

Interconnecting to the SoCalGas Pipeline

Power of Waste: RNG for California
Sacramento

10/05/2017



A  Sempra Energy utility

Discussion Topics

1. Differences Between Biogas and Renewable Natural Gas (RNG)
2. Interconnection: Overview of Components and Costs
3. 5 Steps to Interconnect to the SoCalGas Pipeline
4. Biomethane Interconnection Incentive
5. Interconnection Process Improvements, Tools and Study

Differences Between Biogas & Renewable Natural Gas (RNG)

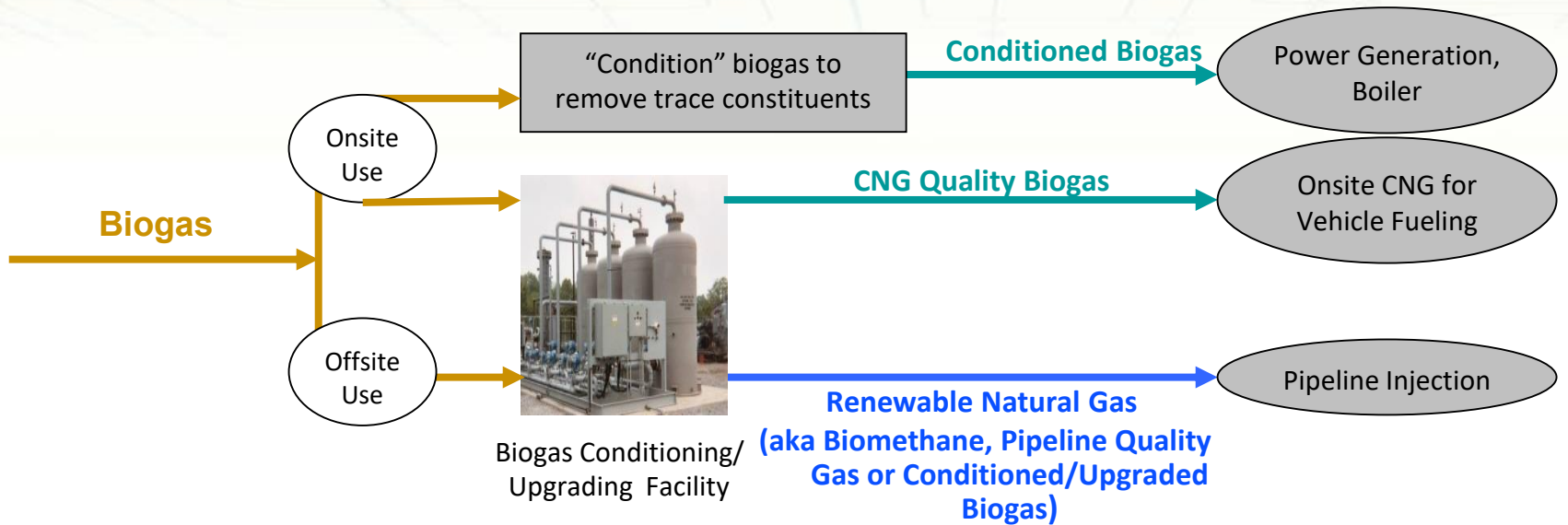
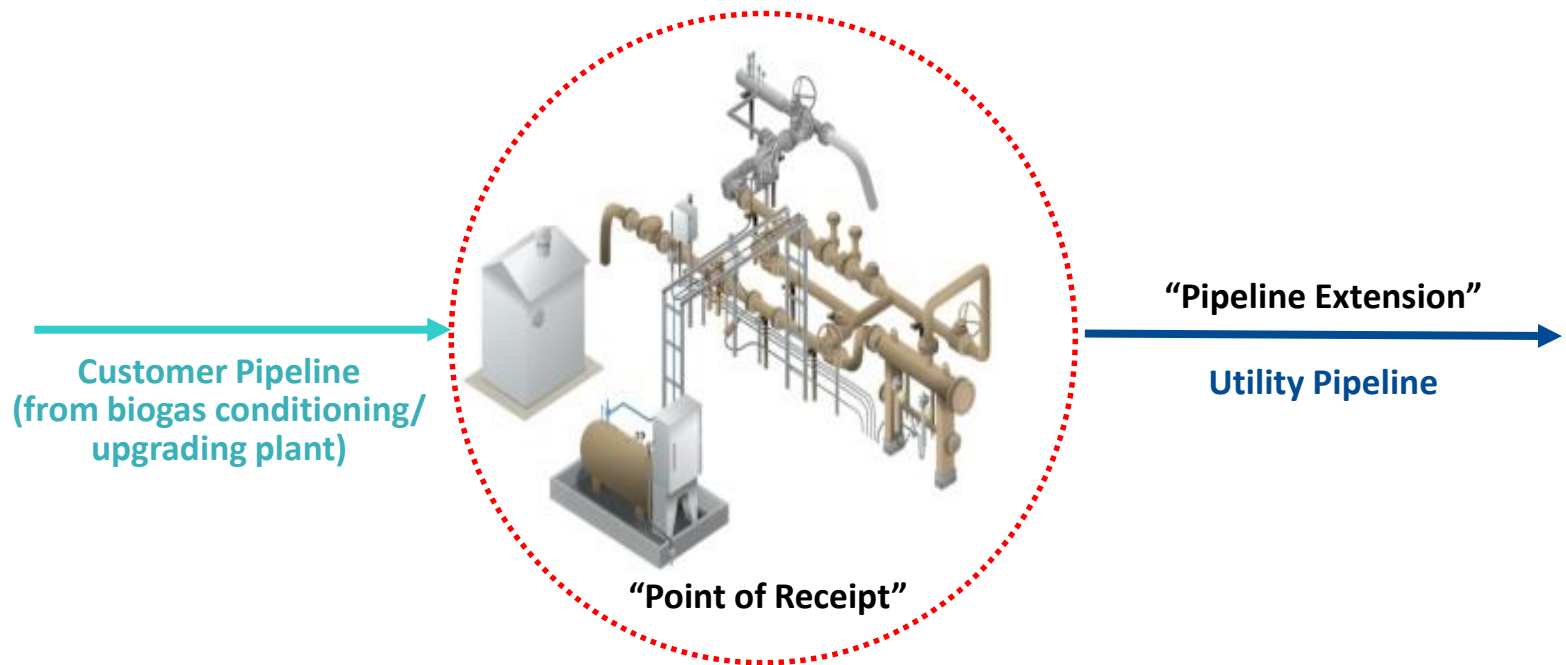


Illustration for Landfill Diverted Waste	Biogas	"Conditioned" Biogas	RNG
Gas Composition and Heating Value			
CH4	62.0%	62.0%	98.5%
CO2	37.6%	37.6%	0.8%
O2, H2, N2, Others	0.4%	0.4%	0.7%
Heating Value (btu/scf)	625	625	991
Two of the Key Trace Constituents			
H2S	300 ppm	1 ppm	1 ppm
Siloxanes	4,000 ppb	70 ppb	1 ppb

Interconnection: Overview of Components and Costs

Two Primary Components of the Term “Interconnection”



“Interconnection” = “Point of Receipt” + “Pipeline Extension”

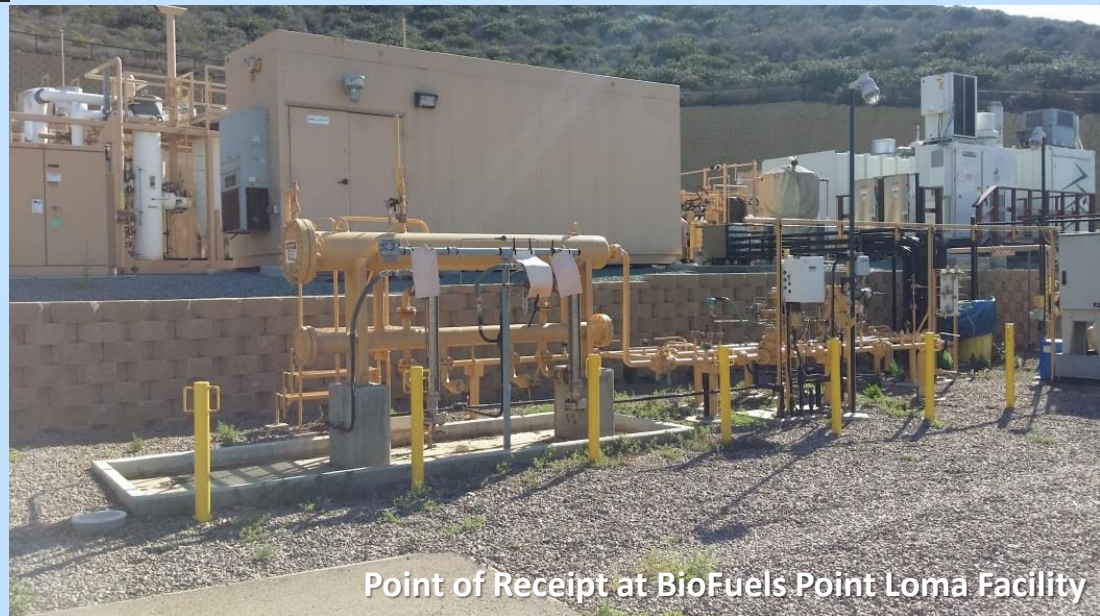
“Point of Receipt” Component of the Interconnection



Point of Receipt at CR&R Perris

The Point of Receipt

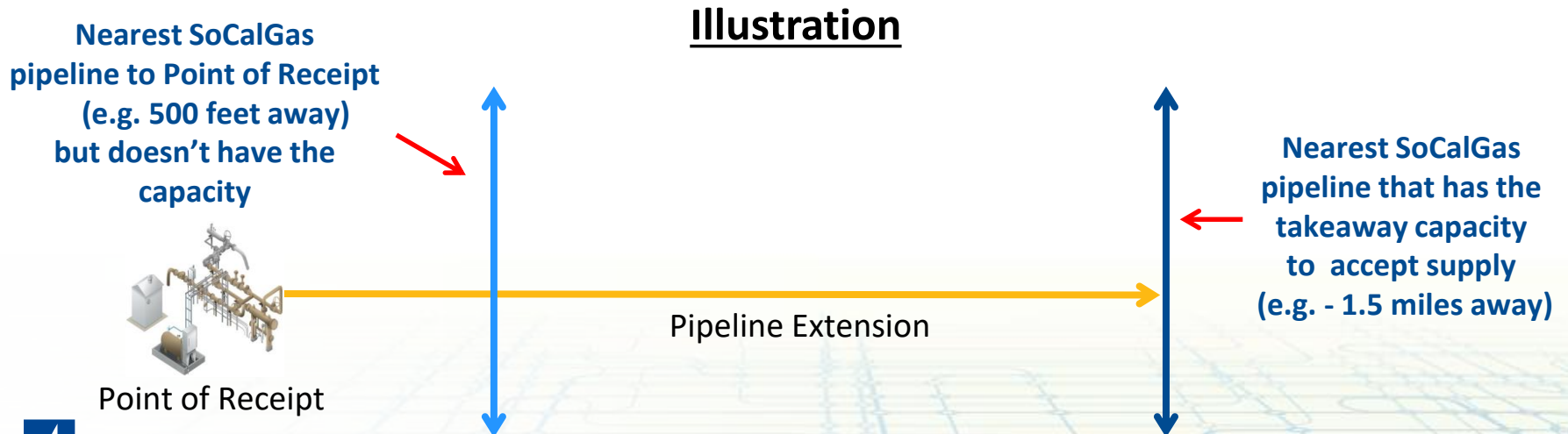
1. **Monitors gas quality** to ensure it meets SoCalGas Rule 30 Gas Quality Specifications (e.g. CO₂, O₂, total inerts, heating value, H₂S)
2. **Prevents non-compliant gas** from entering the utility pipeline network should the monitored Rule 30 parameters not be met
3. **Meters and odorizes** the volume of RNG put into the utility pipeline network



Point of Receipt at BioFuels Point Loma Facility

What is the “Pipeline Extension” Component of the Interconnection?

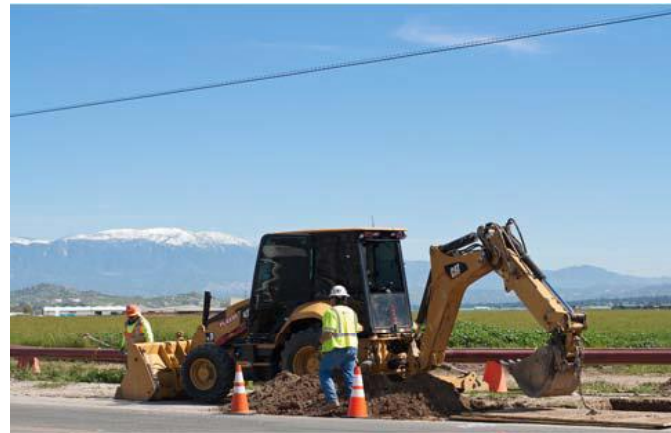
- » **Pipeline extension** is the pipe installed from the outlet of the Point of Receipt to the nearest utility pipeline having the capacity to accept the interconnector volume of RNG
- » Majority of the pipelines in streets are **distribution lines with limited takeaway capability to accept interconnector gas** during summer months (particularly in the early a.m. hours)
 - May result in high pipeline extension costs because the nearest pipeline having the capacity is miles away



Overview of Pipeline Extension – CR&R Perris

Overview

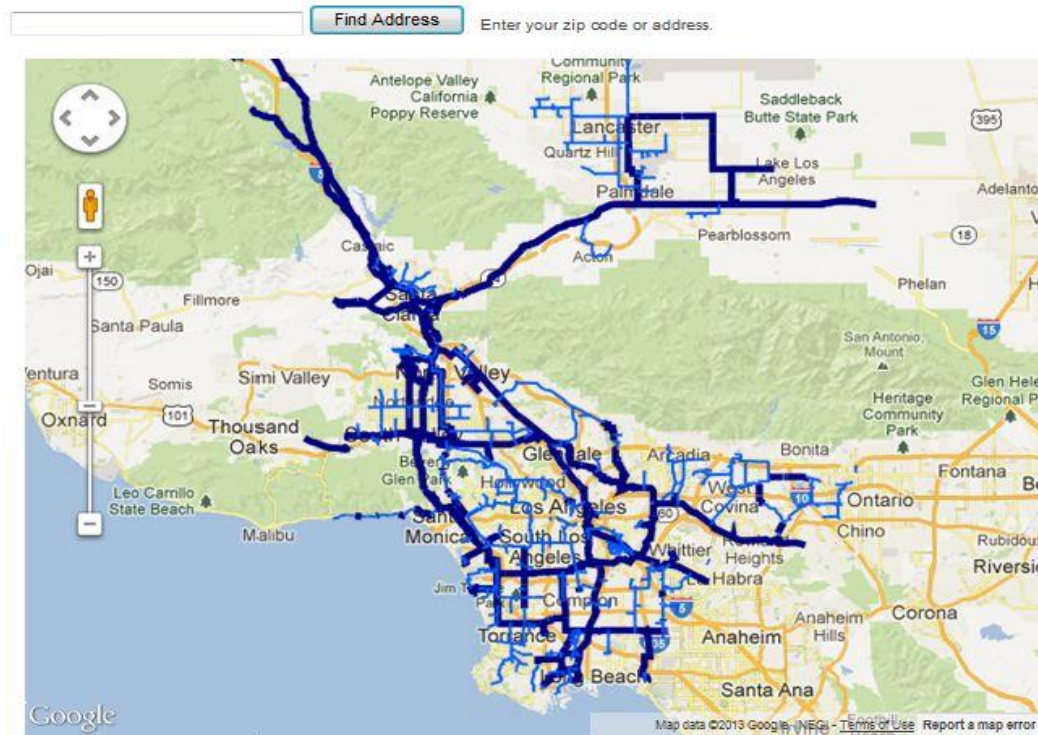
- Installation of approximately 1.4 miles of 8" high pressure steel pipe (directional bore method)
- Majority of the street where pipe was installed did not have curb and gutter (minimized the need to cut asphalt/concrete)
- Pipeline crossed the San Jacinto Canal and required obtaining several permits



Five Step Approach to Interconnecting to the SoCalGas Pipeline System

Step 1: High Level Utility Pipeline Assessment

Gas Transmission and High Pressure Distribution Pipeline Interactive Map - LA



Dark Blue Transmission Lines: Generally large diameter pipelines that operate at pressures above 200 psi and transport gas from supply points to the gas distribution system.

Light Blue High Pressure Distribution Lines: Pipelines that operate at pressures above 60 psi and deliver gas in smaller volumes to the lower pressure distribution system.

SoCalGas has an interactive webpage where the user can type in an address and it will show the nearest high pressure pipeline(s).

<http://www.socalgas.com/safety/pipeline-maps/>

There is also a "National Pipeline Mapping System" that shows high pressure pipelines across the United States

<https://www.npms.phmsa.dot.gov/>

Reminder: Existence of a gas line does not mean it has the necessary capacity!

Step 2: SoCalGas Rule 39 Interconnection “Capacity Study” (Funded by Interconnector)

Interconnection Capacity Study - determines SoCalGas’ takeaway capability to accept interconnector gas (and estimated cost to expand if necessary)

Keep in mind:

- Detail is important (e.g. – precise project location, volumes are critical)
- Adjacent line to project doesn’t guarantee injection acceptance
- It is **very costly** to install pipelines in the public right of way



Biogas Producer

Location = X

Biomethane Volume = Y

Pipeline Extension

The Capacity Study provides:

- 1) approximate pipeline extension length, pipeline diameter and very high level cost to install
- 2) location of the pipeline having take away capacity

Nearest SoCalGas pipeline that has the takeaway capacity to accept supply

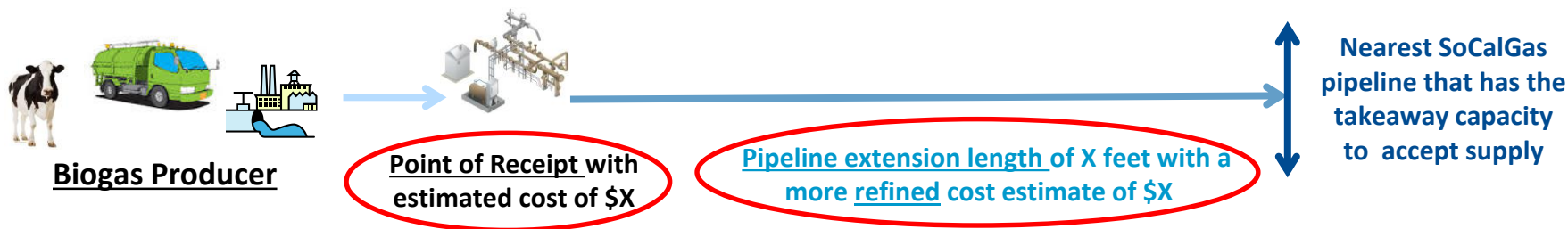
Based on the high level results of Capacity Study, is it economically viable to pursue Preliminary Engineering Study to inject RNG into the utility pipeline?

Go

Stop

Steps 3 & 4: SoCalGas Rule 39 Interconnection “Engineering Studies” (Funded by Interconnector)

Step 3: Preliminary Engineering Study (PES) - more detailed study which includes cost estimate for Gas Quality Monitoring and Measurement Facilities (Point of Receipt)



Based on the results of Step 3, is it economically viable to pursue a Detailed Engineering Study to inject RNG into the utility pipeline?

Go

Stop

Step 4: Detailed Engineering Study (DES) - describes all costs of construction, develop complete engineering construction drawings, and prepare all permit applications

Step 5: SoCalGas Interconnection Authorization, Funding and Construction

- **Authorization and Funding of Interconnection Work**
- **CPUC Biomethane Monetary Incentive**
 - Interconnector to work with utility and follow program guidelines
- **Construction and Reconciliation of Cost**
 - Interconnector is responsible for 100% of actual costs

A Few Keys to Ensure a Smooth Process

- Involve SoCalGas as early as possible, generally at least 18-24 months in advance of desired in service date
- Recommend reviewing various Rule 39 Agreements (available on socalgas.com) early on in the process
- Be ready to fund invoices for various Rule 39 Agreements

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

Interconnection Process Improvements and Tools

- 1. Modify the Existing Rule 30 Gas Quality Deviation Process**
 - Approval of Advice Letter 5128 effective on 5/28/17 allows interconnectors to request a gas quality deviation during the Capacity Study (previously only available starting with the Preliminary Engineering Study)
- 2. Gas Quality Outreach and Education**
 - Developed **Information Sheets** to educate the industry on gas quality standards and monitoring
 - Example:** We frequently hear siloxanes are continuously monitored at our interconnection facilities. Fact is siloxanes are monitored and tested by taking periodic gas samples and sent to a laboratory for testing
- 3. Created a Renewable Gas (RG) Section on socalgas.com**
 - Provides information on a variety of RNG topics. *Additional Information and Resources* page provides links to useful reports and websites
- 4. Developed a downloadable **RNG Toolkit****
 - Available on socalgas.com and topics include: overview of biogas and RNG, interconnection procedure, gas quality standards, interconnection monetary incentive program, and tools/tips for biogas to pipeline projects
- 5. Streamline the Interconnection Process**
 - Reviewed the existing interconnection process to improve/enhance the experience for the interconnector and company personnel
 - Example:** Approval of Advice Letter 5104 effective on 04/08/17 enables SoCalGas and interconnectors to potentially accelerate the interconnection process by procuring interconnection material that requires long lead times much earlier than previously allowed

RNG Toolkit

(Available at socialgas.com/rg)



INNOVATION | TECHNOLOGY

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

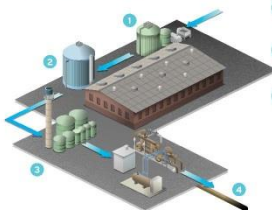
- The Biogas Conditioning/Upgrading Services Tariff is a fully compensatory service paid by participating customers. Monthly tariff services pricing will vary based on the size, scope and location of each project.
- The Biogas Conditioning/Upgrading Services Tariff will be awarded through a long-term Service Agreement, typically 10-15 years. At the end of this 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 collected.
- 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 options as a list.

FREQUENTLY ASKED QUESTIONS
What are the key elements of the Biogas Conditioning/Upgrading Services Tariff?
For more information, visit socialgas.com/rg.

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.

HOW NATURAL GAS IS CONVERTED INTO RNG



- Waste products, such as sludge, food waste or manure are processed in a bioreactor.
- The bioreactor breaks down the organic material to create biogas - a mixture of methane and other elements.
- The biogas can then be processed and conditioned leaving behind RNG, which can be used interchangeably with traditional natural gas.
- 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.



INNOVATION | RNG

TOOLS AND TIPS FOR RENEWABLE NATURAL GAS (RNG) PROJECTS CONNECTING TO THE SOCIALGAS® 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 pressure feeder systems to lower pressure distribution systems. For this reason, SoCalGas must conduct an engineering analysis to find a feasible location.

WHAT FACTORS AFFECT THE FEASIBILITY OF PROJECTS?

Several key factors affect the feasibility of RNG projects. The necessary components for an RNG project include:

- Location: The location of the project is critical. A nearby pipeline must have the capacity to accept the volume of RNG produced.
- Capacity: The capacity of the pipeline to accept the volume of RNG produced is critical.
- Costs: The costs of the project, including the cost of the equipment and the cost of the gas, are critical.

INNOVATION | RNG

RENEWABLE NATURAL GAS TOOL KIT



Photo: iStockphoto.com

Photo: iStockphoto.com



NORTH AMERICA

UNITED STATES

Company	Address	Phone
Acrian Technologies	7777 Exchange Street, Suite 5 Cleveland, OH 44124	314-669-2642
...	8413 Excelsior Drive, Suite 160 Madison, WI 53711	
...	30 Lakewood Circle N Greenwich, CT 6830	
...	4675 MacArthur Court, Suite 80 Newport Beach, CA 92660	
...	5070 N. 35th Street Milwaukee, WI 53209	
...	4940 Campus Drive, Suite C Newport Beach, CA 92660	
...	PO Box 4120, Suite 55888 Portland, OR 97208	
...	1215 S Eads Street Arlington, VA 22202	
...	150 East Dartmore Drive Crystal Lake, IL 60014	



THE SOCIALGAS® 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, and pipeline system. The standards cover two major aspects: gas constituent limits (composition-based specifications) and gas interchangeability specifications (performance-based quality specifications). Gas constituent limits restrict the

impurities to a safe and proper level. The interchangeability standards ensure that the gas meets the requirements of the end-user.

Category	Limit
...	99%
...	96%
...	97%
...	100%
...	96%
...	95%
...	99%

CONSTITUTE

used a decision Order Institution 18 990 (Gatz) collaboration w 7 constituents o found in biogas. F

INNOVATION | RNG

BIOGAS SUPPLIER LIST

Last updated: April 25, 2023

SOUTHERN CALIFORNIA GAS COMPANY REVISED CAL.P.U.C. FILE NO. 47193-G
LOS ANGELES GAS COMPANY REVISED CAL.P.U.C. FILE NO. 43369-G

Rule No. 30 TRANSPORTATION OF CUSTOMER-OWNED GAS

Sheet 1

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 "customer") or its system are described herein.

- A. Access
- Subject to the terms, limitations and conditions of this rule and any applicable CPUC authorized or order or cause to be delivered to the Utility and need the Utility's capability to receive or quantities of gas from the customer or its contract basis an equivalent quantity, on a
 - the right to deliver the gas provided for in the contract ("service agreement") and that the customer will indemnify, defend and hold SoCalGas harmless from and against all claims, damages, losses, costs and expenses, including reasonable attorneys' fees, incurred by SoCalGas as a result of the customer's failure to comply with the terms and conditions of this rule and any applicable CPUC authorized or order or cause to be delivered to the Utility and need the Utility's capability to receive or quantities of gas from the customer or its contract basis an equivalent quantity, on a
 - the right to deliver the gas provided for in the contract ("service agreement") and that the customer will indemnify, defend and hold SoCalGas harmless from and against all claims, damages, losses, costs and expenses, including reasonable attorneys' fees, incurred by SoCalGas as a result of the customer's failure to comply with the terms and conditions of this rule and any applicable CPUC authorized or order or cause to be delivered to the Utility and need the Utility's capability to receive or quantities of gas from the customer or its contract basis an equivalent quantity, on a



INNOVATION | RNG

RENEWABLE NATURAL GAS INTERCONNECTION PROCESS



gas 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 ensure 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 at site and operating conditions. Some examples of technologies used in biogas conditioning:

- High-selectivity membranes
- Pressure swing adsorption systems
- Water scrubbing systems
- Solid scrubbing media
- Regenerative or non-regenerative adsorbent media
- Catalytic O₂ removal

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

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.

Biomethane Producer's Piping



SoCalGas Pipeline Network

Utility Interconnection



SoCalGas Rule 30

Minimum Heating Value

- SoCalGas recently completed comprehensive testing to determine the effects of accepting gas with a lower minimum heating value (existing minimum heating value is 990 btu/scf)
 - The testing was done to determine if a lower minimum heating value was interchangeable with our historical gas supplies
- Based on the results of the study, gas **as low as 974 Btu/scf** did not show increase safety or reliability concerns
 - 974 BTU/scf gas can be interchangeable with gas supplies meeting Rule 30 limits
 - All other gas quality constituent levels still need to be met (e.g. – inerts, CO₂, O₂, Wobbe Number, etc.)
- SoCalGas' Rule 30, Section I.5 offers the ability to request a **gas quality deviation** for those constituents identified in Rule 30, Section I.3 (one of these is minimum heating value)
- A gas quality deviation can be requested during the Capacity Study phase or the Preliminary Engineering Study phase
 - Gas quality deviation requests are **fully collectible** and paid for by the potential interconnector
 - If deviation has no negative impact, then SoCalGas to file an Advice Letter that **must be approved by CPUC**

SoCalGas Rule 30

Minimum Heating Value

Illustration Showing All Gas Quality Constituents Need to Meet Rule 30

Component (Rule 30 Max)					
Methane	mol%	96	96	96	96.3
Carbon Dioxide (3.0%)	mol%	3	1.4	0.5	2.97
Oxygen (0.2%)	mol%	0.15	0.2	0	0.18
Nitrogen	mol%	0.85	2.4	3.5	0.55
Total Inerts (4.0%)	mol%	4	4	4	3.7
Calculated Values					
High Heating value	Btu/cf	974	974	974	977
Wobbe (Rule 30 Min = 1279)		1270	1279	1285	1275

Does not meet minimum Wobbe No of 1279 even though heating value is equal to or greater than 974 btu/scf

Thank You

Jim Lucas

Market Development Manager

jlucas@semprautilities.com