Renewable Natural Gas and Interconnecting to the SoCalGas Pipeline

PR1118.1 Working Group Meeting

October 24, 2017

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SoCalGas

A Sempra Energy utility

Discussion Topics

1. SoCalGas Overview
2. Differences Between Biogas and Renewable Natural Gas (RNG)
3. Market Drivers and Challenges to Produce RNG
4. Interconnection: Overview of Components
5. Biomethane Interconnection Incentive
6. Breakdown of Costs to Produce and Inject RNG into Pipeline
7. Biogas Conditioning and Upgrading Projects
8. Interconnection Tools and Process Improvements
9. Overview of SoCalGas' Biogas Conditioning and Upgrading Services (BCS) Tariff

SoCalGas Overview

- Southern California Gas Company (SoCalGas) has been delivering clean, safe and reliable natural gas to its customers for 150 years
- A regulated public utility that provides gas service to **21.6 million consumers**
- Nation's largest natural gas distribution utility with **5.9 million meters**

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Differences Between Biogas & Renewable Natural Gas (RNG)

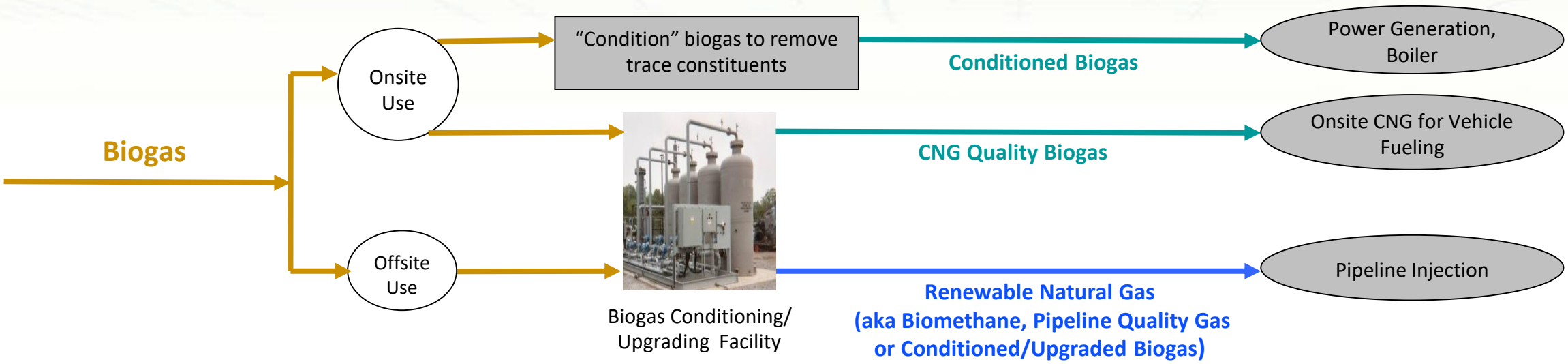

Illustration for Landfill Diverted Waste	Biogas	"Conditioned" Biogas	RNG
Gas Composition and Heating Value			
CH4	62.0%	62.0%	98.5%
CO2	37.6%	37.6%	0.8%
O2, H2, N2, Others	0.4%	0.4%	0.7%
Heating Value (btu/scf)	625	625	991
Two of the Key Trace Constituents			
H2S	300 ppm	1 ppm	1 ppm
Siloxanes	4,000 ppb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

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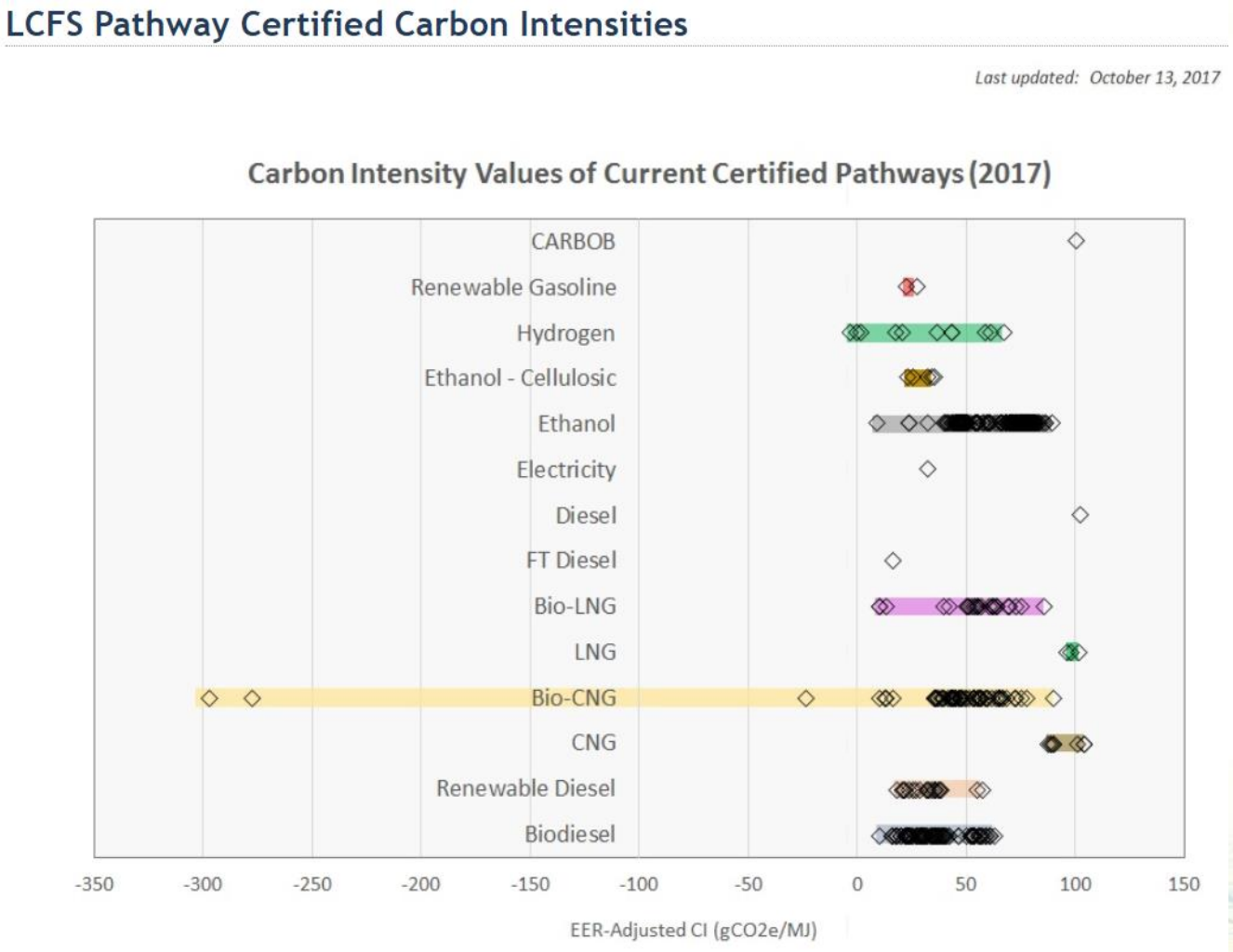
What are the Market Drivers to Produce RNG?

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

- **California Air Resources Board 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



Source: https://www.arb.ca.gov/fuels/lcfs/fuelpathways/pathwaytable.htm

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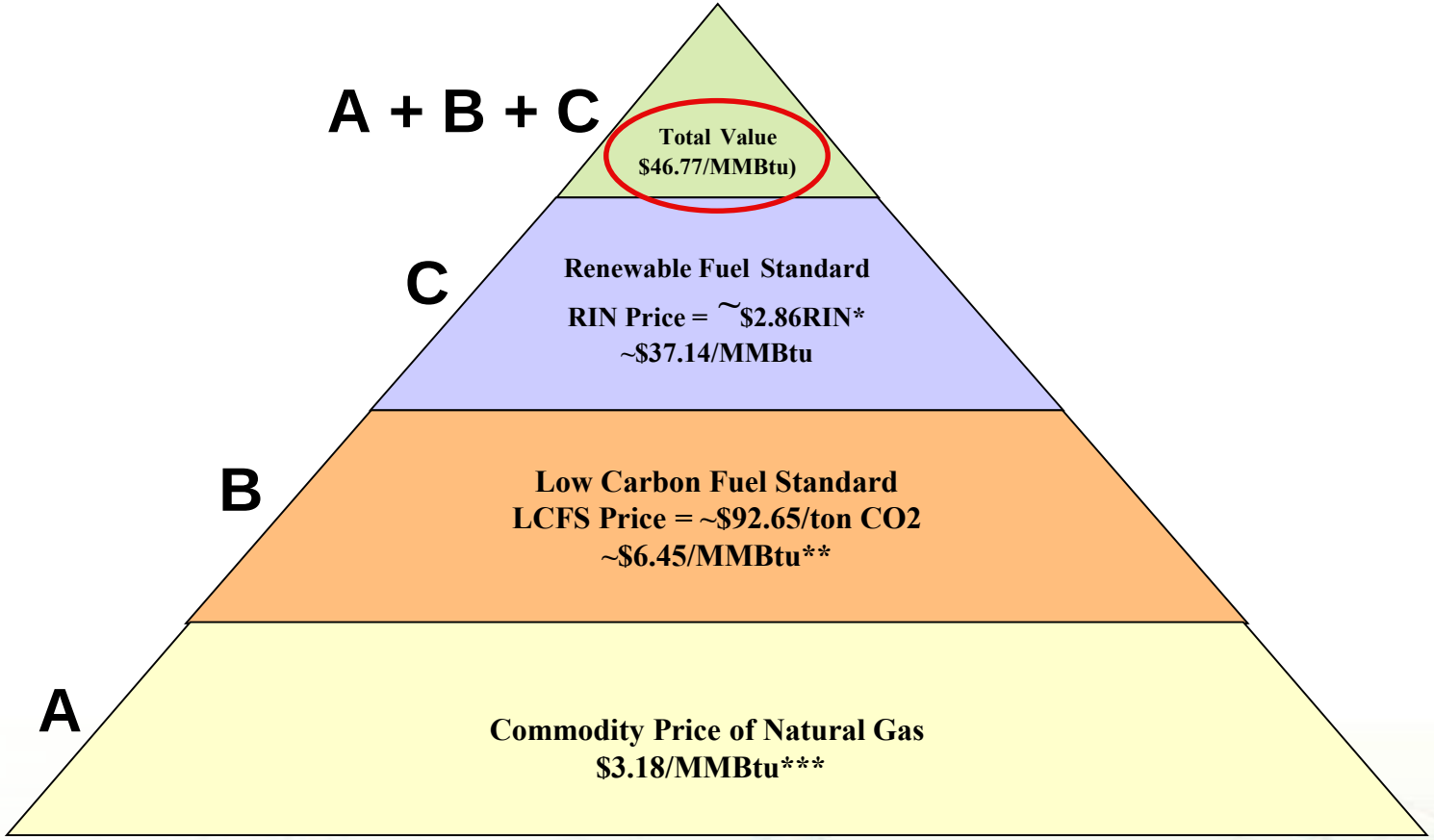
What are the Market Drivers to Produce RNG?

(Estimated Total Value of RNG When Used as a Transportation Fuel in CA)

For WWTP Biogas



Prices as of 10/06/17

* 2017 Vintage D3 RIN's

** Assumes carbon intensity for WWTP of 30 $gCO2/MJ_3$

*** Approximate Henry Hub Natural Gas Future Price – Jan 2018

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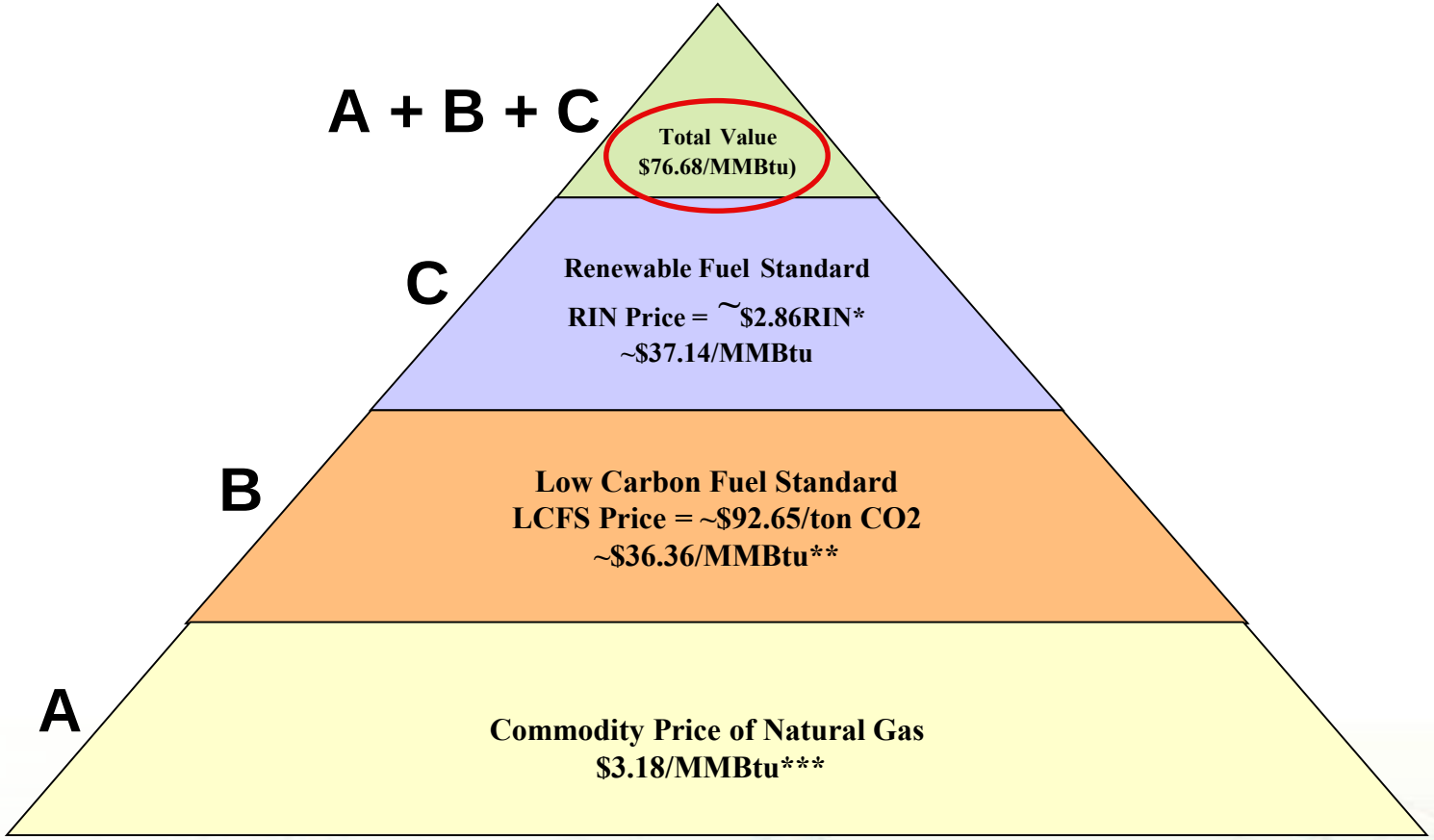
What are the Market Drivers to Produce RNG?

(Estimated Total Value of RNG When Used as a Transportation Fuel in CA)

For Dairy Biogas



Prices as of 10/06/17

* 2017 Vintage D3 RIN's

** Assumes carbon intensity for Dairy Biogas of -276 $gCO2/MJ_3$

*** Approximate Henry Hub Natural Gas Future Price – Jan 2018

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What are the 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

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

Challenges to Produce RNG

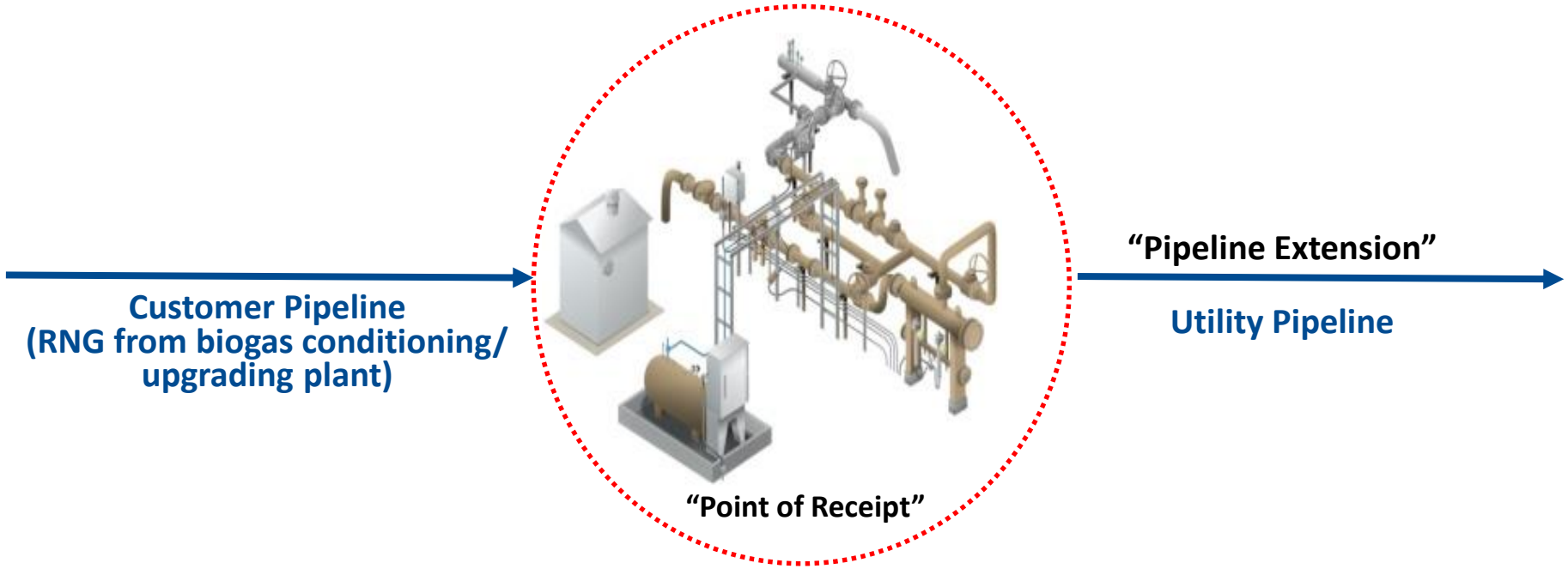
1) **Market Price of RNG**
   - **Entities not willing to enter into long term contracts** to purchase LCFS and Renewable Fuel Standard (RFS2) due to future uncertainty of these markets

2) **Project Scale**
   - Minimum threshold is **approximately 1.0 to 1.5 million standard cubic feet per day for favorable economics** (including interconnection costs). Higher volumes generally needed for landfills
   - Small to medium scale biogas production facilities have historically not been economical. But with biomethane interconnection incentive and high credit prices things are changing

3) **Incentives/Subsidies -** Need **incentive programs specific to RNG projects** to bring down the costs

Interconnection: Overview of Components

Two Primary Components of the Term "Interconnection"

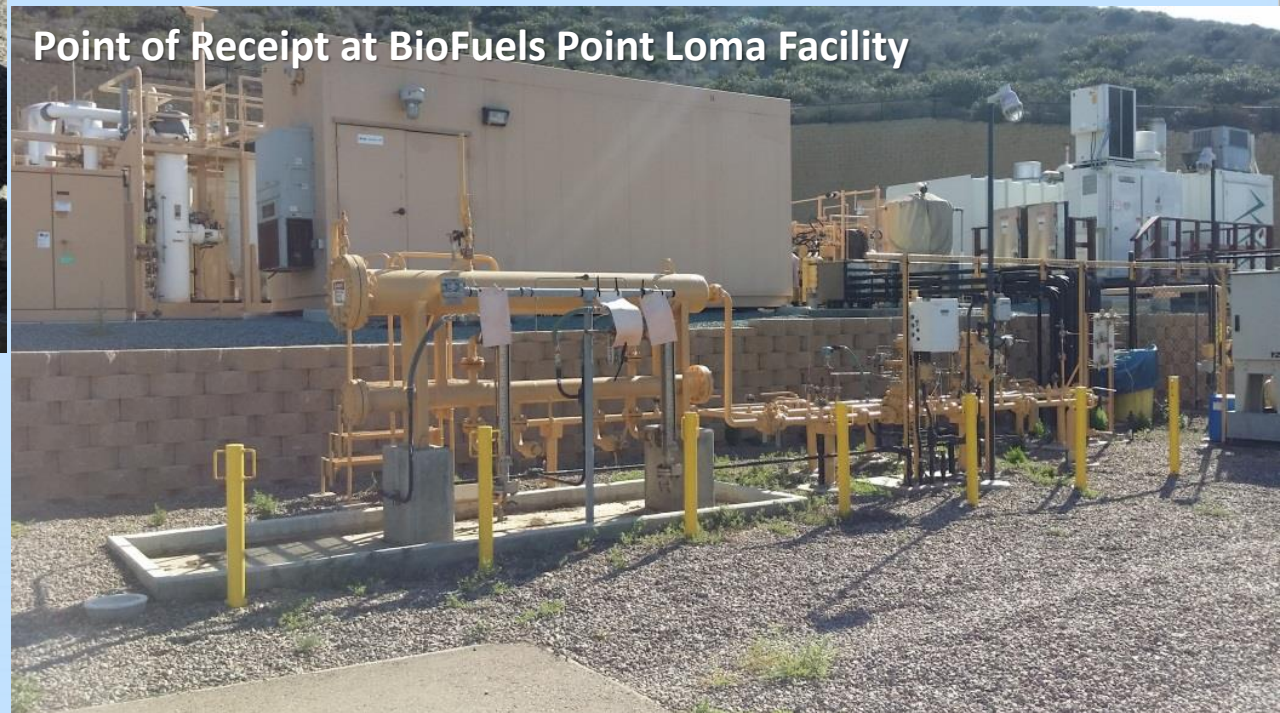


"Interconnection" = "Point of Receipt" + "Pipeline Extension"

“Point of Receipt” Component of the Interconnection

The Point of Receipt

1. **Monitors gas quality** to ensure it meets SoCalGas Rule 30 Gas Quality Specifications (e.g. CO_2, O_2, total inerts, heating value, H_2S)
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



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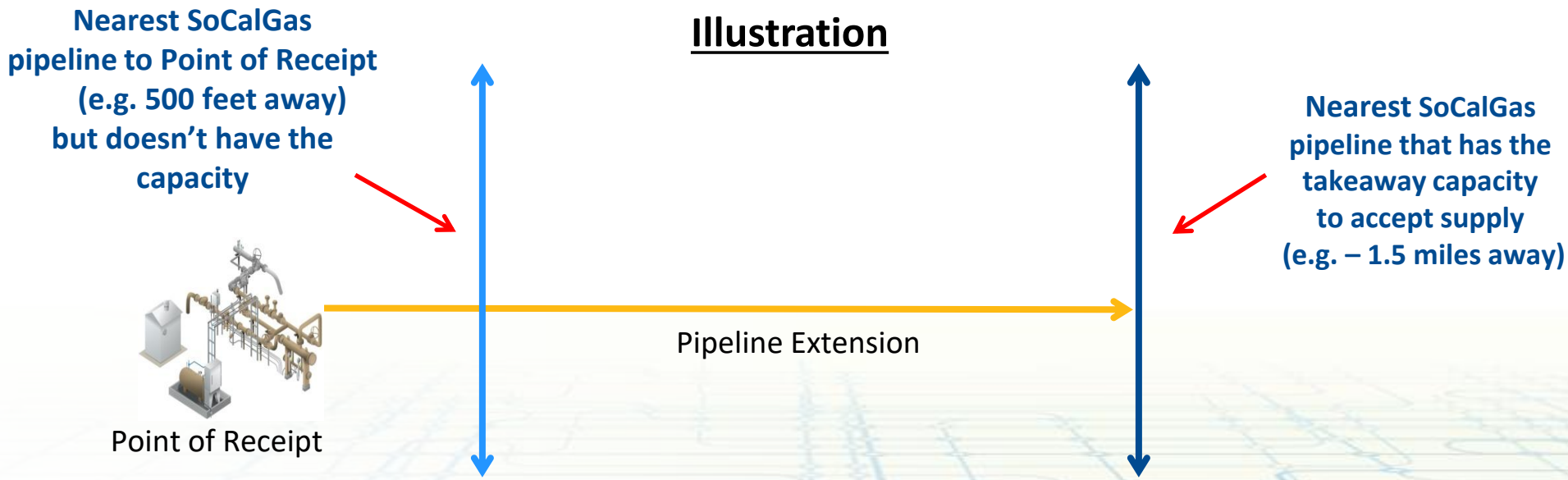
“Pipeline Extension” Component of the Interconnection

- **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



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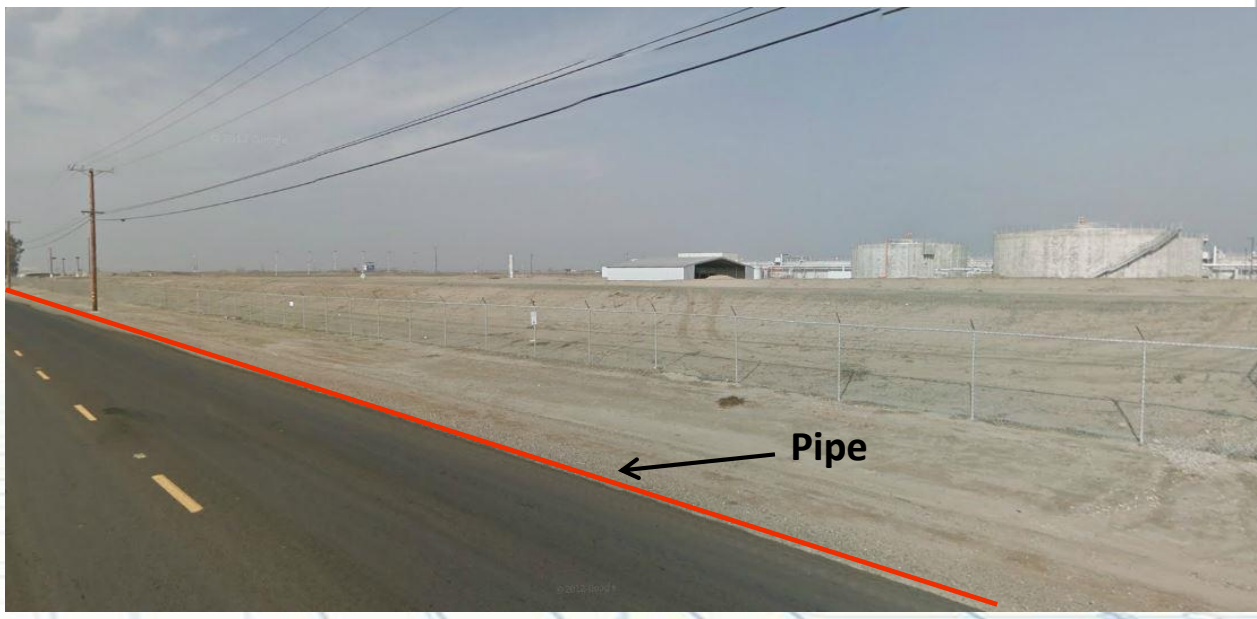
Pipeline Extension Cost Considerations

Illustration 1 (curb and gutter):

- Cost to install pipe is much more expensive when:
  - Asphalt/concrete is cut
  - Traffic control is required
  - Night work is required

Illustration 2 (no curb and gutter):

- Cost to install pipe is much less expensive when:
  - No need to cut asphalt/concrete
  - Minimal traffic control
  - No work hour restrictions



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Biomethane Interconnection Incentive

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

Interconnection project with 3 or more dairies in close proximity	All other interconnection projects (e.g. landfill, wastewater, landfill diverted organics, 1-2 dairies)
Incentive of 50% of eligible costs with **$5 Million Cap**	*Incentive of 50% of eligible costs with* **$3 Million Cap**
Eligible costs include	**Eligible costs include**
Biogas collection lines	Compression equipment for product gas
Compression equipment for product gas	Utility Point of Receipt
Utility Point of Receipt	Utility Pipeline Extension
Utility Pipeline Extension	

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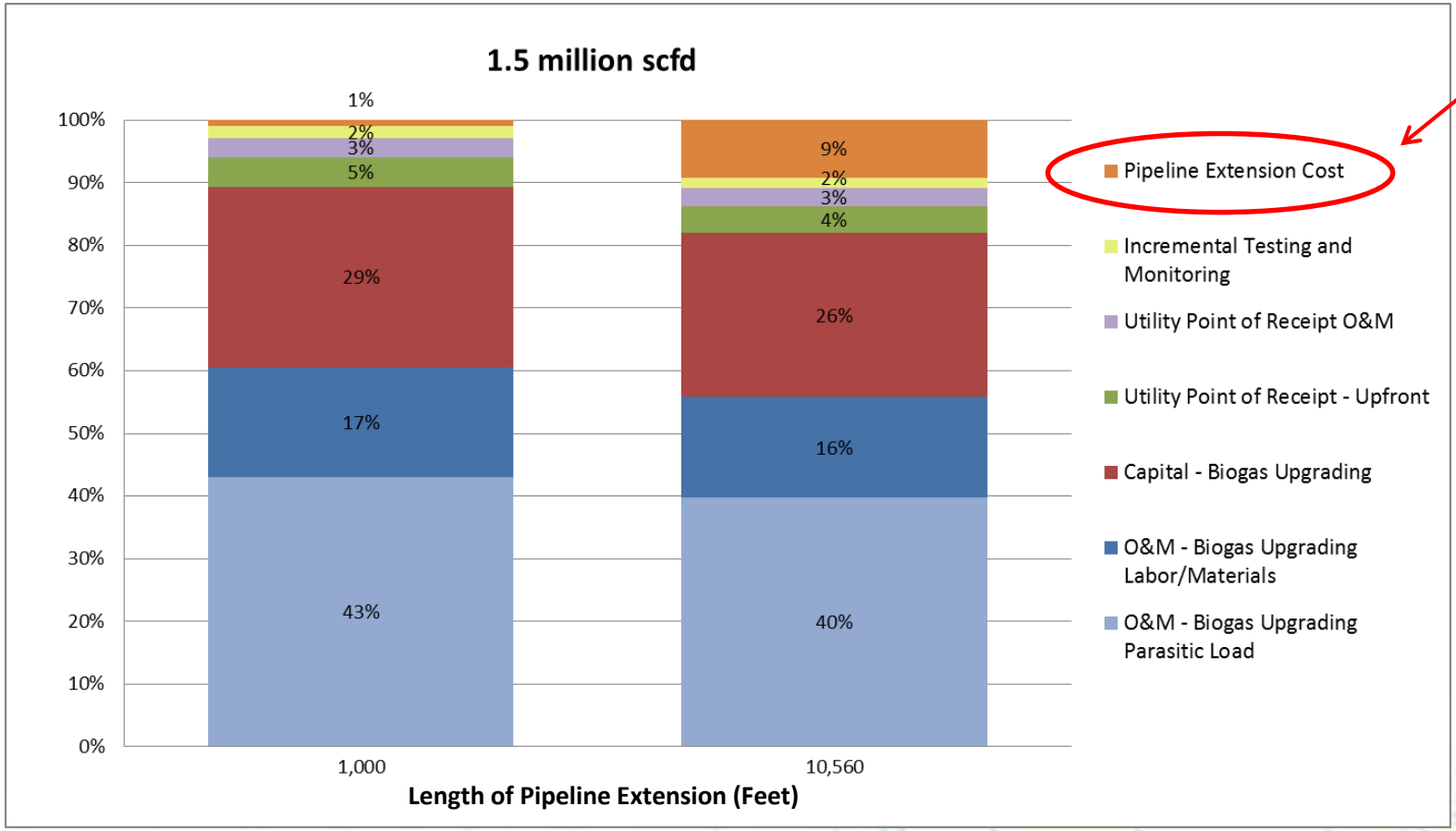
Estimated Breakdown of Major Cost Components for Producing and Injecting RNG into the Pipeline

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



Location is Key!!

Breakdown includes interconnection subsidy of 50%, maximum of $3.0 million per project

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.

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Biogas Conditioning and Upgrading Projects

SoCalGas Biogas Upgrading Demonstration Project at the Hale Avenue Resource Recovery Facility (HARRF)

HARRF Information

- Wastewater treatment facility located in Escondido, CA
- Average Daily Flow ~ 15.6 MGD
- Biogas was being flared prior to start of demonstration project
- Biogas Production ~ 95 million cubic feet per year
- Biogas contains enough energy to supply ~1,200 homes

Source of photo: www.escondido.org/water-treatment-plant.aspx

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SoCalGas Biogas Upgrading Demonstration Project at the Hale Avenue Resource Recovery Facility (HARRF)

- **Demonstration project occurred in 2011 and 2012**
- **Typical Weekly Operating Data**
  - Avg Feed Flow - 158 scfm
  - Avg Product Flow (biomethane) – 85 scfm
  - Avg Product Quality – 99.2% methane
  - Avg Methane Recovery – 90%
  - Avg Product H2S – 0.12 ppm
    - Rule 30 limit is < 4.0 ppm
  - Siloxane range – 0.005 to .04 mg Si/m3
    - Rule 30 lower action level = 0.1 mg Si/m3
- **The demonstration project validated biogas can be safely and efficiently upgraded to SoCalGas Rule 30 pipeline quality specifications**

Xebec Pressure Swing Absorption Unit at the HARRF

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Biofuels Point Loma Renewable Natural Gas Project Overview

- Point Loma Wastewater Treatment Plant treats approximately 175 million gallons of wastewater per day generated by ~2.2 million area residents
- Prior to the project, the plant was flaring more than 1.3 million cubic feet per day of digester gas
- The plant partnered with BioFuels Energy, LLC, to condition/upgrade wastewater digester gas and feed it into the natural gas pipeline system
- Since 2012, the RNG is injected into the utility pipeline and used to power a 2.8 MW fuel cell at UC San Diego and a 1.4 MW fuel cell at South Bay Water Reclamation Plant in San Diego
- Total project cost of $45 million, 75% was subsidized through incentives and tax credits

Data and Photo Sources

https://www.socalgas.com/smart-energy/success-stories/point-loma

https://www.socalgas.com/1443740098116/Biogas-to-RNG-at-Point-Loma-Wastewater-Treatment-Facility.pdf

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CR&R Renewable Natural Gas Project Overview

- CR&R Waste and Recycling Services is a recycling and waste collection company, serving more than 2.5 million people and 5,000 businesses throughout Orange, Los Angeles, San Bernardino, Imperial, and Riverside counties
- Project Details*:
  - Two of the four phases are complete with each phase capable of handling ~83K tons/year of organic waste
  - Each phase is expected to produce ~1,000,000 diesel gallon equivalent (DGE) of vehicle fuel per year, enough to fuel ~80 of CR&R's CNG waste trucks
  - Each phase is capable of producing 10 million gallons/year of liquids (fertilizer) and 35,000 tons/year of solids (soil product)
  - Equipment Vendors: Eisenman (anaerobic digestion) and Greenlane Biogas (biogas upgrading)
  - Cost: Over $100 million at full buildout
  - Construction began in 2014 and RNG expected to flow into SoCalGas pipeline in Q4 of 2017
- The CR&R project will be the first RNG-to-pipeline project in SoCalGas' service territory

*** Sources of Information**

http://biomassmagazine.com/articles/10641/crr-breaks-ground-on-california-ad-facility
http://www.paulrelis.com/california-msw-organics-digester-prepares-to-launch/
https://www.biocycle.net/2017/05/01/high-solids-digester-services-california-municipalities/

CR&R Renewable Gas Project Overview

*** Source of picture -** http://www.jrma.com/projectsdetails/cr-r-environmental-center-ad-facility

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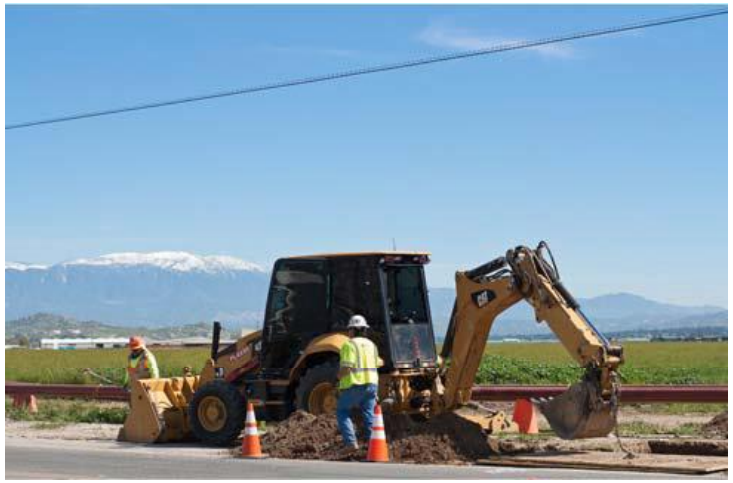
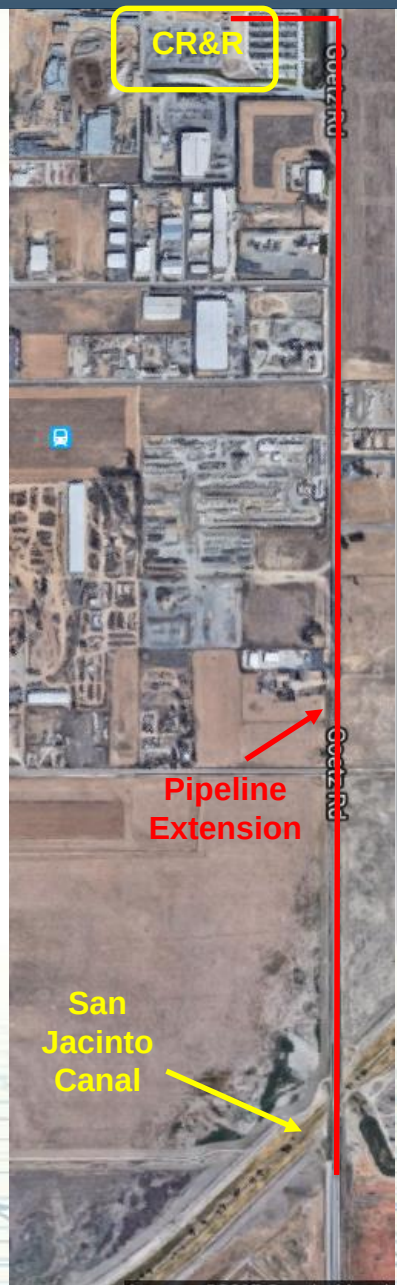
Overview of Pipeline Extension – CR&R Perris

Overview

- Installation of ~1.4 miles of 8” high pressure steel pipe (directional bore method)
- Majority of the street where pipe was installed does not have curb and gutter (minimized the need to cut asphalt/concrete)
- Pipeline crossed the San Jacinto Canal





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Overview of SB 1383

- SB 1383 directs CARB to implement regulations to reduce emissions of Short Lived Climate Pollutants (SLCPs). By 2030, requires a reduction of the following compared to 2013 levels:
  - ✓ 40 percent reduction in methane
  - ✓ 40 percent reduction hydrofluorocarbon (f-gases)
  - ✓ 50 percent reduction in black carbon (such as diesel)

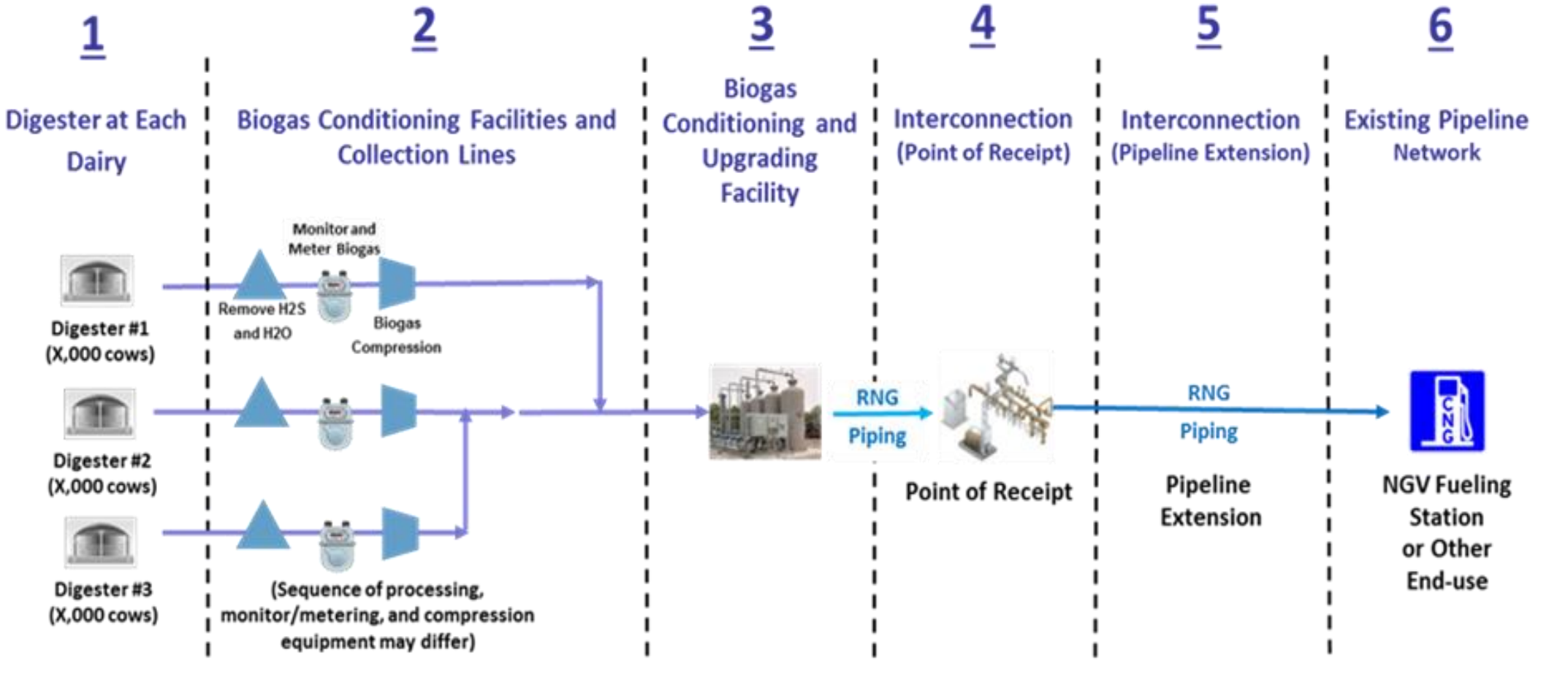
Some Dairy Related Sub-Parts of SB 1383

- Directs CARB to adopt regulations to reduce methane emissions from livestock manure management operations and dairy manure management operations by up to 40 percent below 2013 levels by 2030
  - ✓ Approximately 45% of all methane emissions in CA come from dairies, 25% from manure and 20% from enteric fermentation

- ***No later than January 1, 2018, CPUC to direct gas corporations to implement not less than 5 dairy RNG injection pilot projects***. Reasonable **pipeline infrastructure** costs are recoverable in rates

SB 1383 - Dairy RNG to Pipeline Pilot

Representative renewable gas operating model



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Nitrogen and Oxygen Levels in Landfill Gas Can Significantly Impact Costs and Project Economics

- The removal of nitrogen (N2) and oxygen (O2) from biogas to meet pipeline quality specifications is expensive
- **High levels of nitrogen and oxygen exist in landfill gas** because there has been little need to minimize air intrusion for a landfill gas collection system, as engines/turbines can handle these high levels

Typical Biogas Compositions by Source	Methane (CH4)	Carbon Dioxide (CO2)	Nitrogen (N2)	Oxygen (O2)
Dairy, wastewater treatment, and landfill diverted food/green waste	~60 to 65%	~30 to 35%	<1 %	<0.2%
Landfill	~35 to 60%	~30 to 40%	~10 to 30%	~1 to 3%

- In 2015, SoCalGas commissioned Black & Veatch to perform a evaluation of current biogas upgrading technologies. Included in the report is a high-level impact assessment for removing nitrogen and oxygen

Sensitivity	Scenario	Impact
Nitrogen and oxygen removal	Eliminate the need for nitrogen removal equipment	Lowers cost by 20 to 25% for large scale cases
Pipeline Interconnection Costs	Reduce (post Biomethane Interconnection Incentive) interconnection cost by 50%	3 to 10% reduction in biomethane costs. Greater impact on smaller cases

Interconnection Tools and Process Improvements

Interconnection Tools and Process Improvements

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

RNG Toolkit
(Available at socalgas.com/rg)

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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 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.

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 non-tariff 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/

FREQUENTLY

What are some
that would use t
Examples of cust
be served by the
Tariff include, bu
for pipeline injec
refueling station
combined heat a

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INNOVATION | RNG

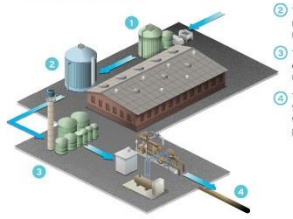
RENEWABLE NATURAL GAS
PART OF CALIFORNIA'S RENEWABLE ENERGY FUTURE

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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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 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 p 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

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INNOVATION | RNG

BIOGAS SUPPLIER LIST

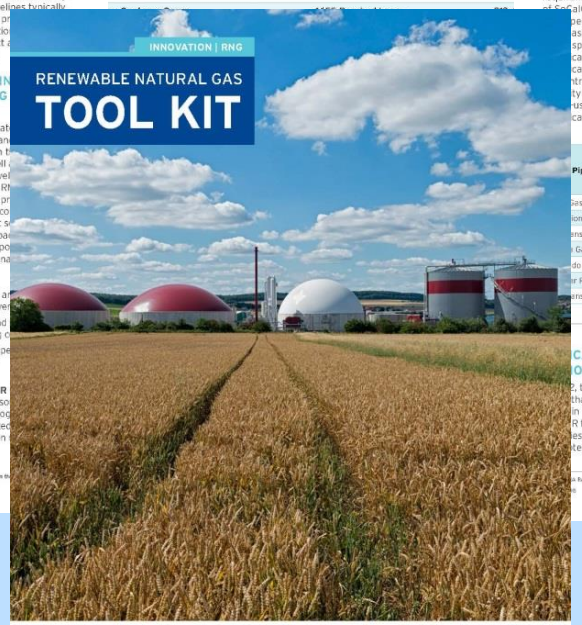
NORTH AMERICA

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-

INNOVATION | RNG

RENEWABLE NATURAL GAS
TOOL KIT



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INNOVATION | RNG

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, pipeline 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	Max	Water Content (Lbs/MMscf)	Various Ine CO_2	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

, 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.

SoCalGas
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INNOVATION | RNG

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.

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

Overview of SoCalGas Biogas Conditioning/Upgrading Services (BCS) Tariff

- **Summary:** The BCS Tariff is a utility tariff that allows SoCalGas to design, install, own, operate & maintain biogas conditioning/upgrading equipment on or adjacent to the customers premise
- **Optional:** The BCS Tariff is an optional tariff service and not tied to any other tariff or non-tariff services the customer may receive
  - The BCS Tariff is promoted on a competitively neutral basis with periodic reporting to the Commission
- **Price:** The BCS Tariff rate charged to the customer covers the full cost to provide the service (both CapEx and O&M costs)
  - **SoCalGas ratepayers do not bear the risk** of under collections related to the BCS Tariff
- **Commonly Asked Questions About BCS Tariff**

	Who is responsible for the upfront investment of upgrading facility?	Who is responsible for on-going maintenance of the upgrading facility?	Who is responsible for the parasitic load (utility costs to run the facility)?	Who owns the biogas and RNG?	Who determines the contract term?	Who is responsible for the interconnection with the utility?
SoCalGas	X	X			Negotiable (typically 10 to 20 years)	
BCS Tariff Customer			X	X		X

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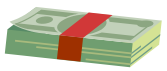
Overview of SoCalGas Biogas Conditioning/Upgrading Services (BCS) Tariff

BCS Tariff Illustration

Customer Owned Biogas

Biogas Conditioning/Upgrading Services Facility
(SoCalGas Owned and Operated)



Customer pays SoCalGas a monthly BCS tariff fee for a turnkey solution

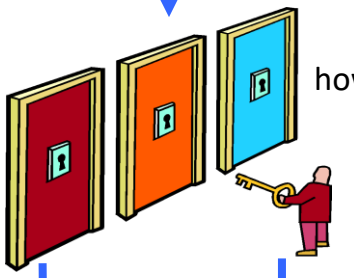
What is included in SoCalGas' turnkey solution?

- 100% of the upfront capital
- Biogas conditioning/upgrading facilities design
- Equipment and construction RFP
- Vendor selection and management
- Project/construction management
- Facility operation and ongoing maintenance
- Contract management

What is not included?

- Customer pays for utility costs (e.g. – kWh to operate the upgrading facility)

Customer Owned Conditioned/Upgraded Biogas



Customer decides how to use conditioned/ upgraded biogas

Onsite Use – CNG or Generation

Interconnection for Pipeline Injection (Responsibility of Customer)

SoCalGas A Sempra Energy utility

Thank You

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