RNG Interconnection Overview

EPA/AGA RNG Workshop - September 2019

SoCalGas

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Interconnection: Overview of Components

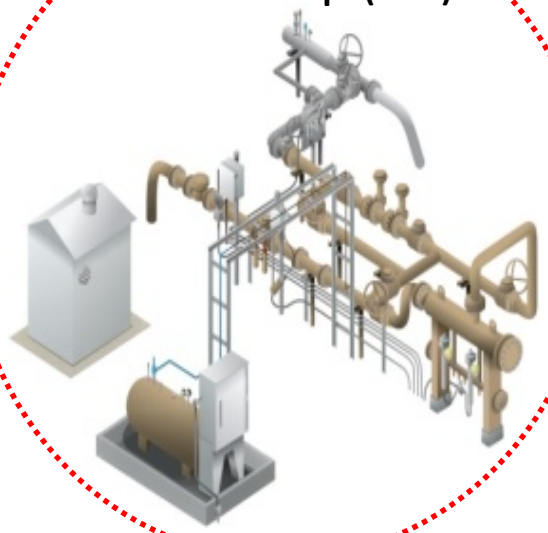
Two Primary Components of the Term "Interconnection"

("Interconnection" = "Point of Receipt" + "Pipeline Extension")

Customer Pipeline

RNG from biogas conditioning upgrading plant

"Point of Receipt (POR)"



Utility Pipeline

"Pipeline Extension"
(cost is site specific)

Interconnection Facilities are Funded by Interconnector and Owned/Operated by SoCalGas

RNG Toolkit
(Available at socalgas.com/rg)

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BIOGAS CONDITIONING/ UPGRADING SERVICES TARIFF

The Biogas Conditioning/Upgrading Services Tariff is a fully elective, optional, nondiscriminatory tariff service for customers that allows SoCalGas® to plan, design, procure, construct, own, operate, and maintain biogas conditioning and upgrading equipment on customer premises. The biogas will be conditioned/upgraded to the gas quality specifications as requested by the customer and agreed to by SoCalGas.

KEY ELEMENTS

- The Biogas Conditioning/Upgrading Services Tariff is a fully compensatory service paid by participating customers. Monthly tariff services pricing will vary based on the size, scope and location of each project.
- The Biogas Conditioning/Upgrading Services Tariff will be provided through a long-term Service Agreement, typically 10-15 years. At the end of the contract term, customer may request to extend the term of the agreement or ask SoCalGas to remove the equipment.
- The tariff service is neither tied to any other tariff or non-tariff services the customer may receive from SoCalGas nor will it change the manner in which these services are delivered.
- Non-utility service providers may offer services that are the same or similar to the Biogas Conditioning/Upgrading Services Tariff and customers are encouraged to explore these service options.
- To assist customers in understanding all of their service options, SoCalGas maintains and provides customers with a list of non-utility service providers.

FREQUENTLY

What are some … that would use …

Exemples of cust… be served by the … Tariff include, bu… for pipeline injec… refueling station… combined heat a…

Is the Biogas Conditioning/Upgrading Services Tariff mandatory if customers want to put renewable natural gas (biomethane) into the pipeline?

No. Customers may elect to install and maintain their own biogas conditioning and upgrading equipment or engage a third party to install and maintain their biogas conditioning and upgrading equipment rather than take the Biogas Conditioning/Upgrading Services Tariff from SoCalGas.

Does enrollment in this tariff result in any preferential treatment when it comes to getting gas service?

No. The Biogas Conditioning/Upgrading Services Tariff is a fully elective, optional, non-discriminatory tariff service that is neither tied to any other tariff or nontariff services the customer may receive from SoCalGas nor will it change the manner in which these services are delivered. As an example, requests for an interconnection capacity study are processed on a "first come, first served" basis for all customers, including customers that elect to take the Biogas Conditioning/Upgrading Services Tariff and customers that do not.

Who can receive service under the Biogas Conditioning/

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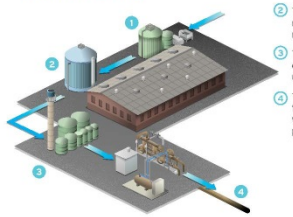
RENEWABLE NATURAL GAS
PART OF CALIFORNIA'S RENEWABLE ENERGY FUTURE

WHAT IS RENEWABLE NATURAL GAS?

Traditionally, pipeline natural gas comes from deep underground wells and is often associated with petroleum production. On the other hand, renewable natural gas (RNG) is natural gas derived from organic waste material found on the surface of the earth. In California, and throughout the United States, there are a variety of sources of this organic waste, which we see in daily life. These include food waste, garden and lawn clippings, animal and plant-based material as well as degradable carbon sources such as paper, cardboard and wood. The abundance of this material can allow for production of biogas in significant quantities.

The most common source of biogas is the naturally-occurring biological breakdown of organic waste at facilities such as wastewater treatment plants and landfills. Biogas typically consists of methane and carbon dioxide, with traces of other elements. Biogas is cleaned and conditioned to remove or reduce non-methane elements in order to produce RNG. The converted RNG is then put into the utility pipeline as a replacement for traditional natural gas. This process helps promote the safe and reliable operation of the natural gas pipeline distribution network as well as the natural gas equipment and appliances used by customers.

HOW ORGANIC WASTE IS CONVERTED INTO RNG



1. Waste products, such as sludge, food waste or manure are processed in a biodigester.
2. The biodigester breaks down the organic material to create biogas – a mixture of methane and other elements.
3. The biogas can then be processed and conditioned leaving behind RNG, which can be used interchangeably with traditional natural gas.
4. This RNG can be used where it is produced for things like generating electricity or fueling vehicles, or it can be injected into a utility pipeline for transportation to other customers.

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TOOLS AND TIPS
FOR RENEWABLE NATURAL GAS (RNG) PROJECTS CONNECTING TO THE SOCALGAS® PIPELINE

Once RNG is conditioned and upgraded, it can be injected into the SoCalGas pipelines. But, location of the interconnection is critical. A nearby pipeline must have the capacity to accept the volume of RNG produced. Customer demand fluctuates daily and seasonally, and natural gas pipelines typically flow in one direction – from higher pr… systems to lower pressure distributio… this reason, SoCalGas must conduct … analysis to find a feasible location.

WHAT FACTORS DETERMIN… VIABILITY OF PRODUCING … RNG*?

The necessary components and relat… condition and upgrade raw biogas an… the pipeline can vary, depending on t… and quality of the raw biogas as well … location. Below a certain quality level … may not be economical to produce R… incentives. Typically, the larger the pr… cleaner the raw biogas, the more eco… feasible that project will be. Project s… the only design factor that may impa… economics. Some other major compo… can play a significant, but often mana… project costs are:

- Equipment to remove nitrogen a… (capital and operating cost driver)
- Compression for processing and … injection (capital and operating …
- Long-distance high pressure pipe… extension (capital cost driver)

1. REMOVING NITROGEN AND/OR …

Often landfills and other biogas so… air infiltration, meaning that nitrog… oxygen can be inadvertently mixed… biogas. Both nitrogen and oxygen …

…ION

…ral gas (RNG) is a carbon-neutral …t replaces traditional natural gas. … important role in reducing the …house gas (GHG) emissions from …system. RNG typically comes …rces such as landfills, wastewater …lls, manure, and food and green … biogas contains byproducts or …t need to be removed so they … impact end-use equipment or the …moving these compounds, also …ing and/or upgrading, ensures the …ipeline standards, as defined in … 30. Conditioning and upgrading …pipeline standards typically includes …r, carbon dioxide (CO_2), hydrogen …d other elements. Numerous …ailable conditioning and upgrading …eady in use here in the United States

Informational purposes only. SoCalGas makes no claim to the viability of merchantability of this information. Interested parties need to perform th… in these sorts of projects

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BIOGAS SUPPLIER LIST

Last Updated: April 25, 2017

NORTH AMERICA

UNITED STATES

Acrion Technologies http://www.acrion.com	7777 Exchange Street, Suite 5 Cleveland, OH 44124	314-669-2612
BioCNG, LLC http://www.biocng.us	8413 Excelsior Drive, Suite 160 Madison, WI 5371	630-410-7202
CH4 Biogas http://ch4biogas.com/	30 Lakewood Circle N Greenwich, CT 6830	203-869-1446
… Energy Fuels …/www.cleanenergyfuels.com/company/…vablefuels.html	4675 MacArthur Court, Suite 800 Newport Beach, CA 92660	949-…
… Horizons, LLC …/www.clearhorizonsllc.com	5070 N. 35th Street Milwaukee, WI 53209	414-…
…y Energy Partners …/www.colonyenergypartners.com	4940 Campus Drive, Suite C Newport Beach, CA 92660	949-…
…bia Biogas …/www.columbiabiogas.com/	PO Box 4120, Suite 55888 Portland, OR 97208	503-…
…orp …/www.ecocorp.com/	1211 S Eads Street Arlington, VA 22202	703-…
…mann Corporation …/www.eisenmann.com	150 East Dartmore Drive Crystal Lake, IL 60014	815-…

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RENEWABLE NATURAL GAS TOOL KIT

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RENEWABLE NATURAL GAS (RNG)

GAS QUALITY STANDARDS

THE SOCALGAS® GAS QUALITY STANDARDS

SoCalGas® Rule 30 describes the requirements for gas to be injected into the utility pipeline. These requirements reflect the first and foremost priority of SoCalGas to protect its customers, employees, …peline system. The standards cover two … aspects: gas constituent limits (composition-… specifications) and gas interchangeability …cations (performance-based quality …cations). Gas constituent limits restrict the …ntration of gas impurities to protect pipeline …ty and ensure safe and proper combustion …user equipment. The interchangeability …cations address end-user combustion performance, ensuring safe and proper combustion for customers.

SoCalGas Rule 30, Section I.5. provides Interconnectors with the option to request specific deviations from meeting the defined gas quality specifications in Section I.3. If SoCalGas determines such gas will not negatively impact system operations, SoCalGas is then required to file an Advice Letter for California Public Utilities Commission (CPUC) appr… permitted to flow into the …

The table below shows so… from across the United St… are specific to each pipeli…

Pipeline Company	Heating Value (Btu/scf) Min	Heating Value (Btu/scf) Max	Water Content (Lbs/MMscf)	Various Ine… CO_2	Various Ine… O_2
…Gas	990	1150	7	3%	0.20%
…ion Transmission	967	1100	7	3%	0.20%
…ans LP	970	–	7	3%	0.20%
… Gas Transmission Co.	1000	1110	7	1%	0.25%
…do Intrastate Gas Co.	968	1235	7	3%	0.001%
…r Pipeline Co.	950	1150	5	2%	0.10%
…ansmission Northwest Co.	995	–	4	2%	0.40%

…CAL GAS CONSTITUENTS FOUND …OGAS

…2, the CPUC issued a decision in the …thane Phase I Order Instituting Rulemaking … in response to AB 1900 (Gatto, 2012). In …R the PUC, in collaboration with other state …es, adopted 17 constituents of concern that …tentially be found in biogas. Reasonably acceptable levels of these human health and system… and ordered to be include… (see Section J.5). As direc… protection levels for each … monitoring, testing, repor… requirements are reviewe… five years, or sooner, if ne… available.

…a Report 1144: Natural Gas Contract Measurement and Quality Clauses (2009). Some standards have been updated based on publicly availab…

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RENEWABLE NATURAL GAS

INTERCONNECTION PROCESS

OVERVIEW

Renewable Natural Gas (RNG), also known as "Biomethane," is biogas that has been processed and upgraded to be interchangeable with traditional natural gas. RNG that meets the standards adopted pursuant to California Health and Safety Code Section 25421 can be put, or injected, into the existing utility natural gas pipelines. SoCalGas® Rule No. 30, "Transportation of Customer-owned Gas," describes the specifications, terms and conditions adopted that must be met in order for SoCalGas to accept RNG into its pipeline network.

The process begins with biogas, which is produced by the anaerobic decomposition of organic material, which occurs naturally. This process happens at facilities such as landfills, landfill diversion facilities, dairies and wastewater treatment plants. This raw biogas is made up of mainly methane and carbon dioxide, with traces of other elements such as water, hydrogen sulfide, siloxanes, nitrogen, and oxygen. Prior to injection into the pipeline, biogas must be conditioned and upgraded to remove or reduce non-methane elements to promote the safe and reliable operation of the pipeline network and end-use natural gas equipment.

BIOGAS PROCESSING TECHNOLOGIES

There are several methods and technologies available to condition biogas. Technology selection can be based on many criteria, including biogas and product gas makeup and site and operating conditions. Some examples of technologies used in biogas conditioning:

- High-selectivity membranes
- Pressure swing adsorption systems
- Water scrubbing systems
- Solid scavenging media
- Regenerative or non-regenerative adsorbent media
- Catalytic O_2 removal

It is common to find a combination of these technologies working in conjunction to meet a set of specification.

BIOMETHANE INJECTION PROCESS

SoCalGas Rule No. 39, "Access to the SoCalGas Pipeline System," provides detailed information on the requirements to interconnect and inject natural gas into utility pipelines. The section below describes the three basic steps of the interconnection process.

SOUTHERN CALIFORNIA GAS COMPANY Revised CAL P.U.C. SHEET NO. 47193-G
LOS ANGELES, CALIFORNIA CANCELING Revised CAL P.U.C. SHEET NO. 43369-G

Rule No. 30 Sheet 1
TRANSPORTATION OF CUSTOMER-OWNED GAS

The general terms and conditions applicable whenever the Utility System Operator transports customer-owned gas, including wholesale customers, the Utility Gas Procurement Department, other end-use customers, aggregators, marketers and storage customers (referred to herein as "customers") over its system are described herein.

A. General

1. Subject to the terms, limitations and conditions of this rule and any applicable CPUC authorized tariff schedule, directive, or rule, the customer will deliver or cause to be delivered to the Utility and accept on redelivery quantities of gas which shall not exceed the Utility's capability to receive or redeliver such quantities. The Utility will accept such quantities of gas from the customer or its designee and redeliver to the customer on a reasonably concurrent basis an equivalent quantity, on a therm basis, to the quantity accepted.
2. The customer warrants to the Utility that the customer has the right to deliver the gas provided for in the customer's applicable service agreement or contract (hereinafter "service agreement") and that the gas is free from all liens and adverse claims of every kind. The customer will indemnify, defend and hold the Utility harmless against any costs and expenses on account of royalties, payments or other charges applicable before or upon delivery to the Utility of the gas under such service agreement.
3. The point(s) where the Utility will receive the gas into its intrastate system (point(s) of receipt, as defined in Rule No. 1) and the point(s) where the Utility will deliver the gas from its intrastate system to the customer (point(s) of delivery, as defined in Rule No. 1) will be set forth in the customer's applicable service agreement. Other points of receipt and delivery may be added by written amendment thereof by mutual agreement. The appropriate delivery pressure at the point(s) of delivery to the customer shall be that existing at such point(s) within the Utility's system or as specified in the service agreement.

B. Quantities

1. The Utility shall as nearly as practicable each day redeliver to customer and customer shall accept, a like quantity of gas as is delivered by the customer to the Utility on such day. It is the intention of both the Utility and the customer that the daily deliveries of gas by the customer for transportation hereunder shall approximately equal the quantity of gas which the customer shall receive at the point(s) of delivery. However, it is recognized that due to operating conditions either (1) in the fields of production, (2) in the delivery facilities of third parties, or (3) in the Utility's system, deliveries into and redeliveries from the Utility's system may not balance on a day-to-day basis. The Utility and the customer will use all due diligence to assure proper load balancing in a timely manner.

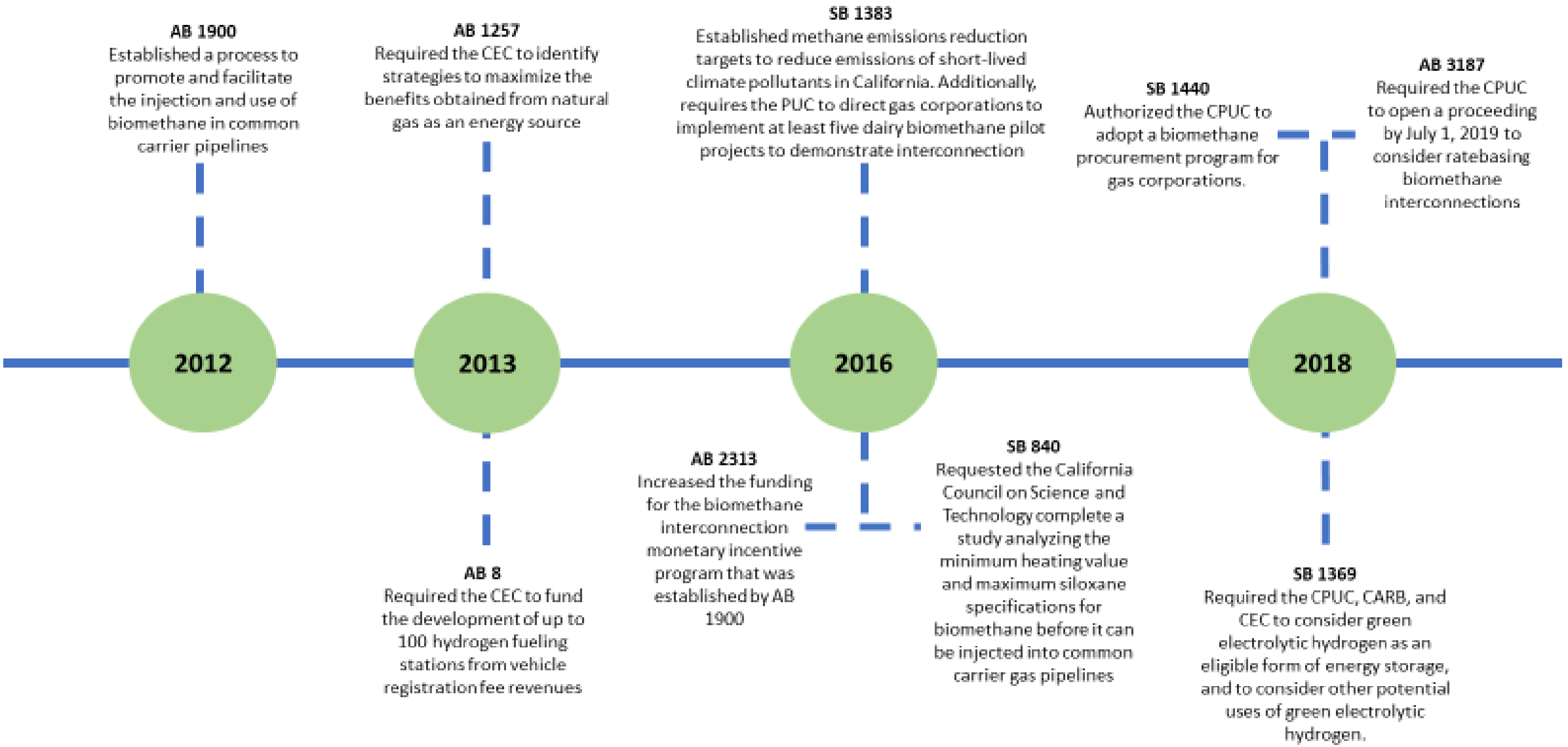
Biomethane Interconnection Incentive

Statewide Program Cap of $40 million, Ending on 12/31/21

Interconnection project with 3 or more dairies in close proximity
Incentive of 50% of eligible costs with **$5 Million Cap**
Eligible costs include
Biogas collection lines
Compression equipment for product gas
Utility Point of Receipt
Utility Pipeline Extension

All other interconnection projects (e.g. landfill, wastewater, landfill diverted organics, 1-2 dairies)
Incentive of 50% of eligible costs with **$3 Million Cap**
Eligible costs include
Compression equipment for product gas
Utility Point of Receipt
Utility Pipeline Extension

History of CA Legislation on Renewable Gas



Three Projects are Currently Injecting RNG into a CA Utility Pipeline
With Many More Under Development

1. Point Loma Wastewater Treatment Plant (Point Loma CA)

- Capturing more than 1.3 MMcfd of digester gas
- Injecting since 2012 into utility pipeline
- Total project cost of $45 million

2. CR&R Waste and Recycling Services (Perris CA)

- Two of the four phases are complete with each phase capable of handling ~83K tons/year of organic waste (~1M DGE/yr of vehicle fuel)
- Green/food waste (previously sent to a landfill) is converted to produce fertilizer, soil amendment and RNG
- Injecting since mid-2018, into SoCalGas pipeline
- Over $100 million total project cost at full buildout
- First RNG-to-pipeline project in SoCalGas' service territory

Three Projects are Currently Injecting RNG into a CA Utility Pipeline

With Many More Under Development

3. Calgren Dairy Fuels (Pixley CA)

- First dairy digester pipeline cluster project in California and started injecting RNG into SoCalGas' pipeline in February, 2019
- Plan to collect biogas from anaerobic digesters at 12 Tulare County dairies by the end of 2019
- The facility will capture the methane produced from more than 75,000 cows
- SoCalGas will be capable of adding up to 2.26 billion cubic feet of RNG each year to its pipeline system

Questions?

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