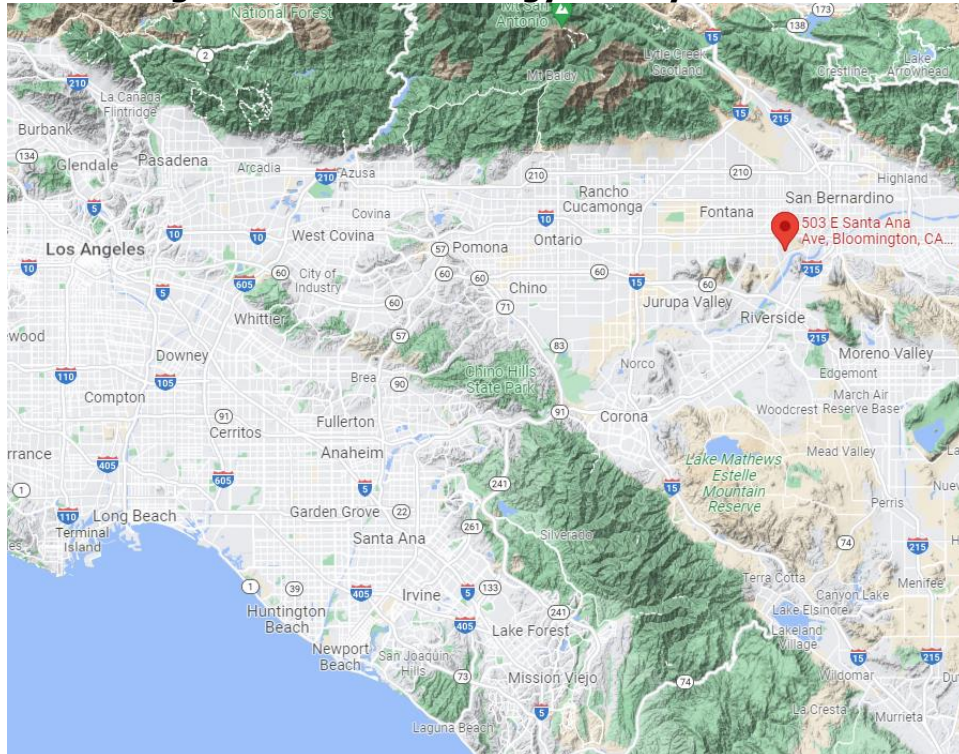


# CHAPTER 1: Introduction

## 1.1 Project Overview

The Recipient, in cooperation with a project team consisting of WML, Anaergia Technologies, LLC, and Momentum, sought to expand the existing bioenergy facility located at 503 East Santa Ana Ave., Rialto, CA 92316.

**Figure 3: Rialto Bioenergy Facility Location**



Source: Google Maps

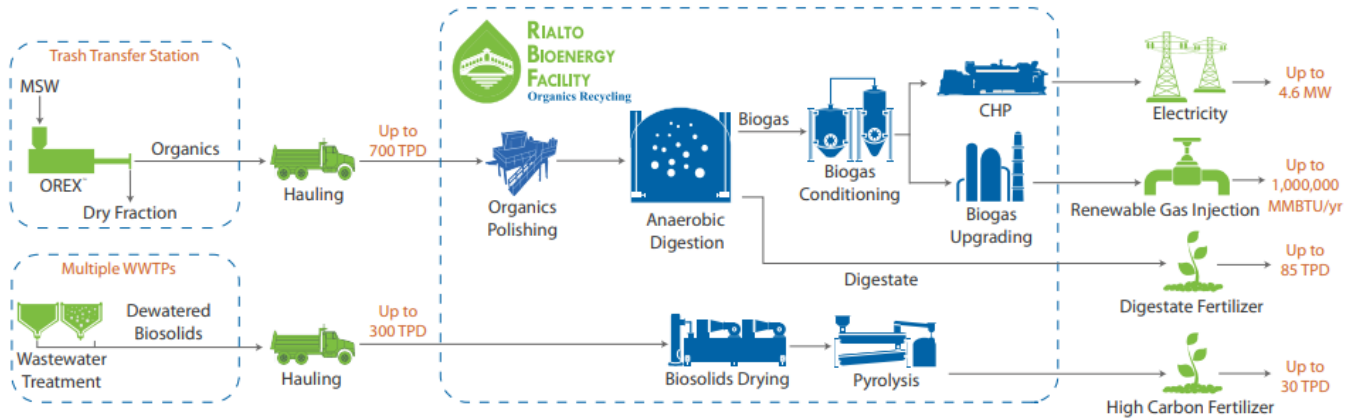
In a previous grant ARV-17-019, the Facility was the beginning of a multi-phase project to restore and upgrade a mothballed bioenergy facility. ARV-17-019 helped fund the initial biogas conditional skid that has the capacity to produce 880,000 DGEs of RNG. The project, RBF Phase 2, installed new equipment to produce additional RNG from MSW to refuel collection and transport vehicles. RBF Phase 2 aligned directly with the Alternative and Renewable Fuel and Vehicle Technology Program’s funding initiatives and meets SB 1383 requirements that require communities and recycling services to divert 75 percent of the state’s organic waste from landfills by 2025.

The Facility receives feedstock in the form of extracted organic waste using an Organics Extrusion (OREX) system installed at the Waste Management Materials Recovery Facility in Sun Valley, in addition to organic waste from Republic Services and liquid waste from Athens Services. Key components installed at the Facility include an Organics Polishing System (OPS), an innovative High-Solids Anaerobic Digester (HSAD), and biogas cleaning and compression equipment. RBF Phase 2 specifically funded the system installation, a gas conditioning system, natural gas pipeline extension and interconnection, and a natural gas monitoring system. The



biogas upgrading system includes a fully integrated, three-stage membrane system with upstream biogas polishing and gas compression.

**Figure 4: Project Flow Diagram**



**This diagram shows the inputs and outputs of the Facility.**

Source: Rialto Bioenergy Facility, LLC

## 1.2 Project Goals

The overarching goal of RBF Phase 2 was to expand production of low-carbon biomethane (i.e., RNG) from MSW-derived organic / food waste for blending into California’s transportation fuel supply.

## 1.3 Project Objectives

The objectives of RBF Phase 2 were the following:

- Utilize 85,800 tons/yr food / organic waste feedstock available under the Applicant’s existing feedstock supply agreement with Waste Management;
- Produce 2.5 million DGE/yr of biomethane;
- Transfer 2.5 million DGE/yr of biomethane under the Applicant’s existing offtake agreement with Waste Management for use as a vehicle fuel;
- Offset 2.5 million DGE/yr of fossil fuel consumption;
- Offset 42,002 MT CO<sub>2</sub>e/yr of greenhouse gas emissions;
- Stimulate at least \$10 million in local economic activity; and
- Provide 30 permanent operating and 200 indirect jobs and other key community benefits to a disadvantaged community suffering from excessive pollution, poverty, and pollution related health concerns.

## 1.4 Relevance to Key Parties

RBF Phase 2 is directly relevant to multiple parties in California showing that the vision laid out in SB 1383 can be achieved and that the project is successful and replicable on a commercial scale. Key parties for whom the project is relevant include the following:

- State regulators and energy/fuels managers seeking to further develop in-state production of renewable biofuels, including RNG.

- State decisionmakers and lawmakers working to achieve California's statutory goals surrounding GHG emissions reduction and the transition to a renewable energy-based economy.
- Waste managers and waste haulers seeking to better manage or expand the diversion of MSW to follow SB 1383 requirements.
- Cities that may be interested in adopting similar technology at their own MSW sites to meet SB 1383 compliance.
- Fleet Managers that are seeking to convert their hauling or class 8 vehicles to low-NOX RNG vehicles

# Chapter 2: Project Context

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## 2.1 Project Team

### 2.1.1 Rialto Bioenergy Facility, LLC

The Recipient is the owner and operator of the Facility, has also secured an additional \$13 million in CEC grants to help fund the project. Rialto Bioenergy Facility, LLC staff maintains a working knowledge and understanding of all facilities and systems included at the Facility site. This includes all existing equipment, facilities, and access areas that would be used to support RBF Phase 2 as well as basic maintenance and operational requirements of the facility, permits and permitting requirements, and utility information. Parent company Anaergia Services, LLC is ultimately responsible for the staffing, function, and operation of the site.

### 2.1.2 Anaergia Services, LLC

The Recipient's and Rialto Bioenergy Facility, LLC's parent company is Anaergia Services, LLC, which is headquartered in Carlsbad, California. Anaergia Services, LLC's ultimate parent company is Anaergia, Inc. (Anaergia), a global leader in the production of clean energy, fertilizer, and recycled water from virtually any waste stream, offering the widest range of maximized resource recovery technologies for the municipal, industrial, commercial, and agricultural markets. The company's portfolio of mature wastewater and food waste management technologies includes digester retrofit enhancement equipment that enables co-digestion of biosolids and other feedstocks while increasing digester capacity and throughput without a corresponding increase in the physical size of the system; organics pre-treatment systems to separate difficult-to-remove contaminants; and organics extrusion systems that extract 90% of the putrescible organic fraction from municipal solid waste.

### 2.1.3 Anaergia Technologies, LLC

Anaergia Technologies, LLC is the sister company of Recipient and Rialto Bioenergy Facility, LLC. Anaergia Technologies, LLC served as a subcontractor to W.M. Lyles in this grant as an equipment provider.

### 2.1.4 W.M. Lyles Co.

W.M. Lyles Co. (WML) served as the general contractor on the project, overseeing all construction and construction-related activities. WML is a Fresno-based, heavy civil and utility construction contractor, with more than 70 years of experience including hundreds of successful infrastructure, energy, and environmental/wastewater construction projects throughout California. The company maintains expertise in the redevelopment and upgrading of existing industrial sites. WML is an exceptionally well-respected leader in contracting in California for the installation of pipelines and other underground utilities, as installed under the project. WML focuses strongly on integrity, relying on a team of experienced industry leaders who work closely with their clients to ensure delivery of highest quality, schedule and budget performance, safety, and value-added insight and service. WML served as the general contractor for three Anaergia projects, including the Victor Valley Wastewater Authority projects in 2014 and 2020, exhibiting strong technical, scheduling, and cost performance abilities.

### **2.1.5 Momentum**

Momentum provided grant administration and commercialization support for the project. Momentum (formerly Grant Farm) inspires, manages, and executes campaigns for entrepreneurial and forward-thinking organizations around the globe. Since 2005, the company's team members—professionals in engineering, law, finance, policy, accounting, and business acceleration—have helped more than 300 high-profile public and private clients plan, develop, and finance \$5 billion+ in transformative advanced technology projects. Momentum manages projects for a variety of clients—from technology startups to Fortune 500 companies, NGOs, and public agencies.

## 2.2 Project Location and Disadvantaged Communities

RBF Phase 2 is located at 503 East Santa Ana Ave., Bloomington, CA 92316.

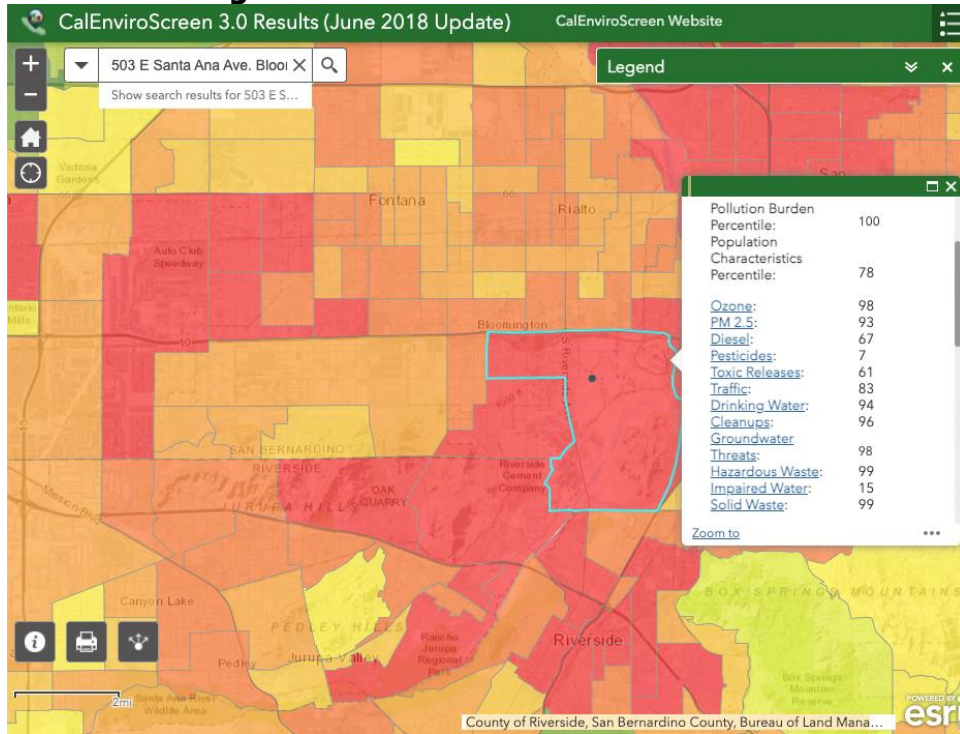
**Figure 5: Rialto Bioenergy Facility Location**



RBF Phase 2 is located in and provides direct benefits to a local community that, according to CalEnviroScreen 3.0, is classified as an SB 535 Disadvantaged Community (DAC) and an AB 1550 low-income community as shown in Figure 5. With a CalEnviroScreen 3.0 percentile range of 96 to 100%, the census tract where the Facility is located carries a pollution burden score of 100 and a population characteristic score of 92. Factors where the community scored especially poorly include hazardous wastes (99), solid waste (99), groundwater threats (97), ozone (96), cleanup sites (96), drinking water (94), and PM2.5 (93).

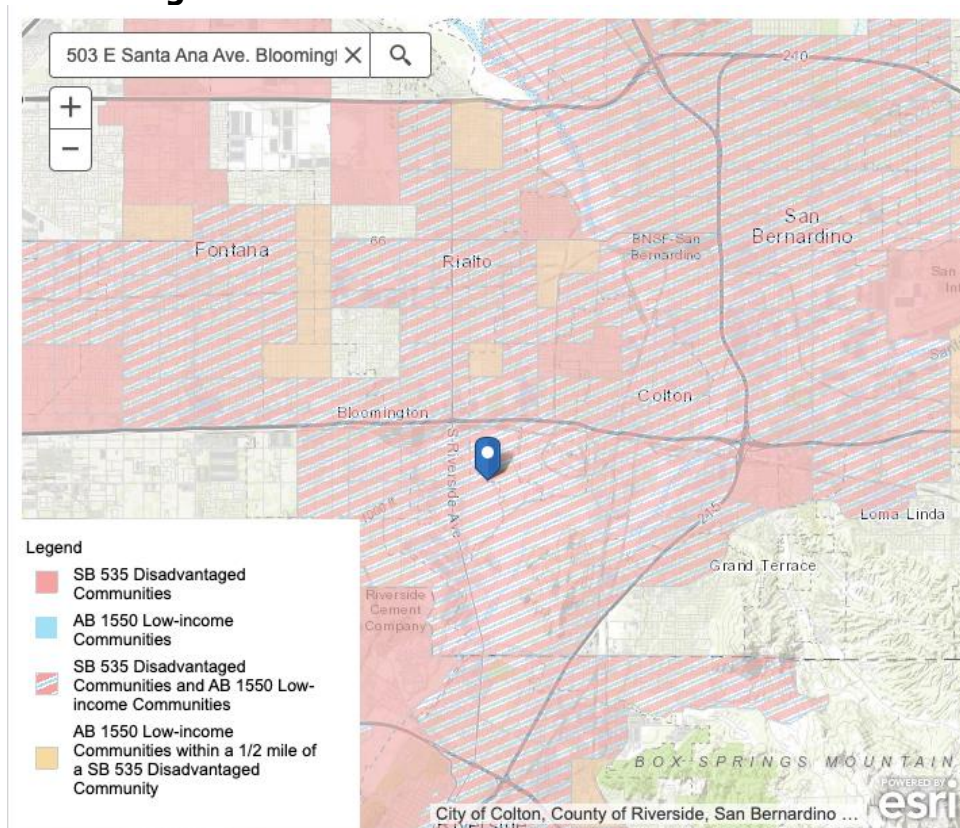


**Figure 6: CalEnviroScreen Emissions**



Source: California Office of Environmental Health Hazard Assessment

**Figure 7: SB 535 and AB 1550 Communities**



Source: California Air Resources Board

## 2.3 Renewable Natural Gas Production (RNG) in California

The processes and technologies installed at the Facility directly contribute to its ability to compete in the California's commercial marketplace for biofuels while also increasing in-state biofuels production. California ranks first in the nation in biogas production potential, with a total of 322 operational biogas systems as of 2021. Of these, 30 treat food waste. However, the potential to treat food waste as well as the organic fraction of MSW and other biomass feedstocks is significantly greater than existing capacity. According to the American Biogas Council, enough feedstock is available in state to support over 1,100 additional biogas production facilities.<sup>1</sup> In addition, none of the biogas production facilities in California, and only one in the nation, use RNG for vehicle fuel.<sup>2</sup> Demand for RNG, which can easily be incorporated into CNG fuel stocks, is strong because many public and private fleets strive to reduce GHG and criteria air pollutant emissions. RNG also has the potential to be used for renewable power generation in place of fossil natural gas to provide renewable electricity without the need to invest significant land and capital into land-intensive forms of renewable energy, such as solar power.

California also produces large quantities of wastewater biosolids each year with 723,000 dry metric tons. Only about 36% meet the Class A standards used for soil amendment. The remaining 64% of biosolids is used as Class B soil amendment (20% of total), landfill daily cover (19%), landfill disposal (13%), surface disposal (3%), incineration (3%), or other uses (6%).<sup>3</sup> Class B biosolids are coming under increasingly stringent regulations in California, which increasingly restricts their land application. Therefore, a growing market is available for technologies that can convert low-grade wastewater biosolids into a higher value beneficial use.

## 2.4 Key Barriers to RNG Production in California

RNG is an important part of California's approach to reducing greenhouse gas emissions across the state. RNG achieves key initiatives to address methane emissions from various wet organic feedstocks, including food waste, green waste, and dairy manure. Although the environmental benefits for RNG are well defined, there are significant market barriers that constrain RNG facility development. The first and foremost is low-cost fossil natural gas. Since 2017, when this project was initially proposed, the industrial price of fossil natural gas has averaged \$7.54/thousand cubic feet (\$7.27/MMBtu).<sup>4</sup> RNG is used in the market for the same applications of fossil natural gas and therefore needs to compete in the marketplace with this option for businesses.

RNG from food wastes requires multiple collection and processing steps, including the waste hauler collection routes, removal of inorganic contaminants, transportation to a central facility, and facility operation. Due to the nature of anaerobic digestion (AD) technologies, food waste cannot be processed at the same scale and volume that fossil natural gas is today.

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<sup>1</sup> <https://americanbiogascouncil.org/biogas-market-snapshot/>

<sup>2</sup> <https://www.anl.gov/es/reference/renewable-natural-gas-database>

<sup>3</sup> <https://www.calrecycle.ca.gov/organics/biosolids#:~:text=Biosolids%20are%20the%20nutrient%2Drich,wastewater%20and%20remove%20the%20solids.>

<sup>4</sup> U.S Energy Information Administration, California Natural Gas Industrial Price. <https://www.eia.gov/dnav/ng/hist/n3035ca3m.htm>

To support RNG production, California has passed landmark legislation and developed globally renowned programs to reduce the costs of food waste collection and assign value to the renewable attributes of RNG. The primary drivers of this market include:

- SB 1383 and AB 1826 require commercial organics collection and significantly eliminate the option to dispose organics in the landfill. These policies help generate cleaner volumes of organic wastes for use as feedstock for RNG.
- Low Carbon Fuel Standard provides transactable credits for transportation fuels with low carbon intensities compared to fossil fuels. This market generates revenue associated with the renewable attributes of the RNG.

Although these policies and programs have improved the market for RNG production, the market is not mature, meaning that at-scale operations have not yet been realized—increasing the costs of each step over the expected prices when the market has matured. ARV-17-019 funding, along with other agency funding, have helped reduce the capital cost of the Facility, allowing for the Facility’s business model to accommodate the higher cost of feedstock in biosolids management in an immature marketplace.

#### **2.4.1 MSW-Organics Separation and Processing**

Generation of RNG from organic waste is greatly constrained by a lack of technologies that can cost-effectively separate and process food waste/organics from MSW. By providing new, effective organics separation and organic processing, Anaergia has directly addressed and helped reduce this existing market barrier. Using the Facility’s technology, organics extracted from MSW can be processed and digested efficiently to produce energy.

#### **2.4.2 Biosolids Management**

Increasingly stringent regulations and lack of cost-effective wastewater biosolids management technologies are driving wastewater treatment providers to seek new solutions to biosolids management. However, most existing solutions are limited by available technology, the majority of which have high capital and operational costs due to handling requirements for Class A biosolids. The Facility provides a novel solution to biosolids management: cost-effectively generating Class A soil amendment without the need for wastewater treatment facilities to invest capital in costly treatment upgrades.

#### **2.4.3 Limited Demonstration**

The technologies have been successfully demonstrated individually but never together as a cohesive system. In addition, demonstration of several of the proposed pieces of equipment has been limited. Given the risk-averse nature of the waste and wastewater management industries, new, reliable data from the demonstration of the proposed facilities will greatly aid in the development of future similar projects.

### **2.5 Project Need and Technical Merit**

The Facility represents the first-ever commercialization of a system that processes biosolids, MSW-extracted food/organic waste, and liquid commercial waste into RNG. Initial market evaluation completed by Anaergia prior to the start of the project identified two potential routes for replication and future commercialization. First, the Facility could be entirely replicated, using



the same feedstocks to produce the same products. Due to economies of scale, Anaergia estimates that a metropolitan population of approximately 500,000 is needed to support a facility similar to the Facility. There are 107 such metropolitan areas in the United States, including 12 in California (Los Angeles, San Francisco, Riverside, San Diego, Sacramento, San Jose, Fresno, Bakersfield, Oxnard, Stockton, Modesto, and Santa Rosa metropolitan areas). Market conditions are considered most strongly favorable for large-scale facilities in California at present due to the favorable regulatory conditions discussed.

Second, the technologies could also be replicated in smaller systems, adopting only a part of the overall process chain described herein. For example, MSW-extracted food/organic waste could be used to produce RNG on a smaller scale than at the Facility, without the need for other feedstocks. Liquid commercial waste or biosolids could also be processed in similar fashion, enabling a larger number of smaller facilities to be sited near feedstock sources. Anticipated future commercialization will likely include a combination of the first and second strategies, making the system highly replicable across much of California. For smaller scale systems, the fixed cost of a dedicated digester facility may be cost-prohibitive. In these cases, wastewater treatment plants (WWTPs) can be used. There are 156 WWTPs in California with anaerobic digestion, all of which have some available capacity for co-digestion. In plants where insufficient capacity exists, Anaergia’s Omnivore system can increase capacity and enable co-digestion of multiple feedstocks using advanced mixing and robust thickening systems to turn a low-solids digester (2–3% total solids) into a high-solids digester (5–8% total solids.) On the solid waste side, there are 802 transfer stations—all candidates for Anaergia’s OREX system, which is scalable. As a result, a large OREX system can provide organic feedstock for a large, dedicated digestion facility like the one proposed. If scaled down, a smaller OREX line can provide feedstock to one of the 156 WWTPs with existing AD infrastructure in California. Flexibility in scale and the ability to provide organic feedstock to existing or new infrastructure make the proposed technology solution highly replicable across the state.

## 2.6 Project Benefits

The entire Facility injected \$180 million directly into California’s economy during design and construction. This figure is based on total cost with a multiplier of 1.48 per dollar spent<sup>5</sup> to account for indirect economic activity such as raw materials, logistics, transportation, customer service, technical support, regulatory and safety specialists, distribution, professional services, and taxes. During operations, the Facility will contribute a minimum of approximately \$7.5 million per year in additional statewide economic activity driven by RNG sales, tipping fees, coproduct sales, and new employment. Table 1 breaks down the various grants, rebates, and incentives the recipient used to partly finance the project.

**Table 1: Grants, Rebates, and Incentives**

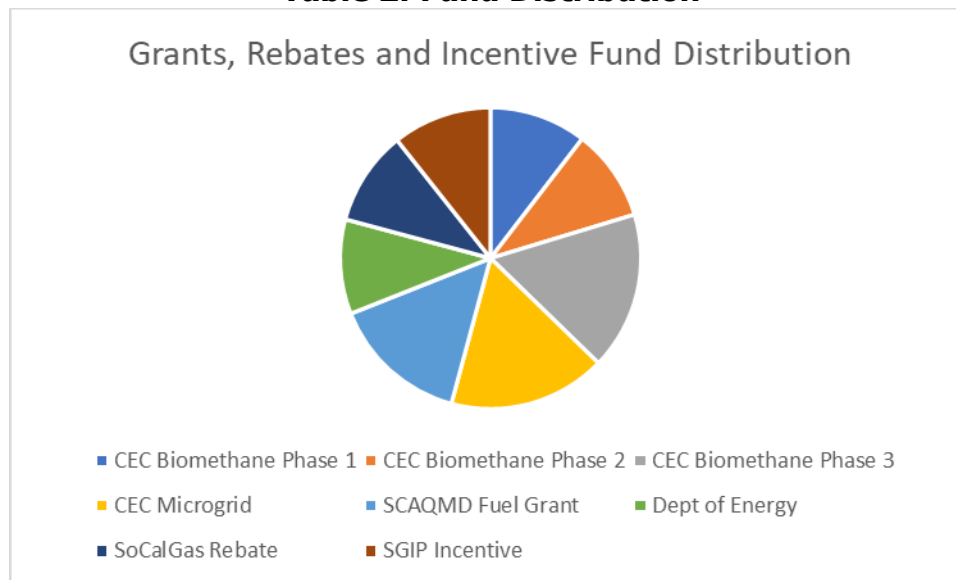
| Grant                         | Amount      | Purpose   |
|-------------------------------|-------------|---|
| <b>CEC Biomethane Phase 1</b> | \$3,080,000 | Revitalize Mothballed Bioenergy Facility to Produce 880,00 DGE of RNG |

<sup>5</sup> US Bureau of Economic Affairs, 2014, as cited in <http://www.industryweek.com/global-economy/competitive-edge-manufacturings-multiplier-effect-its-bigger-you-think>

|                               |              |   |
|-------------------------------|--------------|---|
| <b>CEC Biomethane Phase 2</b> | \$2,916,620  | Expand RNG Production by adding a second biogas conditioning skid to increase production to 2.5M DGE of RNG |
| <b>CEC Biomethane Phase 3</b> | \$5,000,000  | Continued expansion by addition a third biogas conditioning skid increasing capacity by 2.4 DGE of RNG      |
| <b>CEC Microgrid</b>          | \$5,000,000  | Install a 2MW Microgrid System  |
| <b>SCAQMD Fuel Grant</b>      | \$4,365,801  | Redevelop an existing non-operational regional bioenergy facility to produce RNG for Transportation Fuel    |
| <b>Dept of Energy</b>         | \$2,999,096  | Permitting, testing, and 30% design of drying and pyrolysis systems   |
| <b>SoCalGas Rebate</b>        | \$3,000,000  | Incentive for successfully installing and operating an RNG interconnection with the SoCal Gas power grid    |
| <b>SGIP Incentive</b>         | \$3,150,000  | Incentive for installation and performance of a CHP system that includes four engines totaling 4.6 MW       |
| <b>Total</b>                  | \$33,511,517 |   |

Source: Rialto Bioenergy Facility, LLC

**Table 2: Fund Distribution**



Source: Rialto Bioenergy Facility, LLC.

RBF Phase 2 has continued to expand the Facility, the largest supplier of RNG derived from landfill diverted organics in California. As discussed previously, RNG is currently publicly available for sale as a transportation fuel in limited quantities. When operating at full capacity, RBF Phase 2 will produce up to 2.5M DGE of biomethane per year to be used for transportation fuel, making it the largest RNG fuel production facility in California and significantly expanding existing California production capacity.

In addition to the RNG created, by diverting food waste from the landfill, the project had reduced GHG emissions by 1,438 MTCO<sub>2</sub>e as of October 2021 and is on target to reduce GHG emissions by 16,084 MTCO<sub>2</sub>e per year by 2022. A further reduction per annum of at least 2,617 MTCO<sub>2</sub>e is projected due to edible food rescued and donated to High Desert Second Chance food pantry

as part of the CalRecycle grant. Table 3 lists the projected reductions due to diverted food waste and edible food rescued.

**Table 3: GHG Reductions by Material Type**

| <b>Year</b>               | <b>Material Type</b> | <b>Tons of Organic Material Diverted by Material Type</b> | <b>GHG Reductions by Material Type (MTCO2e)</b> |
|---------------------------|----------------------|---|---|
| <b>As of October 2021</b> | Diverted Food Waste  | 5,527.8   | 1,478   |
| <b>2021</b>               | Diverted Food Waste  | 14,183.3  | 3,791   |
| <b>2022 onwards</b>       | Diverted Food Waste  | 60,171.4  | 16,084  |
| <b>As of October 2021</b> | Edible Food Rescued  | 1,164   | 2,072   |
| <b>2021</b>               | Edible Food Rescued  | 1,300   | 2,314   |
| <b>2022 Onwards</b>       | Edible Food Rescued  | 1,500   | 2,670   |

Source: Rialto Bioenergy Facility, LLC

From a technological standpoint, the innovative suite of technologies targeting MSW-derived food/organic waste, liquid commercial waste, and biosolids management promises to be replicable in up to 12 other major metropolitan areas in California alone, and in more than 100 such areas nationally. In addition, individual components demonstrated under the Facility will also be viable for use in smaller applications focused on a single waste stream. Therefore, by supporting early market development of these technologies, Anaergia can ultimately support the deployment of 52 additional RNG production facilities of equal size to the Facility in the state within the next two decades.

# Chapter 3: Project Approach

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## 3.1 Project Approach

The Recipient and project team designed RBF Phase 2 to produce RNG from MSW, with the goal of producing 2.5M DGE per year. RBF Phase 2 has expanded upon existing CEC funded projects and it was anticipated that RBF Phase 2 would divert 85,800 tons/yr food of organic waste feedstock and in doing so eliminate 42,002 MT of carbon emissions annually.

See Chapter 4 for a description of the detailed technical processes involved in converting MSW into RNG.

## 3.2 Final Project Elements

For RBF Phase 2, the Recipient procured, installed, and commissioned the following project elements:

- Biogas Conditioning Skid (see to Figure 21)
- Membrane Biogas Upgrading System (see to Figure 9 and 10)
- Ammonia Scrubber and Water Treatment Skid (see to Figure 12 and 14)
- Biogas Conditioning Skid: Activated Carbon, Chiller, Heat Exchanger (see to Figure 15, 16 and 17)
- Biogas Conditioning Skid: Biogas Analysis (see to Figure 18)
- Biogas Storage (see to Figure 19)
- Piping and Valves for Biogas (see to Figure 19)
- Natural Gas Pipeline Interconnection (see to Figure 20)

## 3.3 Tasks and Key Deliverables

Recipient and the project team deployed the project through the following tasks:

**Task 1: Administration:** With support from Momentum, Recipient oversaw administration of the project, consistent with the subtasks and deliverables identified in the scope of work.

**Task 2: Facility Design and Engineering:** The project team completed all documentation and drawings needed for equipment as well as final permitting and construction. Using the lessons learned from Anaergia's other projects, and from prior upgrades at the Facility site, the project team developed all the relevant engineering documents required for permit review by the City of Rialto.

**Task 3: Facility Construction and Commissioning:** WML completed equipment procurement (initiated after completion of 30% design drawings under Task 2) and completed construction of the project. The project team completed all subtasks and milestones consistent with traditional construction project management, including equipment and material acquisition, installation, and commissioning timelines. This phase completed construction on September 11, 2020. The project team completed commissioning RBF Phase 2 on January 28, 2021. Commissioning was completed incrementally by testing each piece of equipment before

commissioning the phase. The commissioning process included checks and milestones specific to each component, all of which were validated for performance and durability.

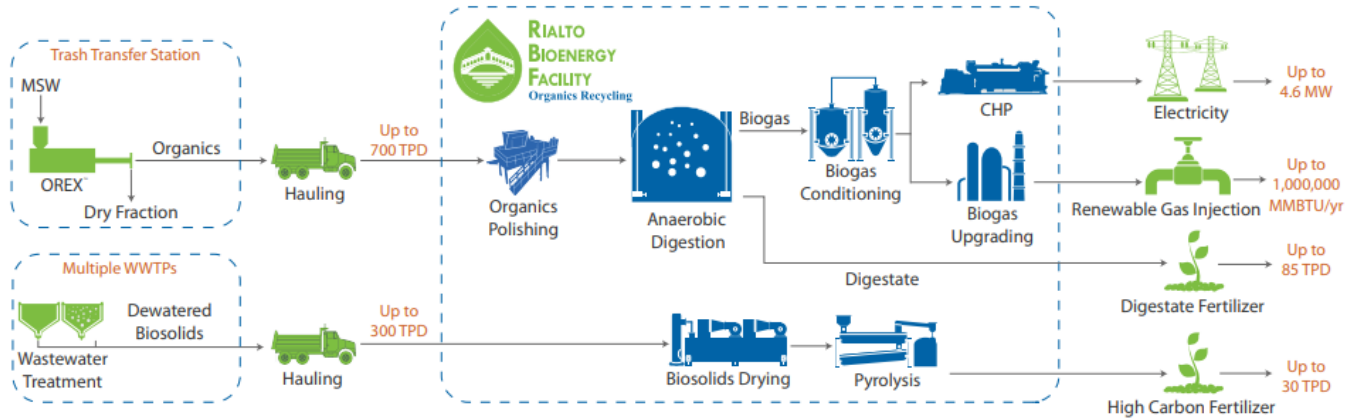
**Task 4: Data Collection and Analysis:** The project team is gathering data on a consistent basis. The Facility keeps detailed records of incoming feedstock (using truck scales), biomethane production, and RNG injected into the pipeline. These numbers are recorded on a daily or monthly basis and used to track ramp-up progress, financial records, and GHG emissions.

# Chapter 4: System Design

## 4.1 System Summary and Flow Diagram

The Facility system includes an OREX installed at the Waste Management Materials Recovery Facility as well as an organics polishing system, an innovative High-Solids Anaerobic Digester (HSAD), and Air Liquide biogas cleaning and compression equipment that was funded by this grant.

**Figure 8: Project flow Diagram**



**This diagram shows the inputs and outputs of the Facility**

Source: Rialto Bioenergy Facility, LLC

## 4.2 Food Waste from MSW

The Facility receives feedstock from the innovative Anaergia OREX pre-processing system at the Waste Management Material Recovery Facility, a centralized location in Sun Valley. The OREX is the only technology capable of cost-effectively extracting the vast majority ( $\geq 90\%$ ) of putrescible organic waste from mixed MSW.

The OREX has been integrated into a new pre-processing “wet line” that has enabled Waste Management to send organic food waste extruded from the MSW stream to the facility. Waste Management has created route-specific waste streams containing high levels of organics to the RBF Phase 2 rather than to the landfill. Specific collection targets include Waste Management’s existing customers that generate high-moisture/high-organic-content wastes. Examples include high-organics commercial and institutional food wastes as well as mixed organics/MSW sourced from multifamily residential complexes.

The waste processing line that incorporates the OREX operates by first shredding the incoming MSW to open bags and liberate their contents, then coarse-screening the waste to remove large non-organic materials such as cardboard and large plastic containers. The screened MSW is now concentrated with organic waste and conveyed into an in-feed chamber of the OREX. Here, a hydraulic ram applies 4,000 pounds per square inch (psi) of pressure to the waste, extruding organics through a perforated plate.

Readily digestible and putrescible organics are forced through the holes, while residual material—mainly plastics, paper, bone, and glass—is retained. Organics are extruded as a

stackable cake with 30% solids content. The concentrated nature of the organics minimizes transportation costs and carbon footprint and eliminates the need for dilution water at the transfer station. Residual material is then ejected from the compression cylinder and prepared for further recycling and/or disposal. Meanwhile, organic feedstock is transferred to a storage bin before being loaded into trucks for transport to the RBF. Inert contaminants (glass, grit, paper, plastic fragments, and so on) typically amount to <1.5% of the extruded organics on a dry mass basis.

### **4.3 Feedstock Cleaning**

The wet organic fraction extracted from MSW is received from the Waste Management OREX via truck and unloaded into receiving bins and conveyed by positive displacement pumps to an OPS. The OPS is a two-stage system designed to remove inert contaminants from the incoming feedstock, which would otherwise become entrained in the digester or residual solids downstream. The wet organic fraction is first routed into a dynamic cyclone, which separates floatable rejects (mostly plastic films/from plastic bags that are extruded by the high pressure of the OREX). The cleaned feedstock is next pumped into the proposed high-solids digester located at the Facility site.

### **4.4 Anaerobic Digestion**

Cleaned food waste, along with incoming commercial liquid waste (that is, food waste) is injected into two 3,500,000-gallon anaerobic digesters, one of which was partially funded by the CalRecycle Organics Program, that operate using a 30-day solids retention time (SRT). The digesters require 0.6 MW of heat, which is provided by a combined heat and power (CHP) system. The Facility has included six Anaergia PSM 1500 high-viscosity electric mixers in each digester tank for a total of 12 mixers. These mixers enable higher digester throughput for the size of the digester by efficiently mixing high-solids/high-viscosity slurries that result from the high solids loading rates.

Conventional mixers require a digester volume three times the size of the digester at the Facility to process similar volumes of organic waste. This is because conventional mixers can only mix low-solids/low-viscosity slurries that are roughly three times lower in concentration—requiring more dilution in the feed, tripling the volume of the feed material, and therefore tripling digester volume.

### **4.5 Biogas Cleaning, Upgrading, and Compression**

Biogas produced by the digester is transferred to an Air Liquide biogas system that was funded by RBF Phase 2 and includes biogas conditioning, membrane biogas upgrading, and RNG compression. The Biogas Conditioning Skid removes gas constituents—including water, hydrogen sulfide gas (H<sub>2</sub>S), siloxanes, and non-desirable volatile organic compounds (VOCs)—that could otherwise foul or damage downstream equipment. The Air Liquide biogas conditioning skid was chosen as an industry-standard system capable of meeting required specifications for the subsequent membrane-based upgrading system. The membrane biogas upgrading system uses membranes to remove CO<sub>2</sub>, O<sub>2</sub>, and any residual water, H<sub>2</sub>S, and other residual contaminants—producing RNG with at least 98% purity. Output from the system is compositionally ready for pipeline injection but still requires compression. The RNG Compressor

brings the RNG up to pipeline pressure—300 psig. The system is functionally equivalent to an industry-standard natural gas compressor, used widely across RNG and the fossil natural gas industry to compress the target gas to pipeline pressures.

## **4.6 Drying**

The Facility has below-grade receiving bins and above-ground storage for biosolids. After reception and storage, biosolids will be transferred to one of two medium-temperature belt dryers. The dryers use waste heat and pyrolysis gases from the pyrolysis process as the heat sources. The dryers use no external fossil fuel for drying. The incoming biosolids can range from 24% to 30% total solids (TS) and are dried to greater than 90% TS dry pellets. The resulting product is a high-quality Class A fertilizer.



# Chapter 5: Project Implementation and Results

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## 5.1 Project Design and Construction

The Recipient and the CEC kicked off the project on July 24, 2019. Since this was an expansion of an existing facility, all permits, and subcontractors were already in place. Engineering plans were completed in Q1 2020 and along with WML and Anaergia Technologies, LLC, the Recipient completed procurement of the necessary equipment in Q3 2020. Other than minor delays in the delivery of some equipment due to the COVID-19 pandemic, the construction was completed on schedule.

**Figure 9: Biogas Upgrader Membranes #1**



Source: Rialto Energy Facility, LLC

**Figure 10: Biogas Upgrader Membranes #2**



Source: Rialto Energy Facility, LLC

**Figure 11: Biogas Connection to the Upgrader**



Source: Rialto Energy Facility, LLC



**Figure 12: Ammonia Scrubber**



Source: Rialto Energy Facility, LLC

**Figure 13: H<sub>2</sub>S Vessels**



Source: Rialto Energy Facility, LLC

**Figure 14: Waterskid Treatment**



Source: Rialto Energy Facility, LLC

**Figure 15: Carbon Filters**



Source: Rialto Energy Facility, LLC



**Figure 16: Heat Exchangers**



Source: Rialto Energy Facility, LLC

**Figure 17: Chiller**



Source: Rialto Energy Facility, LLC



**Figure 18: Biogas Analyzer**



Source: Rialto Energy Facility, LLC

**Figure 19: Biogas outlet to Anaerobic Digester**



Source: Rialto Energy Facility, LLC

**Figure 20: Injection Point**



Source: Rialto Energy Facility, LLC

**Figure 21: Biogas Upgrading**



Source: Rialto Energy Facility, LLC



## 5.2 Project Timeline Summary

Table 4 provides a summary timeline of the key milestones and achievements of the project, and Table 5 summarizes grant deliverables.

**Table 4: Project Milestone Summary**

| Milestone                               | Completion Date |
|---|-----------------|
| Limited Notice to Proceed to Construct  | 6/26/2018       |
| Grading Plan Completion                 | 2/19/2019       |
| Major Equipment Ordered                 | 06/10/2019      |
| Electrical Design of Conditioning Area  | 11/27/2019      |
| Conditioning Foundation                 | 12/20/2019      |
| Mechanical Design of Conditioning Area  | 12/31/2019      |
| Install H2S Scrubber Vessels            | 01/06/2020      |
| Biogas Storage Installation             | 01/31/2020      |
| Install Biogas Dehumidification         | 02/20/2020      |
| Install Siloxane Removal Carbon Filters | 02/21/2020      |
| Install BG Ammonia Scrubber             | 03/09/2020      |
| Install Control Panels                  | 05/15/2020      |
| Biogas Piping                           | 07/02/2020      |
| Install Biogas Analyzer                 | 07/31/2020      |

Source: Rialto Bioenergy Facility, LLC

**Table 5: Grant Deliverables Summary**

| Task No. | Task Description                            | Completion Date |         | % Complete | Status   |
|----------|---|-----------------|---------|------------|----------|
|          |   | Planned         | Actual  |            |          |
| 1.1      | Updated Schedule of Products                | 9/30/19         |         |            | Ongoing  |
| 1.1      | Updated List of Match Funds                 | 6/17/19         | 8/8/19  | 100%       | Complete |
| 1.1      | Updated List of Permits                     | 6/17/19         | 8/8/19  | 100%       | Complete |
| 1.1      | Kick-Off Meeting Agenda (CEC)               | 6/17/19         | 7/24/19 | 100%       | Complete |
| 1.2      | 1 <sup>st</sup> CPR Report                  | TBD             |         |            |          |
| 1.2      | Additional CPR Report                       | TBD             |         |            |          |
| 1.3      | Written Documentation of Meeting Agreements | 3/15/22         |         |            |          |
| 1.3      | Schedule for Completing Closeout Activities | 3/15/22         |         |            |          |
| 1.4      | Monthly Progress Reports                    | Monthly         | Monthly |            | Ongoing  |
| 1.5      | Final Outline of the Final Report           | 10/15/21        | 10/1/21 | 100%       | Complete |
| 1.5      | Draft Final Report                          | 1/14/22         |         |            |          |
| 1.5      | Final Report                                | 2/15/22         |         |            |          |
| 1.6      | Letter Regarding Match Status               | 6/13/19         | 8/8/19  | 100%       | Complete |



|     |   |              |          |      |          |
|-----|---|--------------|----------|------|----------|
| 1.6 | Copies of Match Fund Commitment Letter                  | 6/14/19      | 8/8/19   | 100% | Complete |
| 1.7 | Letter Documenting the Permit Status                    | 6/13/19      | 8/8/19   | 100% | Complete |
| 1.8 | Letter Describing Subcontracts Needed                   | 9/30/19      | 9/10/19  | 100% | Complete |
| 1.8 | Draft Subcontracts                                      | Per Contract | 9/10/19  | 100% | Complete |
| 1.8 | Final Subcontracts                                      | 9/30/19      | 9/10/19  | 100% | Complete |
| 2   | Written Notification of Completion of Engineering Plans | 1/30/20      | 3/4/2020 | 100% | Complete |
| 2   | Construction and Equipment List                         | 1/20/20      | 1/21/20  | 100% | Complete |
| 3   | Procurement Plan (Draft)                                | 1/20/20      | 1/13/20  | 100% | Complete |
| 3   | Procurement Plan (Final)                                | 2/28/20      | 2/28/20  | 100% | Complete |
| 3   | Procurement Report (Draft)                              | 8/30/20      | 8/24/20  | 100% | Complete |
| 3   | Procurement Report (Final)                              | 9/15/20      | 9/2/20   | 100% | Complete |
| 3   | Construction Plan (Draft)                               | 1/20/20      | 1/21/20  | 100% | Complete |
| 3   | Construction Plan (Final)                               | 2/28/20      | 2/28/20  | 100% | Complete |
| 3   | Written Notification of Site Preparation                | 1/7/20       | 1/7/20   | 100% | Complete |
| 3   | Major Project Change List                               | 7/13/20      | 7/22/20  | 100% | Complete |
| 3   | Construction Report (Draft)                             | 1/15/21      | 1/8/21   | 100% | Complete |
| 3   | Construction Report (Final)                             | 1/31/21      | 1/28/21  | 100% | Complete |
| 3   | Written Notification of Completion of Installation      | 10/30/20     | 12/11/20 | 100% | Complete |
| 3   | Testing and Commissioning Plan (Draft)                  | 9/2/20       | 9/2/20   | 100% | Complete |
| 3   | Testing and Commissioning Plan (Final)                  | 10/15/20     | 9/30/20  | 100% | Complete |
| 3   | Testing and Commissioning Report (Draft)                | 1/31/21      | 1/25/21  | 100% | Complete |
| 3   | Testing and Commissioning Report (Final)                | 2/15/21      | 1/25/21  | 100% | Complete |
| 3   | Written Notification of Completion of Commissioning     | 1/31/21      | 1/28/21  | 100% | Complete |
| 4   | Initiation of Operation (no deliverable required)       | 1/31/20      | 10/6/20  | 100% | Complete |

Source: Rialto Bioenergy Facility, LLC

### 5.3 Commissioning

Consistent with the Testing and Commissioning Plan, RBF Phase 2 conducted performance testing on the following equipment:

- Biogas Conditioning Skid
- Membrane Biogas Upgrading System
- Ammonia Scrubber and Water Treatment Skid
- Biogas Conditioning Skid: Activated Carbon, Chiller, Heat Exchanger
- Biogas Conditioning Skid: Biogas Analysis
- Biogas Storage
- Piping and Valves for Biogas
- Natural Gas Pipeline Interconnection

In addition to performance tests, the equipment also underwent the following tests:

- **Factory Acceptance Testing** – Upon completion of vendor control panels prior to shipment, manufacturer’s certificate of testing was provided.
- **Certification of Installation** – The Contractor and Vendor certified that all equipment was installed per manufacturers’ recommended practices.
- **Commissioning** – Equipment was commissioned in accordance with manufacturers’ written instructions.
- **Site Acceptance Testing (SAT)** – Upon completion of commissioning, a SAT was conducted on each piece of equipment or component of the system.
- **System Testing** – Upon completion of the individual SATs, a full system test was conducted.

Commissioning was completed by January 28, 2021. A summary of the testing and commissioning results was included in the Testing and Commissioning Report.

## 5.4 Project Operations

### 5.4.1 Throughput, Usage, and Operations Data

Due to the limited deliveries of feedstock as well as the challenges presented by the COVID-19 pandemic, the current throughput data does not represent the intended capacity of the Facility. The report will be updated at a later date with new data and will present a better representation of the Facility’s capabilities. Please see Attachment A for preliminary data.

### 5.4.2 Normal Operating Hours, Uptime, and Downtime

The operating hours for the facility are 24/7. There is some downtime due to maintenance; however, this is difficult to predict. This downtime is kept to a minimum to maximize facility operations.

### 5.4.3 Feedstock Supply Summary

As mentioned in Section 5.4.1 above, due to the limited deliveries of feedstock, the data does not represent the intended capacity of the Facility and will be updated later. Please see Attachment A for preliminary data.

### 5.4.4 Maximum Fuel Production Capacity

**Table 6: Fuel Production Capacity(as of October 2021)**

| <b>Max Fuel Production at Facility Capacity</b> | <b>Amount</b> | <b>Unit</b> |
|---|---------------|-------------|
| <b>Max Avg Flow</b>                             | 671.1         | SCFM        |
| <b>Max Daily Volume</b>                         | 966,445.7     | SCF         |
| <b>Heat Value of Biomethane</b>                 | 1,010.0       | BTU/SCF     |
| <b>Max Biomethane Injected Daily</b>            | 976.1         | MMBTU       |
| <b>Max Biomethane Injected Annually</b>         | 356,280.3     | MMBTU       |

Source: Rialto Bioenergy Facility, LLC

#### **5.4.5 Class A Soil Production**

As mentioned in Section 5.4.1 above, due to the limited deliveries of feedstock, the data does not represent the intended capacity of the Facility and will be updated later. Please see Attachment A for preliminary data.

#### **5.4.6 Waste from Production Processes**

The OPS rejects any plastics or other non-organic material that is not suitable for anaerobic digestion; these rejects are sent to a nearby landfill. Please refer to Attachment A for preliminary data.

**Figure 22: OPS Rejects Collection**



Source: Rialto Bioenergy Facility, LLC

## **5.5 RNG Production, Quality, and Standards**

### **5.5.1 RNG Carbon Intensity**

The Facility RNG Carbon Intensity (CI) score is currently at -58 gCO<sub>2</sub>e/MJ and is continuing to drop as the Facility ramps up biomethane production. The CI score is calculated via the GREET model from the California Air Resource Board (CARB). The Facility uses the Siemens InfoServer to pull most of the data as well as scale tickets and monthly utility invoices.

### **5.5.2 RNG Fuel Price**

RNG prices change daily due to the market, and it is difficult to predict future prices. Below is an average provided by EcoEngineers.

**Figure 23: RNG Fuel Price**  


**Daily RIN, LCFS & CFP Update**

8/9/21

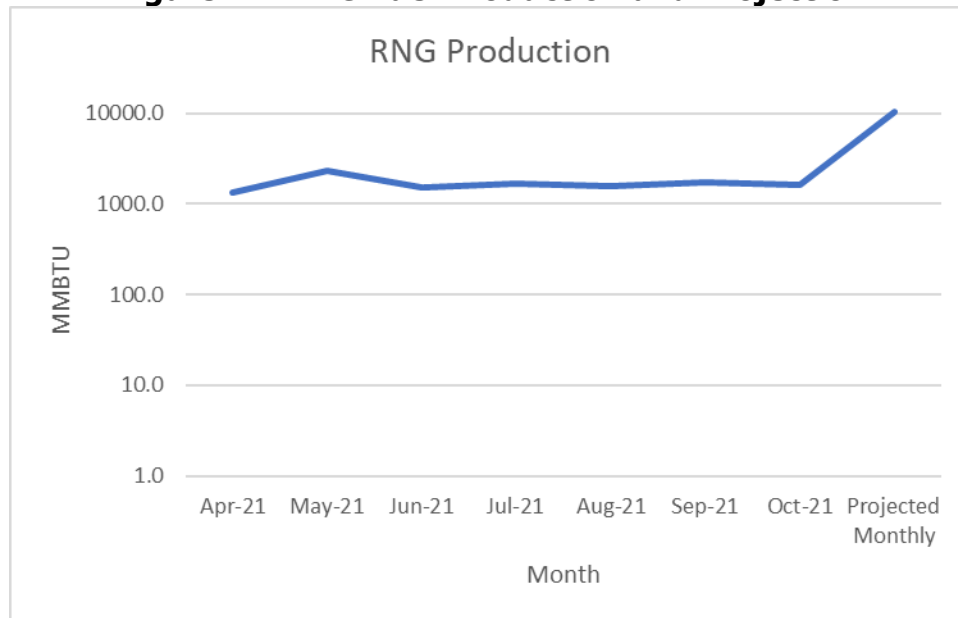
| D-Code                 | Average Price |         |         | Closing Value |         |         |
|------------------------|---------------|---------|---------|---------------|---------|---------|
|                        | 2019          | 2020    | 2021    | 2019          | 2020    | 2021    |
| D3                     | \$3.170       | \$3.200 | \$3.180 | \$3.170       | \$3.200 | \$3.180 |
| D4                     | \$1.790       | \$1.820 | \$1.805 | \$1.790       | \$1.820 | \$1.800 |
| D5                     | \$1.780       | \$1.810 | \$1.790 | \$1.780       | \$1.810 | \$1.790 |
| D6                     | \$1.670       | \$1.680 | \$1.681 | \$1.670       | \$1.680 | \$1.675 |
|                        | Average Price |         |         | Closing Value |         |         |
| California LCFS Credit | \$182.50      |         |         | \$182.50      |         |         |
| Oregon CFP Credit      | \$125.00      |         |         | \$125.00      |         |         |

*Data Provided in the EcoEngineers Daily RIN Price Update is intended for informational purposes only.*

**5.5.3 RNG Production and Diesel Displacement**

The data being presented for RNG production are limited by the feedstock being delivered. Please see Section 5.4.1 for the reasons causing this limitation. The data will be updated at a later date as the Facility is able to procure more feedstock and the anaerobic digesters have achieved the ideal microbial environment for biogas production.

**Figure 24: RNG Fuel Production and Projection**



Source: Rialto Bioenergy Facility, LLC

**Table 7: Diesel Displacement**

| <b>Month</b>          | <b>RNG Delivered (Dth)</b> | <b>DGE Displacement</b> |
|-----------------------|----------------------------|-------------------------|
| <b>April 2021</b>     | 1,334.4                    | 9,607.3                 |
| <b>May 2021</b>       | 2,303.2                    | 16,583.1                |
| <b>June 2021</b>      | 1,528.1                    | 11,002.0                |
| <b>July 2021</b>      | 1,670.8                    | 12,029.6                |
| <b>August 2021</b>    | 1,585.9                    | 11,418.8                |
| <b>September 2021</b> | 1,747.9                    | 12,585.2                |
| <b>October 2021</b>   | 1,597.5                    | 11,502.1                |
| <b>Total</b>          | 11,767.81                  | 84,728.25               |

Source: Rialto Bioenergy Facility, LLC

#### **5.5.4 Low Carbon Fuel Standard and Renewable Fuel Standard**

The facility follows SoCalGas Rule 45, which can be found in Appendix 1.

#### **5.5.5 Duty Cycle of Current Fleet and Future Vehicle Acquisitions**

The Recipient has made extensive efforts to conduct outreach for low-NOX fleet conversion, including outreach to over 70+ fleet operators within the State of California over the course of the grant. Through this outreach, there was significant interest by companies to learn more about CNG/RNG and the availability of fuel. Several fleet operators expressed plans to convert their fleet and seek additional information about how to acquire RNG from the facility.

### **5.6 Project Economics**

#### **5.6.1 Project Jobs and Economic Development**

RBF has directly created a total of 24 new full-time, permanent jobs:

Chief operator (4 jobs)

Facility Administrator (1 job)

Facility Manager (1 job)

Instrumentation Technician (2 jobs)

Maintenance Manager (1 job)

Maintenance Mechanic Technician (3 jobs)

Maintenance Mechanic Trainee (1 Job)

Operations Manager (1 job)

Operations Technician (4 jobs)

Operations Technician Trainee (5 jobs)

Lab Technician (1 job)

All job titles listed are essential to the operation of the RBF. Recipient intends to continue employing these employees throughout the life of the project, which Recipient anticipates will be more than 20 years. During this time, it will be subject to upgrades and repairs to prolong its life cycle. All salaries will be sustained through RBF revenues.

### 5.6.2 Facility Financials Summary

**Table 8: Grant Invoice Summary**

| Invoice Number | Invoice Date | Reimbursement Amount | Match Amount   |
|----------------|--------------|----------------------|----------------|
| 1              | 7/10/2019    | \$2,203,600.72       | \$2,917,173.75 |
| 2              | 8/20/2019    | \$104,452.40         | \$0            |
| 3              | 1/13/2020    | \$456,805.00         | \$0            |
| 4              | 4/15/2020    | \$151,761.88         | \$0            |
| <b>Total</b>   |              | \$2,916,620.00       | \$2,917,173.75 |

Source: Rialto Bioenergy Facility, LLC

## 5.7 Environmental Impact

### 5.7.1 Greenhouse Gas Emissions

Please see Table 3 for GHG reductions.

**Table 9: Air Emissions Summary**

| Particulates                        | Amount as of October 2021(lbs) | Projected Amount(lbs) |
|-------------------------------------|--------------------------------|-----------------------|
| <b>ROG (Reactive Organic Gases)</b> | 452                            | 5,395                 |
| <b>NOx (Nitrous Oxide)</b>          | 120                            | 1,431                 |
| <b>PM2.5</b>                        | 59                             | 700                   |
| <b>Diesel PM</b>                    | 6                              | 76                    |

Source: Rialto Bioenergy Facility

## 5.8 Facility Operations

### 5.8.1 Title 24 Standards

Please see Appendix 2 for Title 24 standards.

### **5.8.2 Potential Economic Development and Expansion**

The project has injected \$180 million directly into California's economy during Facility design and construction. This figure is based on the total Facility cost with a multiplier of 1.48 per dollar spent to account for indirect economic activity, such as raw materials, logistics, transportation, customer service, technical support, regulatory and safety specialists, distribution, professional services, and taxes. During operations, the Facility will contribute a minimum of approximately \$7.5 million per year in additional statewide economic activity driven by RNG sales, tipping fees, coproduct sales, and new employment.

In addition, the Facility's innovative suite of technologies targeting MSW-derived food/organic waste, liquid commercial waste, and biosolids management aims to be replicable in up to 12 other major metropolitan areas in California alone and over 100 such areas nationally. Individual components demonstrated under the facility will also be viable for use in smaller applications focused on a single waste stream. Therefore, by supporting early market development of these technologies, the facility could ultimately support the deployment of 52 additional RNG production facilities of equal size to the Facility in the state within the next two decades.



## Chapter 6: Project Outreach

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The Recipient developed a comprehensive outreach plan to actively engage community members and to support general community engagement. The plan was affected by COVID-19 restrictions but includes the following elements, which the Recipient will reestablish once the pandemic is over:

- Open house events designed to make DAC members and other stakeholders aware of the RBF, its operations, and the significant benefits of renewable energy. Pre-COVID-19 events included open house events, meetings, and site tours with a variety of attendees, including local tribe members, the Mayor of Rialto, Workforce Development agencies, other city officials, and local schools and colleges. These activities will continue throughout the working life of the RBF. Open house events have served as opportunities to educate local community members about upcoming job openings as well as upcoming job training opportunities and are held in coordination with the Workforce Development Department of San Bernardino County.
- A groundbreaking event was held on December 7, 2018, with stakeholders from around the state. A total of 27 organizations attended, including the California Energy Commission, CalRecycle, California Air Resources Board, and the U.S. Department of Energy.
- A follow-up Stakeholder meeting was held on September 4, 2019. The meeting was to introduce those new to the project to the technology involved and to initiate the process of engagement with local community leaders that supported the project.
- Site tours were also a critical part of engaging stakeholders with the project. For example, on August 29, 2019, the Los Angeles County Sanitation District was given a tour of the facility. Their feedback was positive because the Facility had similarities with their own visions and objectives.
- Hiring targeted specifically at DACs throughout the working life of the Facility.
- Allocation of \$3,000 per year in annual scholarships for local high school seniors intending to follow environmentally related career paths. The first Rialto Bioenergy Facility Environmental Stewardship Awards were given to three students from Carter High School and Rialto High School in June 2021.
- Partnership with the San Bernardino Workforce Development through the Business Services Supervisor Curtis Compton. Mr. Compton is engaged as a community champion for the project and promotes the project at outreach events.
- Anticipated ribbon-cutting event for community and state stakeholders.

# Chapter 7: Lessons Learned and Conclusions

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## 7.1 Key Lessons

The Recipient has learned a great deal working through the various challenges presented by this project as well as navigating the delays caused by the COVID-19 pandemic. These lessons have been an invaluable learning experience that will serve to make all following projects even more successful. The following are important lessons learned by the Recipient.

- **Schedule**

Starting construction prior to finalizing 100% process design caused delays in the schedule and design review. The Recipient will ensure that 100% process design is completed prior to starting construction in future projects of this scale.

- **Cost**

During 2020, the Recipient experienced delays in materials delivery that contributed to construction delays and increased installation costs with overtime, leading to an overall increase in construction costs. The Recipient will review its risk-assessment planning for future projects including contingency for force majeure events.

- **Technical Aspects**

The Recipient will ensure that the design is reviewed by the operations team much earlier in the design to guarantee that all operations team requirements are incorporated into the plans as early as possible to more effectively and efficiently transition from construction to operations.

- **Contract**

The Recipient will aim to complete 90% process design and 30% construction design prior to executing a design build GMP contract to minimize change orders or contemplate completing 100% design of the entire facility and issuing a lump sum contract.

- **Financial/Budget**

The Recipient underestimated the operations startup budget prior to commercial operations to fully commission and hand over the facility. The Recipient will increase the budget for this transition from construction to commercial operations for future projects.

- **Scope**

The Recipient used third-party consultants for detailed design of the facility. The Recipient now understands the need to develop these capabilities in-house and will likely manage and perform detailed engineering in-house rather than outsourcing to third parties to ensure that all lessons learned in this project and others are transferred to new development projects.

- **Feedstock Shipments**

Due to the COVID-19 pandemic and the limited enforcement of SB 1383, feedstock has not been delivered at the desired rate. The Facility has the capacity to receive a higher volume of processed organics and expects the feedstock deliveries to continue ramping up in the next few months until capacity is reached.

## **7.2 Conclusions**

This Facility continues to be the largest anaerobic digestion facility in North America. This is a flagship project that establishes California as the epicenter of food waste RNG production. This Facility since its inception with support from has served as a showcase for agencies nationwide evaluating AD opportunities.

The CEC funding of this project was critical to its success. The investment by the state into the project at the beginning and intermediary phases of a larger multistage project demonstrated the potential of converting organic waste from MSW into RNG. As the Facility ramps up, the GHG reductions and RNG production will only increase. Due to the ramp-up nature of anaerobic digesters, it will be several years until full production is realized. The projected RNG production is shown in Figure 24 Currently, production is approximately 10% of the expected projection of a monthly production of 10,000 MMBTU of RNG per month.

The state's investment into the Facility was critical to attracting more traditional private funding, which drove the ability to expand to make a larger environmental impact. In addition to the improved environmental benefits, projects like the Facility can offer significant economic potential through local job creations. As stated in Section 5.8.3., this project has the potential to be implemented in 12 metropolitan areas in California and over 100 such areas in the nation. In addition to aligning with the current goals of SB 1383, this project is an example that producing RNG from feedstocks such as MSW is an impactful and viable solution that will only help California in the current climate crisis.

# Attachment A: Incoming and Outgoing Throughput Data

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|                                       | Oct-20 | Nov-20 | Dec-20 | Jan-21 | Feb-21 | Mar-21 | Apr-21 | May-21 | Jun-21 | Jul-21 | Aug-21 | Sept-21 | Oct-21   | Total    |
|---------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|----------|----------|
| <b>Feedstock Deliveries</b>           |        |        |        |        |        |        |        |        |        |        |        |         |          |          |
| Food Waste Tankers (tons)             | 134.10 | 462.26 | 347.37 | 585.45 | 379.34 | 380.55 | 367.40 | 311.70 | 474.15 | 489.33 | 494.44 | 692.27  | 691.18   | 5,809.55 |
| Food Waste End Dump (tons)            | 17.65  | 144.84 | 134.56 | 206.19 | 159.00 | 278.45 | 308.48 | 292.98 | 230.88 | 290.04 | 302.60 | 247.40  | 394.10   | 3,007.17 |
| Total (tons)                          | 151.75 | 607.10 | 481.93 | 791.64 | 538.35 | 659.00 | 675.88 | 604.68 | 705.03 | 779.37 | 797.03 | 939.67  | 1,085.28 | 8,816.73 |
| Biosolids (tons)                      | -      | 138.86 | -      | 57.00  | 116.14 | 99.78  | -      | 39.14  | 47.84  | 190.93 | 548.22 | 278.93  | 381.49   | 1,898.34 |
| <b>Outgoing Trailers</b>              |        |        |        |        |        |        |        |        |        |        |        |         |          | -        |
| Digestate for Land Application (tons) | -      | -      | 5.00   | 8.23   | 52.70  | 96.27  | 124.18 | 187.62 | 98.09  | 98.26  | 70.75  | 122.31  | 138.05   | 1,001.47 |
| Class A Dried Biosolids (tons)        | -      | -      | -      | -      | -      | -      | -      | -      | -      | 11.97  | 69.56  | 47.92   | 137.12   | 266.57   |
| Total (tons)                          | -      | -      | 5.00   | 8.23   | 52.70  | 96.27  | 124.18 | 187.62 | 98.09  | 110.23 | 140.31 | 170.22  | 275.18   | 1,268.04 |
| Rejects/Plastic (tons)                | -      | -      | 5.95   | 6.18   | 45.16  | 23.54  | 39.14  | 35.44  | 24.17  | 33.79  | 47.18  | 37.51   | 46.22    | 344.29   |

# GLOSSARY

**CALIFORNIA ENERGY COMMISSION (CEC)**—The state agency established by the Warren-Alquist State Energy Resources Conservation and Development Act in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy policy. The Energy Commission's five major areas of responsibilities are:

1. Forecasting future statewide energy needs
2. Licensing power plants sufficient to meet those needs
3. Promoting energy conservation and efficiency measures
4. Developing renewable and alternative energy resources, including providing assistance to develop clean transportation fuels
5. Planning for and directing state response to energy emergencies.

**COMPRESSED NATURAL GAS (CNG)**—Natural gas that has been compressed under high pressure, typically between 2,000 and 3,600 pounds per square inch, held in a container. The gas expands when released for use as a fuel.

**RENEWABLE NATURAL GAS (RNG)** is a pipeline-quality gas that is fully interchangeable with conventional natural gas and thus can be used in natural gas vehicles. RNG is essentially biogas (the gaseous product of the decomposition of organic matter) that has been processed to purity standards.

**CALIFORNIA AIR RESOURCES BOARD (CARB)**—CARB is charged with protecting the public from the harmful effects of air pollution and developing programs and actions to fight climate change. From requirements for clean cars and fuels to adopting innovative solutions to reduce greenhouse gas emissions, California has pioneered a range of effective approaches that have set the standard for effective air and climate programs for the nation and the world.

**LOW CARBON FUEL STANDARD (LCFS)**—Under the AB 32 Scoping Plan, the Board identified the Low Carbon Fuel Standard as one of the nine discrete early-action measures to reduce California's greenhouse gas emissions that cause climate change. The LCFS is a key part of a comprehensive set of programs in California to cut GHG emissions and other smog-forming and toxic air pollutants by improving vehicle technology, reducing fuel consumption, and increasing transportation mobility options. The LCFS is designed to decrease the average carbon intensity of California's transportation fuel and provide an increasing range of low-carbon and renewable alternatives, which reduce petroleum dependency and achieve air quality benefits.

**DIESEL GALLON EQUIVALENT (DGE)**—The amount of special fuel, or special fuel that is liquefied natural gas or compressed natural gas, that is equivalent in terms of energy content to 1 gallon of diesel fuel, as provided in this subsection. The equivalent amount is the amount of fuel that by volume possesses an energy content of 129,500 British thermal units.

