

# Renewable Natural Gas Outreach and Education

EPA Technology Transfer Workshop  
Renewable Natural Gas – Driving Value for Natural Gas and Biogas Sectors

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A  Sempra Energy utility

# Markets and Organizations

# Markets and Organizations

**Landfills:** ~35 facilities within SoCalGas' service territory

## Drivers to Produce RNG

- Largest source of biogas
- Many are flaring due to recent air quality regulations, which lowered emission levels for stationary engines
- High value of RNG when used for transportation

## Challenges to Produce RNG

- High nitrogen content can make cleanup technically/ economically challenging
- Landfills are often located in remote sites with limited pipeline infrastructure



**WWTPs:** ~50 facilities within SoCalGas' service territory

## Drivers to Produce RNG

- Many are flaring due to recent air quality regulations, which lowered emission levels for stationary engines
- High value of RNG when used for transportation

## Challenges to Produce RNG

- Majority of WWTP's do not produce large volumes of biogas and economics are difficult for pipeline injection

# Markets and Organizations

**Dairies:** ~ 1 million dairy cows within SoCalGas' service territory

## Drivers to Produce RNG

- Can provide significant reduction in methane emissions
- Lowest carbon intensity of all LCFS pathways
- High value of RNG when used for transportation

## Challenges to Produce RNG

- Single dairy projects are typically not large enough for economics to work for pipeline injection
- Dairy cluster projects require significant capital (need to build digesters unlike WWTPs and landfills)



**Organics Diversion:** ~ 9 million tons per year of food and green waste sent to landfills within SoCalGas' service territory

## Drivers to Produce RNG

- State diversion goals for organics
- Negative carbon intensity LCFS pathway
- High value of RNG when used for transportation

## Challenges to Produce RNG

- Projects require significant capital (need to build digesters and processing facilities unlike WWTPs and landfills)

# Markets and Organizations

## Other Entities Where Education is Provided Include:

1. Local and State Agencies
2. Cities and Counties
3. Air Quality Districts
4. Engineering and Consulting Firms
5. SoCalGas Internal Organizations

# Content and Messaging

Examples of High Level Information Provided  
When Meeting with Customers or Presenting at  
Industry Events

# Differences Between Biogas & Renewable Natural Gas (RNG)

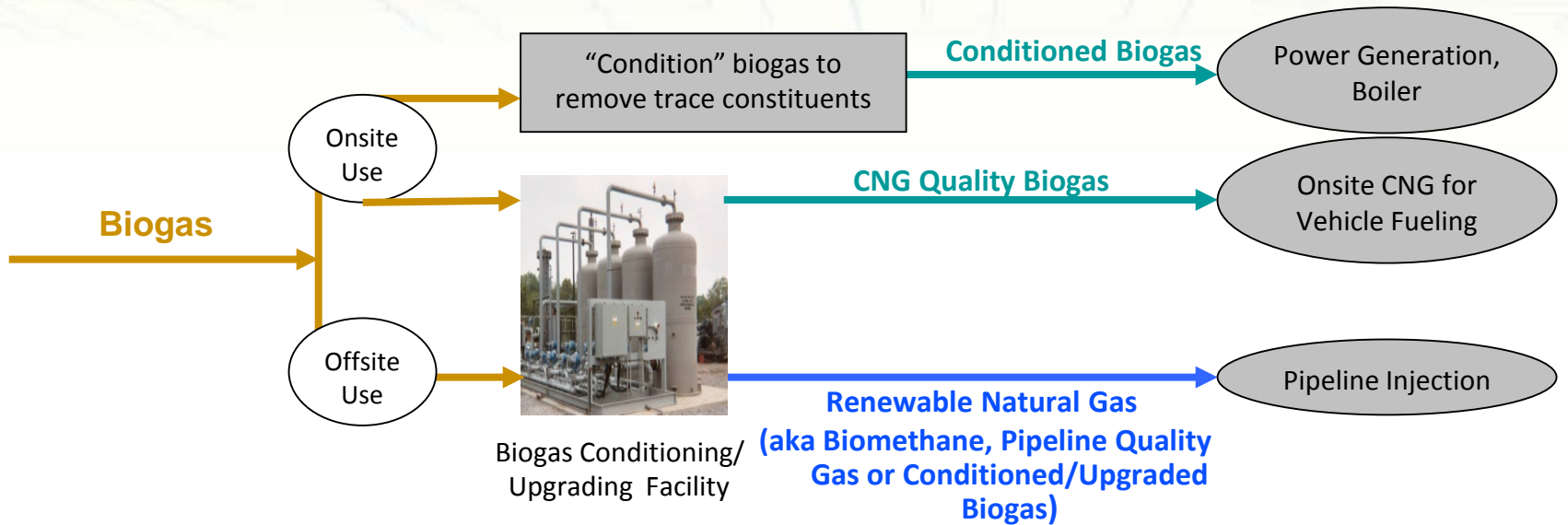


Illustration for Landfill Diverted Waste	Biogas	“Conditioned” Biogas	RNG
<b>Gas Composition and Heating Value</b>			
CH4	62.0%	62.0%	98.5%
CO2	37.6%	37.6%	0.8%
O2, H2, N2, Others	0.4%	0.4%	0.7%
Heating Value (btu/scf)	625	625	991
<b>Two of the Key Trace Constituents</b>			
H2S	300 ppm	1 ppm	1 ppm
Siloxanes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

# Market Drivers to Produce RNG

- 1) **Utilize as a Transportation Fuel** - When RNG is used as a transportation fuel from a qualified feedstock, **credits can be generated and sold** which increases the market value of RNG



**CARB Low Carbon Fuel Standard (LCFS)** – program to reduce the carbon intensity of California’s transportation fuels by at least 10 percent by 2020



**EPA Renewable Fuel Standard (RFS)** – federal program that requires petroleum refiners and importers of gasoline to demonstrate that a portion of the fuel they sell is renewable. Fuel volume requirements currently go through 2022



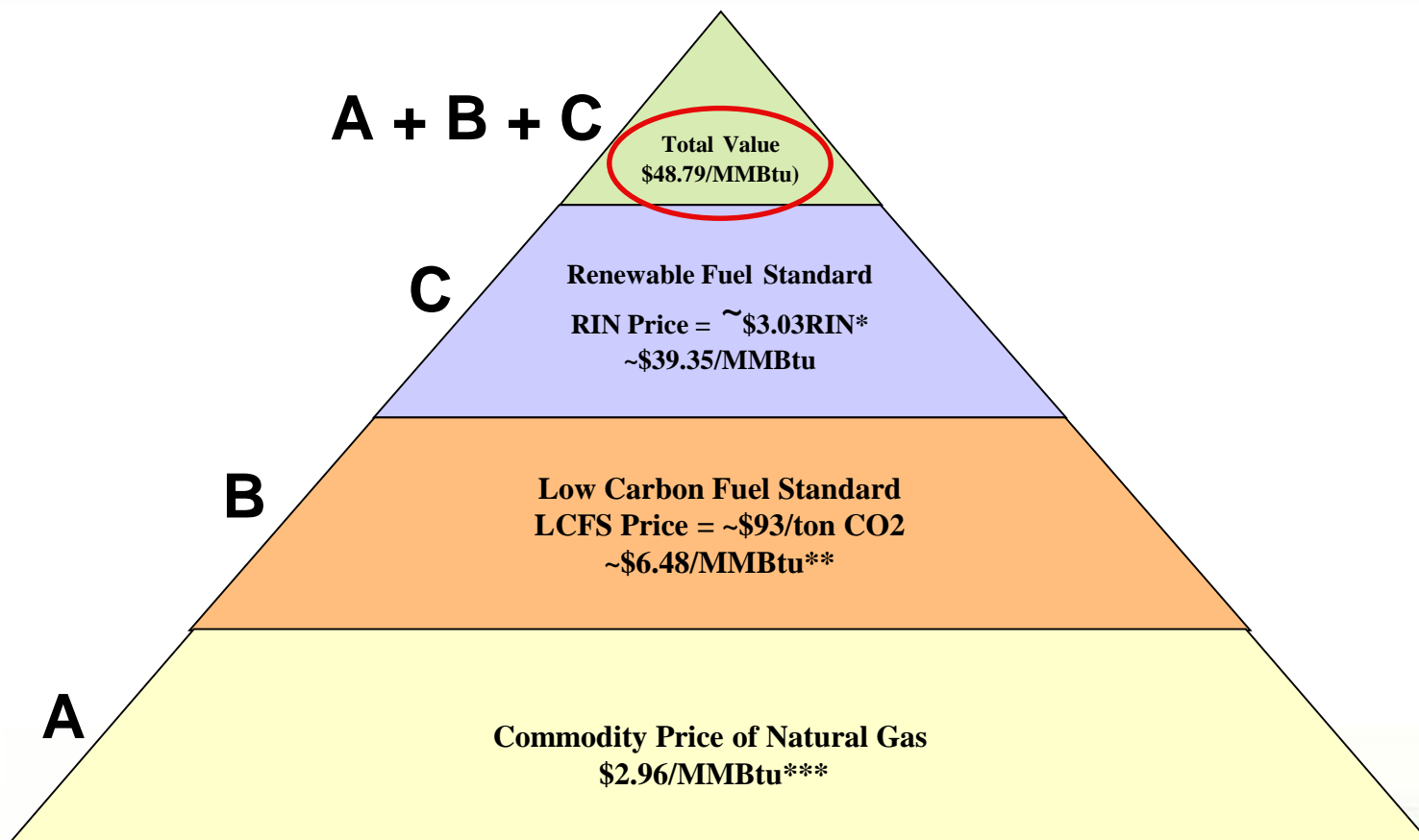
# RNG as a Transportation Fuel – LCFS

Natural Gas and RNG both have carbon intensities below the current target, and therefore both generate LCFS credits.

LCFS Pathway	Carbon Intensity Value (gCO <sub>2</sub> e/MJ)
Gasoline	98.47
Diesel	101.01
Traditional Natural Gas	79.46
Landfill RNG	~30-60
Wastewater Treatment RNG	~7 or 30
Landfill diverted organic waste RNG	~-23
CalBio Dairy Prospective RNG	~-276

# Market Drivers to Produce RNG

(Estimated Value of RNG From WWTP Biogas When Used as a Transportation Fuel in CA)



Prices as of 09/15/17

\* 2017 Vintage D3 RIN's

\*\* Assumes carbon intensity for WWTP of 30 gCO<sub>2</sub>/MJ<sub>3</sub>

\*\*\* Approximate Henry Hub Natural Gas Future Price – Oct 2017

# Market Drivers to Produce RNG

- 2) **Utilize for Electric Generation** - RNG can be used as the fuel source to produce renewable energy (utility scale and distributed generation)
- **Renewables Portfolio Standard (RPS)** – RNG can be used to help achieve California RPS goals, 50% by 2030
  - **Self Generation Incentive Program (SGIP)** - California Public Utilities Commission mandated program providing incentives to support existing, new and emerging distributed energy resources

Minimum Renewable Fuel Blending	
Application Year	% Renewable Fuel Required
2016	0%
2017	10%
2018	25%
2019	50%
2020	100%

# 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**

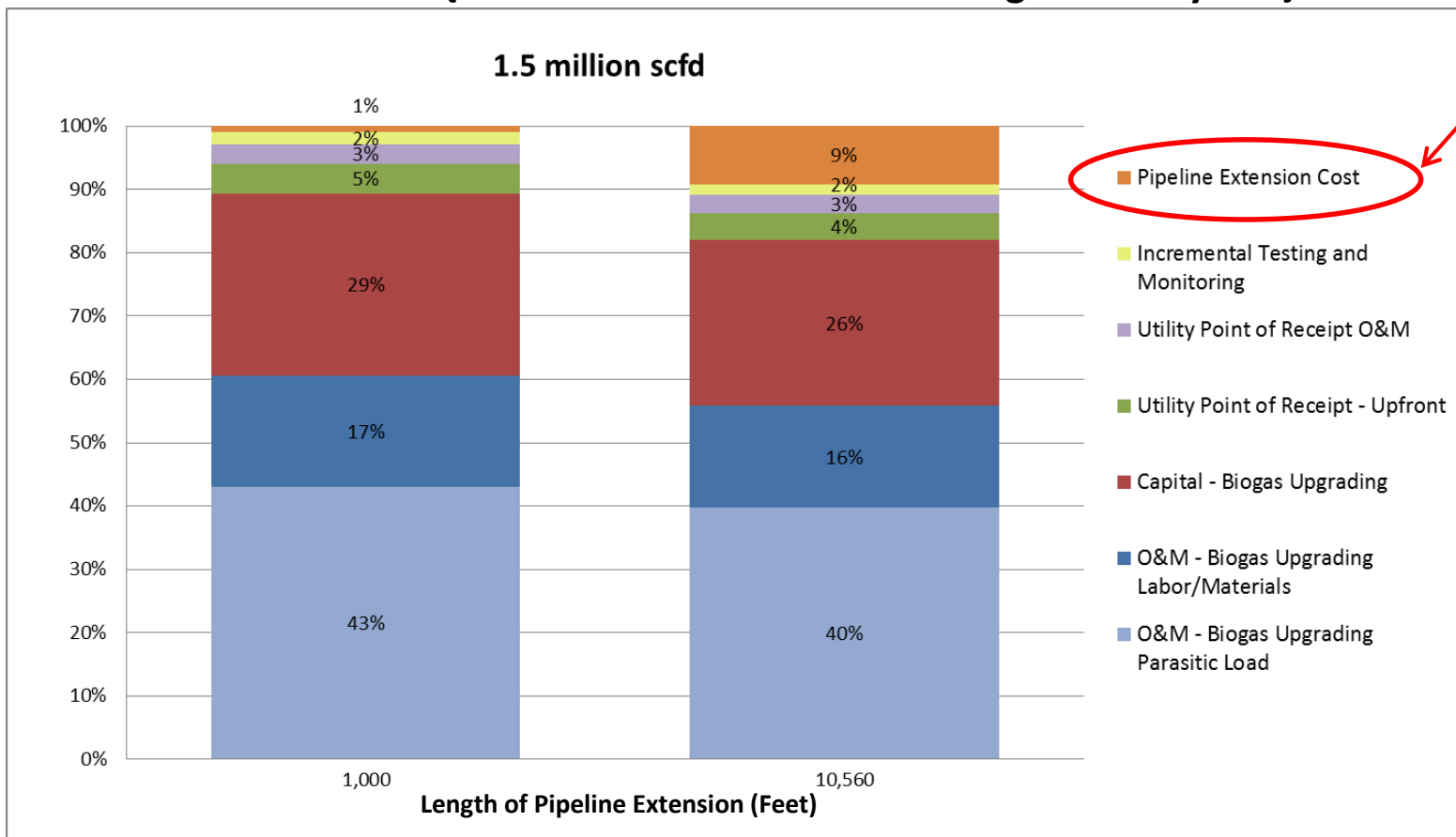
Compression equipment for product gas

Utility Point of Receipt

Utility Pipeline Extension

# Estimated Breakdown of Major Cost Components for Producing and Injecting RNG into the Pipeline

Estimated Breakdown of Lifecycle Costs to Produce and Inject RNG into the Pipeline  
 {based on 1.5 million scfd of biogas for 15 years}



- 1) Pipeline Extension costs are based on installing pipeline in roads with curb/gutters.
- 2) Estimated costs assume testing for all 17 biogas constituents and includes the cost of the tests and associated labor.

# Additional Delivery Channels

# Renewable Gas Section on socalgas.com

- » Launched renewable gas section on socalgas.com in mid-2017
- » Includes six subsections:
  - What is Renewable Natural Gas?
  - Biogas and Renewable Natural Gas
  - Biogas Conditioning/Upgrading Services
  - New or Expanded RNG Interconnection Receipt Points
  - Biomethane Monetary Incentive Program
  - Additional Information and Resources
- » Additional subsections will be added in the future

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## Renewable Gas

Renewable energy is an increasingly important part of California's clean energy future. You've probably heard of renewable energy sources like solar and wind, but you may not have heard of renewable natural gas (RNG). This section provides information and resources to help you understand how renewable natural gas is generated and delivered to customers.

### What is Renewable Natural Gas?

See how Renewable Natural Gas is derived from organic waste materials.

[Learn More](#)

### Biogas and Renewable Natural Gas

Your business may be able to save energy and money with renewable biogas and biomethane.

[Find out How](#)

### Biogas Conditioning/Upgrading Services

See how SoCalGas® can help biogas producers plan, design, procure, construct, own, operate and maintain biogas conditioning and upgrading equipment.

[Learn More](#)

# RNG Toolkit

(available for download at [socalgas.com/rg](http://socalgas.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 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 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.



## INNOVATION | RNG

### 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 pipeline. 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.

## INNOVATION | RNG

### RENEWABLE NATURAL GAS TOOL KIT

Key factors in determining the feasibility of RNG projects include the necessary components and equipment to condition and upgrade biogas. The pipeline can vary, and the quality of the raw biogas is important. Below a certain level, the project will not be economically viable. Typically, the raw biogas must be 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.

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For this information, visit [socalgas.com/rg](http://socalgas.com/rg).



## INNOVATION | RNG

### BIOGAS SUPPLIER LIST

#### NORTH AMERICA

##### UNITED STATES

<b>Acrian Technologies</b> www.acrian.com	7777 Exchange Street, Suite 5 Cleveland, OH 44124	314-669-2642
<b>Aspen Energy</b> www.aspenenergy.com	8413 Excelsior Drive, Suite 160 Madison, WI 53711	
<b>Bay Fuel</b> www.bayfuel.com/company/	30 Lakewood Circle N Greenwich, CT 06830	
<b>Bay Fuel</b> www.bayfuel.com/company/	4675 MacArthur Court, Suite 80 Newport Beach, CA 92660	
<b>Calgon Energy Services</b> www.calgonenergy.com	5070 N. 35th Street Milwaukee, WI 53209	
<b>Energy Partners</b> www.energypartners.com	4940 Campus Drive, Suite C Newport Beach, CA 92660	
<b>Energy Partners</b> www.energypartners.com	PO Box 4120, Suite 58888 Portland, OR 97208	
<b>Energy Partners</b> www.energypartners.com	1215 S Eads Street Arlington, VA 22202	
<b>Energy Partners</b> www.energypartners.com	150 East Dartmore Drive Crystal Lake, IL 60014	



## 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, 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

#### CONSTITUENTS

Constituent	Limit
Hydrogen Sulfide	99%
Methane	96%
Water	97%
Carbon Dioxide	100%
Other Gases	96%
Other Liquids	95%
Other Solids	99%

#### CONSTITUENTS

used a decision Order instituting AB 1900 (Gatz) collaboration with 7 constituents of gas found in biogas. F

SOUTHERN CALIFORNIA GAS COMPANY REVISED CAL.P.U.C. RULE NO. 47193-G  
LOS ANGELES GAS SERVICE COMPANY REVISED CAL.P.U.C. RULE 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. General

- Subject to the terms, limitations and conditions of this rule and any applicable CPUC authorized or order or case to be delivered to the Utility and 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 (RNG) GAS QUALITY STANDARDS

performance, ensuring safe and proper combustion for customers.

SoCalGas Rule 30, Section 1.5, provides interconnectors with the option to request specific deviations from meeting the defined gas quality specifications in Section 1.3. 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) approval before the gas is permitted to flow into the utility pipeline system.

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 the contract.

customer and customer shall accept, a (b) (6) on such day. It is the intention of the parties to this contract that transportation which the customer shall receive at the



## INNOVATION | RNG

### RENEWABLE NATURAL GAS INTERCONNECTION PROCESS



garies 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<sub>2</sub> 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.

Biomethane Producer's Piping



SoCalGas Pipeline Network

Utility Interconnection





# RNG Toolkit

(available for download at [socalgas.com/rg](http://socalgas.com/rg))

## STEP 1

### INTERCONNECTION CAPACITY STUDY

The process starts with an Interconnection Capacity Study, which determines the utility's downstream capacity to take the renewable natural gas away from the interconnection point and the associated utility facility enhancement cost. The Capacity Study step also provides interconnectors with the option to request a deviation from the gas quality specifications defined in SoCalGas' Rule 30, Paragraph I.3. Interconnectors are responsible for the actual costs needed to perform the Interconnection Capacity Study. These costs typically range from \$5,000 to \$10,000 and requires six weeks to complete<sup>1</sup>.

## STEP 2

### PRELIMINARY ENGINEERING STUDY

The Preliminary Engineering Study develops the preliminary cost estimates for land acquisition, site development, right-of-way, metering, gas quality, permitting, regulatory, environmental, unusual construction, operating and maintenance costs. Interconnectors are responsible for the actual costs needed to perform the Preliminary Engineering Study. These costs typically range from \$50,000 to \$60,000 and requires four to five months to complete<sup>1</sup>.

## STEP 3

### DETAILED ENGINEERING STUDY

There are three elements in the Detailed Engineering Study, including:

1. Description of all costs of construction
2. Development of complete engineering construction drawings
3. Preparation of all construction and environmental permit applications and right-of-way acquisition requirements

Interconnectors are responsible for the actual costs needed to perform the Detailed Engineering Study. These costs typically range from \$145,000 to \$225,000 and four to six months to complete<sup>1</sup>.

Interconnectors may have the option to request and fund the Preliminary and Detailed Engineering Studies (Steps 2 and 3) concurrently.

### BIOMETHANE INTERCONNECTION INCENTIVE PROGRAM

In 2015, the California Public Utilities Commission established the Biomethane Interconnector Monetary Incentive Program<sup>2</sup>. This program can provide an incentive that can contribute up to 50 percent of interconnection costs, with a cap of \$3 million per project. The cap is \$5 million for dairy cluster projects, defined as three or more dairies in close proximity. The program is described in detail in SoCalGas Rule 39 Section A.3.a. Your SoCalGas account executive can help to navigate the qualification and application process for this incentive.

### FIND OUT MORE

For more information, please visit:

[socalgas.com/rg](http://socalgas.com/rg)

or contact us at:

[gasstudyrequests@semprautilities.com](mailto:gasstudyrequests@semprautilities.com)

<sup>1</sup>The provided estimated costs are based on historical projects and can vary based on site specific conditions. The estimated costs and timeline does not include requests involving a deviation from the gas quality specifications.

<sup>2</sup>15-06-02: <http://docs.cpuc.ca.gov/PublishedDocs/Published/0000/0000/0000/0000/152572023.PDF>

This program is funded by California utility customers and administered by Southern California Gas Company (SoCalGas) under the auspices of the California Public Utilities Commission. Program funds, including any funds utilized for rebates or incentives, will be allocated on a first-come, first-served basis until such funds are no longer available. This program may be modified or terminated without prior notice.

The information contained herein is made available solely for informational purposes. Although SoCalGas has used reasonable efforts to assure the accuracy of the information at the time of its inclusion, no express or implied representation is made that it is free from error or suitable for any particular use or purpose. SoCalGas assumes no responsibility for any use thereof by you, and you should discuss decisions related to this subject with your own advisors and experts.

Siloxanes, one of the constituents of concern, can be found in a variety of consumer products. Siloxanes are typically present in biogas created at landfills and waste water treatment plants, and can sometimes be found in diverted food and green waste biogas. Siloxanes can create problems in end-user equipment because during combustion, they can coat equipment with a fine layer of silica and silicates. This is especially problematic for sensitive end-user equipment found in Southern California. For example, siloxanes can cause expensive catalysts to fail. These catalysts perform an important service reducing emissions to keep our air clean, and are found in all fuel cells, natural gas vehicles, and the majority of electric power generators. The local aerospace industry and other manufacturers have also expressed concerns with siloxanes potentially entering their sensitive facilities through the fuel supply.

### CLEANING BIOGAS TO PIPELINE QUALITY STANDARDS

Several methods and technologies are available to condition and upgrade biogas into renewable natural gas (RNG) and remove constituents of concern. Technology selection can be based on many criteria, including the makeup of the biogas as well as site and operating conditions. Some examples of technologies used in biogas conditioning and upgrading are:

- High-selectivity membranes
- Pressure swing adsorption systems
- Water scrubbing systems
- Solid scavenging media
- Regenerative or non-regenerative adsorbent media
- Catalytic O<sub>2</sub> removal

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

<sup>3</sup>SoCalGas utilizes an independent third party laboratory and may include a performance sample when measuring siloxane levels.

The information contained herein is made available solely for informational purposes. Although SoCalGas has used reasonable efforts to assure the accuracy of the information at the time of its inclusion, no express or implied representation is made that it is free from error or suitable for any particular use or purpose. SoCalGas assumes no responsibility for any use thereof by you, and you should discuss decisions related to this subject with your own advisors and experts.

### GAS CONSTITUENT MONITORING AND MEASUREMENT

Gas quality is maintained by two different types of monitoring, based on the Biomethane OIR requirements. Some attributes such as carbon dioxide, total inerts, and heating value are continuously monitored at the point of utility interconnection. Other constituents, such as siloxanes, are monitored by taking quarterly or annual samples of the gas and testing it in a laboratory.

SoCalGas Rule 30 requires gas quality testing on biomethane constituents of concern be done by independent certified third-party laboratories<sup>3</sup>. The NELAC Institute (TNI) maintains a list of laboratories (<http://iams.nelac-institute.org/search>) which are able to test for constituents of concern, including the measurement of siloxanes below the defined trigger level.

### FIND OUT MORE

For more information, please visit:

[socalgas.com/rg](http://socalgas.com/rg)

Or contact our Low Carbon Fuels Market Development Team at:

[marketdevelopment@semprautilities.com](mailto:marketdevelopment@semprautilities.com)

# Annual RNG Workshop

- » First RNG Workshop held in Southern California in October of 2016 and co-hosted with Energy Vision
- » Very successful event attended by more than 180 people
- » Panel sessions cover:
  - Policy
  - Biogas Upgrading Technologies
  - Case Studies
  - Utility Interconnection
  - RNG end-uses
- » 2017 RNG Workshop will take place in Sacramento on October 5<sup>th</sup> and co-hosted with Energy Vision and PG&E



## Upcoming Workshop

### Power of Waste: Renewable Natural Gas for California

This full-day workshop, the second annual event co-hosted by SoCalGas®, Energy Vision and Pacific Gas and Electric Company, will discuss renewable natural gas and its critical role in enabling California to achieve its greenhouse gas reduction and air quality goals. Don't miss your chance to learn from and interact with many of the industry's leading experts.

Workshop topics include:

- The big value proposition in turning organic feedstock into RNG
- Policy drivers
- Anaerobic digestion case studies
- Biogas upgrading technology review
- Utility interconnection
- High-value end-use markets for RNG

Attendees are expected to include biogas project developers, government leadership, local and state agencies, facility operators, equipment vendors, utilities, and academia.

This no-cost event is hosted in collaboration with the national environmental research group Energy Vision and Pacific Gas and Electric Company.

[Register Now](#)

Capital Plaza Halls  
Grand Ballroom  
1215 J Street  
Sacramento, CA 95814

Thursday, October 5,  
2017  
8:00 a.m. to 4:15 p.m.

No cost to attend.

**Register now as space  
is limited.**

# Thank You

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