Application No.: A.12-04-024
Exhibit No.: SCG –
Date: March 8, 2013
Witness: Jim Lucas

Application of Southern California Gas Company (U904G) to Establish a Biogas Conditioning/Upgrading Services Tariff	)))))	Application 12-04-024 (Filed April 25, 2012)

SOUTHERN CALIFORNIA GAS COMPANY

BIOGAS CONDITIONING/UPGRADING SERVICES

REBUTTAL TESTIMONY

Prepared Direct Rebuttal Testimony

of

Jim Lucas

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

March 8, 2013

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PREPARED DIRECT REBUTTAL TESTIMONY OF

JIM LUCAS

ON BEHALF OF SOUTHERN CALIFORNIA GAS COMPANY

I. INTRODUCTION AND BACKGROUND

Two intervenors, Division of Ratepayer Advocates (DRA) and Southern California Generation Coalition (SCGC), submitted written testimony regarding SoCalGas's proposed Biogas Conditioning/upgrading Services (BCS) tariff. Among the two intervenors, only DRA recommends denial of SoCalGas' Application. Both recommend that, if it approves the application, the Commission adopt certain restrictions including putting the service outside the ordinary ratemaking process, thus insulating ratepayers from any risk. SCGC further recommends adoption of a 5% payment to ratepayers on each BCS project.

Intervenors' testimony addresses certain issues identified in the Scoping Ruling, as well as some that go beyond those issues. This rebuttal testimony addresses the project and technical issues raised. In particular: 1) assertions questioning BCS tariff project economic viability apparently attempting to imply that the proposed service will not lead to any projects being developed in support of state policy goals; 2) assertions that SoCalGas' lacks the requisite experience to offer the proposed service and; 3) assertions that SoCalGas cannot properly assure the quality of the biomethane introduced onto the pipeline system from BCS tariff projects.

In relation to the issues defined in the Scoping Ruling the issues to be addressed here are:

- Will the biogas conditioning and upgrading services aid in obtaining California environmental goals, including its Renewables Portfolio Standard (RPS) goals?
    - In an apparent attempt to demonstrate that the proposed BCS tariff will not advance state policy goals to advance the development of biogas resources, DRA argues that biomethane is extremely expensive as compared with most other renewables and that this is the reason that projects are not being developed. DRA offers no evidence to support the premise that biogas conditioning/upgrading in general is not economic but SoCalGas none-the-less rebut for the record the incorrect assertions put forward by DRA regarding project economics and the market value of biomethane.

- What will be the risks to ratepayers if the instant Application is granted?
    - DRA implies that BCS tariff projects have a high risk of failure based on data on biogas projects that DRA alleges to be accurate and relevant to the proposed service. SoCalGas disagrees with the DRA assessment of risk of project failure and provides evidence to support the erroneous conclusions drawn by DRA.

The majority of points raised by the Intervenors have been addressed in SoCalGas' application and the Intervenors introduce virtually no new factual information or evidence to support their objections to SoCalGas' proposed BCS tariff. The following testimony addresses the points raised in opposition to the proposed tariff, further details the foundations of the BCS tariff and reiterates why its approval is in the interest of ratepayers.

More specifically, the key points are:

1. When biomethane is injected into the utility pipeline network and nominated to an RPS certified generation facility, the cost to generate renewable energy is very competitive with other renewable technologies, such as wind and solar. As such, the economics of the BCS proposal can assist the state in meeting its RPS goal of 33% by 2020.
2. DRA is incorrect in its claim that nearly half of all attempts to produce biogas in California have failed and also fails to make any showing of the relevance of their data to the proposed BCS tariff. First, the DRA data is limited to livestock and provides no information on what role, if any, biogas conditioning/upgrading played in the projects they reference. DRA also fails to acknowledge that the wastewater treatment industry has been successfully producing and utilizing biogas for decades. In fact, there are over 150 wastewater treatment facilities in California with onsite digesters.
3. SoCalGas has demonstrated that biogas upgrading to pipeline quality is generally economic given sufficient volumes of raw biogas. As SoCalGas has previously testified[1], biogas can be conditioned/upgraded to pipeline quality at a cost that is

[1] Witness Goodman's Direct Testimony, Page 6, Lines 11-12.

competitive with other renewable resources at volumes of approximately 1.5 million standard cubic feet per day (scfd) of biogas.

4. SoCalGas has a great deal of experience in gas processing and compression through the long operation of its many gas storage fields, and views biogas processing (and this tariffed service) as a logical extension of this experience whereby we can aid our customers in developing their potential renewable natural gas resources to achieve both customer and social benefits.
5. In addition to the monitoring and testing procedures under SoCalGas' Rule 30 for gas constituents, SoCalGas will have gas quality monitors to analyze both the biogas entering the BCS facility and the biomethane leaving the BCS facility. SoCalGas will also have valves with controls to divert the biomethane from reaching SoCalGas' interconnection facility should certain gas constituents not meet Rule 30 gas quality specifications. Also, SoCalGas will review the gas quality data provided by the BCS facility on a continual basis to identify any trends and/or outliers.

II. THE ECONOMICS FOR BIOGAS CONDITIONING/UPGRADING CAN SUCCESSFULLY BE SATISFIED AT SCALE

DRA makes numerous assertions on biogas project viability which demonstrate a misunderstanding of biogas and biomethane project economics. This is only indirectly in the scope of the instant proceeding as it only indirectly relates to whether the proposed service will promote biogas development in the state. However, SoCalGas will rebut the incorrect assertions of DRA to ensure that the record is accurate on these matters.

A. Economies of Scale for Biomethane

On page 18, lines 5-6 of its testimony, DRA states that "While natural gas prices are currently between \$3 and \$4 per MMBTU, the cost of biomethane can range between \$11 and \$23 per MMBTU depending on the project." In making this assertion, DRA footnotes "The Economic Feasibility of Dairy Manure Digester and Co-Digester Facilities in the Central Valley of California, p.3-9[2]" Pages 3-9 of the report provide two illustrative representations/scenarios

[2] www.waterboards.ca.gov/centralvalley/water_issues/dairies/dairy_program_regs_requirements/final_dairy_digstr_econ_rpt.pdf

where the biogas from 10,000 cows is conditioned/upgraded to biomethane for the purpose of pipeline injection. Both scenarios assume biomethane production of 94,400,000 standard cubic feet per year. The cost analysis shows the cost to produce and inject biomethane into the utility pipeline network is $10.79 and $20.52/MMBtu under the two scenarios.

SoCalGas is not surprised at the cost range derived in this analysis given the modest amount of gas throughput. On page 24, line 27 of Witness Goodman's testimony, it states: "Each of these activities generates or processes large amounts of organic waste material, which as a feedstock for anaerobic digestion can produce enough biogas to satisfy the economies of scale (approximately 1.5 million standard cubic feet per day) for a pipeline injection project as described below." Assuming biogas has a methane content of 60% and the biogas conditioning/upgrading facility has a methane capture rate and operational uptime of 90% and 95% respectively, the 1.5 million cubic feet per day of biogas equates to approximately 281,000,000 cubic feet per year of biomethane. This is nearly three times as much biomethane compared to the scenarios used by DRA (94,400,000 standard cubic feet per year). If DRA would have considered SoCalGas' stated threshold of 1.5 million scfd of biogas, they would have realized the scenarios in the above mentioned report do not produce enough biogas/biomethane to satisfy the economics for pipeline injection and are not appropriate scenarios for stating a cost range to produce biomethane. In addition, DRA incorrectly assumes that the comparison price for biomethane is conventional natural gas. Biomethane is a renewable resource and, as described below, would be price competitive with renewable electric resources in the lower portion of the range cited by DRA. Zero carbon vehicle fuel may command an even higher price once the LCFS is implemented.

B. Biomethane Is Competitive with Other Renewable Technologies

On page 18, lines 6-7 of DRA's testimony, DRA argues that "biomethane is extremely expensive as compared with most other renewables." DRA provides no references or support for this argument.

On March 28, 2012, the California Energy Commission (CEC) voted to suspend provisions for the consumption of biomethane as eligible for RPS and limits the use of biomethane to pre-certified power plants until resolution of the suspension. On September 27, 2012, AB 2196 was signed by Governor Brown which repealed the suspension.

On January 25th, 2013, the CEC issued a "Notice Regarding Staff Concept Paper for Implementation of Assembly Bill 2196 Pertaining to the Renewables Portfolio Standard Program".[3] Also issued with the notice is the "Staff Concept Paper on Implementation of Assembly Bill 2196".[4] In the Staff Concept paper, CEC staff has identified outstanding issues and related questions regarding the details of implementing AB 2196. As stated by the CEC on page 3 the Staff Concept paper, "After considering stakeholder input to the concept paper and under the direction of the lead commissioner on renewables, staff plans to release a draft *RPS Eligibility Guidebook, 7th Edition* in early 2013, followed by a public workshop on the staff's proposed revisions to the draft guidebook. After incorporating stakeholder input on the draft guidebook, staff anticipates that the Energy Commission will consider adoption of the final draft *RPS Eligibility Guidebook, 7th Edition* at a business meeting in spring 2013."

Based on the details and language of AB 2196, it is extremely likely that biomethane injected into SoCalGas' utility pipeline network and used at a RPS certified generation facility will be considered as eligible for RPS once the *RPS Eligibility Guidebook 7th Edition* is approved by the CEC.

SoCalGas is often asked to present at biogas and waste-to-energy conferences to discuss a variety of topics pertaining to biomethane. One of the topics SoCalGas frequently discusses during our presentations is the cost competitiveness of biomethane compared to other renewable technologies such as wind and solar. Two recent published reports providing a cost of generation comparison for renewable technologies are: 1) the Renewable Energy Transmission Initiative (RETI) Phase 2B;[5] and 2) the U.S. Energy Information Administration, Annual Energy Outlook 2012.[6]

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3 http://www.energy.ca.gov/portfolio/notices/2013-01-25_Notice_of_Availability_AB-2196_RPS_Staff_Concept_Paper_Rev.pdf

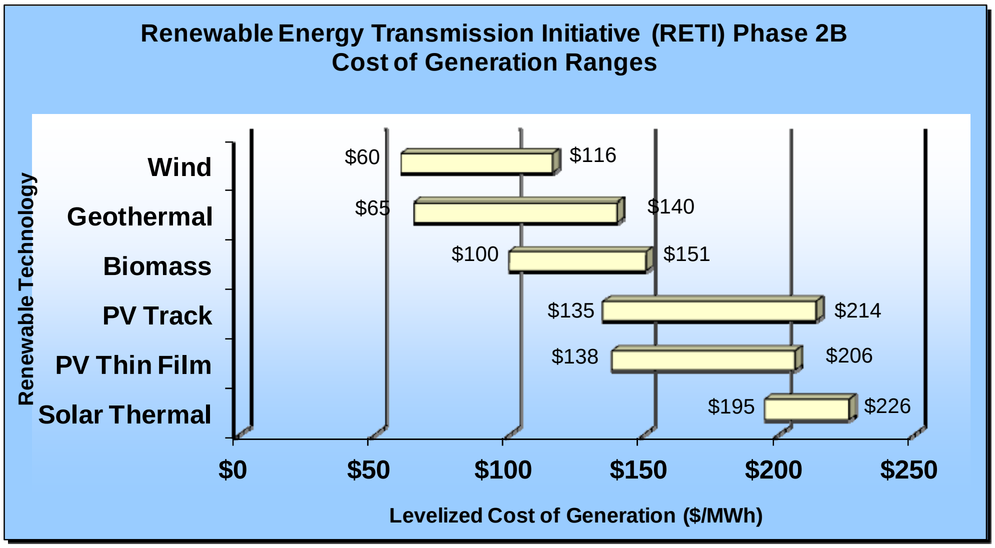
4 http://www.energy.ca.gov/2013publications/CEC-300-2013-001/CEC-300-2013-001.pdf

5 http://www.energy.ca.gov/2010publications/RETI-1000-2010-002/RETI-1000-2010-002-F.PDF, May of 2010

6 www.eia.gov/forecasts/aeo/electricity_generation.cfm

Chart 1 below is from the RETI Phase 2B report and provides cost of generation ranges (at utility scale) for a variety of renewable technologies.[7] The ranges include the financial benefits from any applicable investment tax credits (ITC's) and production tax credits (PTC's).[8]

Chart 1



The U.S. Energy Information Administration comparison is illustrated in Chart 2 below. The illustration presents average levelized costs (at utility scale) for generating technologies that are placed in service on or after 01/01/2017. Since the report selects systems that are placed in service on or after 01/01/2017, the cost of generation ranges do not include targeted tax credits such as the production or investment tax credit available for some technologies.[9]

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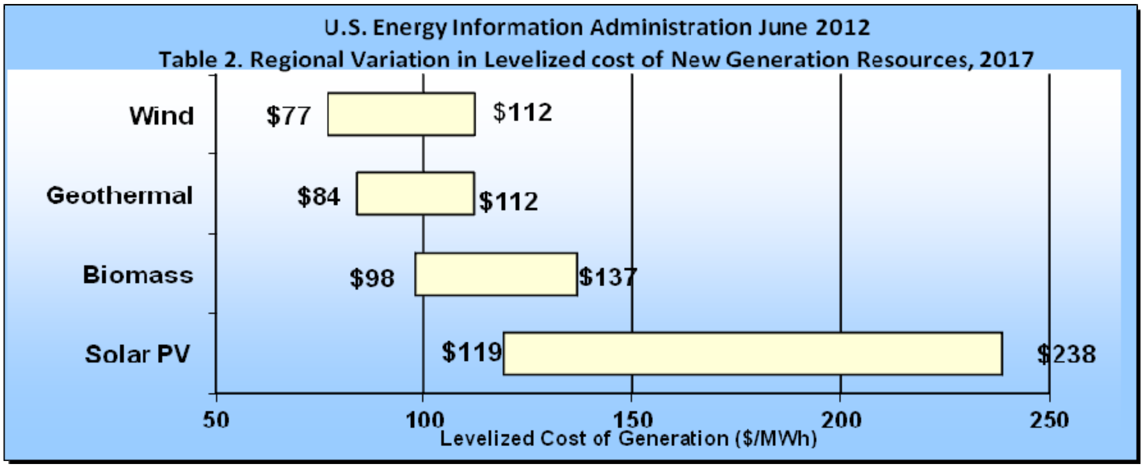
[7] RETI Phase 2B report, Page 1-2.
[8] RETI Phase 2B report, Page 3-4.
[9] www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US02F&re=1&ee=1

Chart 2



Charts 1 and 2 show very similar cost of generation ranges for the renewable technologies, even though come 2017 the benefits from investment tax credits and production tax credits will be eliminated or significantly reduced. This can likely be attributed to the dramatic drop in cost of renewable energy, particularly for photovoltaics over the past 5-10 years.[10]

Now that a cost of generation range has been determined for a variety of renewable technologies, how does the use of biomethane at a RPS certified generation facility compare to these ranges? Based on various discussions with biogas developers, the market price of biomethane has generally been in the $9 to 12/MMBtu range over the past few years. Table 1 below shows the calculation used to develop a cost of generation using biomethane that is injected into the utility pipeline network and nominated to a RPS certified generation facility. The calculation takes and uses various assumptions from the CPUC's 2011 Market Price Referent (MPR) model[11].

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[10] http://www.economist.com/blogs/graphicdetail/2012/12/daily-chart-19

[11] http://www.cpuc.ca.gov/PUC/energy/Renewables/mpr

Table 1

	(a)	(b)	(c)	(d)	(e)	(f)	
	Biomethane* ($/MMBtu)	Transportation ($/MMBtu)**	Total Fuel Cost ($/MMBtu) (a) + (b)	Total Fuel Cost ($/MWh)*** [(c) x (g)]/1,000	Combine Cycle Power Production Variable O&M ($/MWh)****	Combined Cycle Power Production Fixed Costs ($/MWh)****	Cost to Generate RPS Energy ($/MWh) (d)+(e)+(f)
Biomethane - High	$ 12.0	$ 0.30	$ 12.30	$ 85.2	$ 6.82	$ 20.49	$ 112
Biomethane - Low	$ 9.0	$ 0.30	$ 9.30	$ 64.4	$ 6.82	$ 20.49	$ 92

* Conditioned Biogas ($/MMBtu): Estimated market price of biomethane at the point of injection
** SoCalGas GT-F5D Rate Schedule (Over 3 million therms)
*** Heat Rate **(g)** of 6,924 Btu/kWh - From 2011 MPR Model: Average CCPP Heat Rate over life of plant
**** From 2011 MPR Model: 2012 average of variable cost componenet, average of fixed cost component

As illustrated in Table 1 above, the cost of generation for biomethane is between $92 to 112 per MWh, which is lower than the range for photovoltaic and within the range for wind.

III. BIOGAS PRODUCTION IN CALIFORNIA

A. Biogas Production Has Occurred in California for Decades

As stated in Witness Goodman's direct testimony on page 6, lines 5-13, biogas can be produced from a variety of sources of organic waste, including but not limited to, landfill diversion operations, wastewater treatment facilities, concentrated animal feeding operations, and food/green waste processing.

On page 18 of DRA's testimony, lines 9 – 13, it states: 1) "Nearly Half of All Attempts to Produce Biogas in California Have Failed" and 2) "Biogas production in California has been limited to date". DRA makes these statements based on the AgStar Anaerobic Digester Database,[12] a database that focuses on livestock digesters only. It does not take into consideration other sources of biogas production, such as wastewater treatment facilities nor present specific analysis of the project issues leading to failure of the projects it cites. According to the website "biogas data"[13], there are 156 wastewater treatment facilities in California that have digestion facilities and many have successfully been producing biogas for decades. DRA's claim about biogas production being limited in California is narrowly focused to only one

[12] EPA's AgStar Anaerobic Digester Database - www.epa.gov/agstar/downloads/digesters_all.xls
[13] http://www.biogasdata.org/facilities?utf8=%E2%9C%93&search=ca

industry sector as evident by the number of wastewater treatment facilities currently producing biogas and draws no connection between claimed project failures and the proposed BCS tariff.

B. AgStar Anaerobic Digester Database

The AgStar Anaerobic Digester Database shows ten livestock digesters shutdown in California, nine of which are dairy digesters and one is a swine digester. This list needs to be updated because the complete mix digesters at Inland Empire Utilities Agency (IEUA) - Reg Plant 5[14] have recently been put back into operation and are taking foodwaste to generate biogas[15].

SoCalGas disagrees with DRA's assertion that nearly half of all attempts to produce biogas in California have failed. This statement implies that the reason the bioenergy projects failed was due to problems/issues with the digesters (biogas production) and not the other components that make-up a bioenergy project (e.g., onsite generation equipment). As depicted below, SoCalGas clearly shows that most of the shutdowns were not due to biogas production issues. In fact, some dairies chose to flare a portion of the biogas because it was cheaper to flare than to use it onsite.

First, the Agstar Database (for St. Anthony Farm), states that "Program being dismantled, not digester issues." Based on this comment, biogas production was likely not the primary reason for this project being unsuccessful.

Second, owner of Vintage Dairy filed for bankruptcy in late 2011.[16]

Third, in February of 2009, as part of the PIER Program, the CEC issued the "Dairy Methane Digester System Program Evaluation Report"[17] and it includes a case study for six of the bioenergy facilities stated as shutdown in the AgStar Anaerobic Digester Database. As stated in the report, a common obstacle for these bioenergy facilities was net metering as the dairies were not able to benefit from the production of excess energy. Below are some comments taken from three of the case studies:

[14] The complete mix digesters at IEUA are located at RP-5 and not RP-1, as stated in Agstar Anaerobic Database report.

[15] http://www.biocyclewestcoast.com/2012/Presentations/Wednesday/McNamara_s.pdf

[16] http://www.thebusinessjournal.com/news/agriculture/174-dairy-technology-entrepreneur-declares-bankruptcy

[17] http://www.energy.ca.gov/2009publications/CEC-500-2009-009/CEC-500-2009-009.PDF

Eden-Vale Dairy – "During the study period the system produced far more biogas and electricity than could be used for dairy operations connected to the engine. The dairy owner reports having no incentive to generate surplus electricity for which he would have received no compensation. Therefore, excess gas not used by the engine-generator was flared during this period."[18]

Koetsier Dairy – "The dairy owner reports having no incentive to power the second engine-generator in order to produce surplus electricity for which he would have received little to no compensation. Therefore, the dairy owner underfeeds the digester and flares the gas that is not used by the one engine."[19]

Van Ommering Dairy – "Generator was not run at capacity because there was no compensation available for excess generated power. This greatly reduced the financial feasibility of the project."[20]

Finally, the San Joaquin Valley Air Pollution Control District Rule 4702 Internal Combustion Engines lowered the air pollution emission standards for spark-ignited internal combustion engines used in agricultural operations. By January 1, 2009, operators had to comply with the more stringent emission standards, which required many operators to retrofit engines with expensive air pollution control equipment or shut them down. At an Agstar workshop held on October 15, 2010, Paul Sousa of the Western United Dairymen gave a presentation titled "California-Specific Issues Impacting Digester Projects"[21] and on slide 9, it states that one of the CA dairy digesters was shut down due to Rule 4702. He also stated that two digesters were already shut down for other reasons but Rule 4702 creates an additional hurdle for those digesters to come back online.

SoCalGas looks forward to supporting the agricultural and other sectors with the proposed BCS tariff which will provide an additional option for developing biogas resources and help avoid the chronic difficulties of creating sustainable bioenergy projects. Failure of some

[18] Dairy Methane Digester System Program Evaluation Report, page 48
[19] Dairy Methane Digester System Program Evaluation Report, page 52
[20] Dairy Methane Digester System Program Evaluation Report, page 59
[21] http://epa.gov/agstar/news-events/events/workshop10.html

dissimilar past projects attempting to put biogas to beneficial use is not an argument against the proposed BCS tariff, it is evidence of the market need for such a service.

IV. SOCALGAS HAS A GREAT DEAL OF EXPERIENCE IN GAS PROCESSING AND COMPRESSION

On page 22 of DRA's testimony, lines 11 – 12, it states "the production and processing of gas are not a core competency of SoCalGas". DRA also states on page 22, lines 13-15, that "SoCalGas is a monopoly gas utility, and as such its core competency is in the transmission and distribution of natural gas, not gas processing or production". DRA is incorrect in its assertion that SoCalGas lacks competence and experience in gas processing. This is in fact, a routine part of SoCalGas storage and gas production operations. SoCalGas has a great deal of experience in gas processing and compression through the operation of its many gas storage fields and compressor stations, and views biogas processing as a logical extension of its core service offerings. Some typical gas processing components that are part of the day-to-day storage operations are: solids and liquids filtration and separation, gas dehydration, tail gas and low pressure gas pre-treatment systems – utilizing permanganate, SulfaTreat and activated carbon (for removal of H_2S, VOC's, mercaptans), hydrocarbon dewpoint control, regenerative thermal oxidizer (RTO), compression equipment, and blowers. SoCalGas also has two pressure swing adsorption (PSA) units in operation, one of which is located at SoCalGas' Montebello facility where cushion gas is processed (removal of CO_2, H_2S, H_2O and ethane) and put into the utility pipeline network. The second PSA system resides at the Hale Avenue Resource Recovery Facility (HARRF) as part of SoCalGas' biogas upgrading demonstration project. SoCalGas also owns and operates twelve transmission compressor stations with over 130,000 horse power of compression.

Table 2 below provides an overview of SoCalGas' experience in gas processing and compression at six different facilities and compares this experience to the major components required for biogas conditioning and upgrading using a PSA system.

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Table 2

	Active Storage Fields				Other Facilities		
Gas Processing or Equipment Type	Aliso Canyon	Goleta	Honor Rancho	Playa Del Rey	Montebello	HARRF Biogas Demonstration Project	Is the Process Typically Used When Conditioning/ Upgrading Biogas?
Blowers	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Manage BTU Content in Product Gas					Yes	Yes	Yes
CO2 Removal					Yes (PSA)	Yes (PSA)	Yes
Compressors	Yes	Yes	Yes	Yes	Yes	Yes	Yes
H2S Removal		Yes		Yes	Yes	Yes	Yes
Hydrocarbon Dew Point Control	Yes			Yes		Yes (PSA)	Yes
Odor/VOC Removal	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pre-treatment Filtering	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RTO - Emission Control	Yes	Yes	Yes	Yes	Yes		Yes
Siloxane Removal						Yes	Yes
Water Removal	Yes	Yes	Yes	Yes	Yes (PSA)	Yes (PSA)	Yes

As the matrix shows, SoCalGas has experience for all of the major components required for biogas conditioning/upgrading using a PSA system.

The majority of the components typically found in a PSA biogas conditioning/upgrading system have been commercially available and operating in the field for decades. What has changed over the last decade is the focus on climate change and reducing of greenhouse gas emissions. This has created a premium for biomethane when used offsite at a RPS certified generation facility or for transportation fuel. This premium for biomethane has resulted in the integration of the various gas processing components listed above to produce biomethane.

V. SOCALGAS WILL MONITOR THE GAS QUALITY OF THE BIOGAS ENTERING THE BCS FACILITY AND THE BIOMETHANE LEAVING THE BCS FACILITY

As part of SoCalGas' Rule 30, prior to allowing biomethane into the SoCalGas pipeline network, SoCalGas initially obtains the gas analysis results of the biogas and treated biomethane prior to start up. At the time of start-up, the biomethane is tested for constituents and if any of the constituents are detected at levels where it may be a potential hazard, then the biomethane will be tested for that suspect constituent on a more frequent basis (e.g., monthly, quarterly) or continuous monitors may be installed. SoCalGas currently monitors the biomethane at the point of receipt with a hydrogen sulfide (H_2S) analyzer, gas chromatograph (for hydrocarbon [C1-C6], carbon dioxide, and nitrogen), sulfur speciation, carbon dioxide, and moisture and oxygen analyzers. The main trace constituent for biomethane is H_2S and that is monitored continuously with an on-line H_2S analyzer. The alarm is set at 4 ppm to deny access automatically to SoCalGas' pipeline network. Transmission will go to the producer site to verify and re-establish access once the H_2S concentration meets the 4 ppm limit. Also, a composite sample of the biomethane is collected monthly and analyzed using a gas chromatograph.

In addition to the monitoring and testing procedures under SoCalGas' Rule 30 for gas constituents, SoCalGas will have gas quality monitors to analyze both the biogas entering the BCS facility and the biomethane leaving the BCS facility. Since biogas typically has high concentrations of H_2S, CO2 and water, the BCS facility will have continuous monitors for those constituents as well as for other constituents that may be of concern. SoCalGas will also have valves with controls to divert the biomethane from reaching SoCalGas' interconnection facility should certain gas constituents not meet Rule 30 gas quality specifications. SoCalGas will monitor the gas quality data provided by the BCS facility on a continual basis to identify any trends, spikes and/or outliers. All of the expenses associated with the gas quality monitors and valves with controls for the BCS facility will be included as part of the BCS fee charged to the tariff service customer.

As stated on pages 23 - 24 of DRA's testimony, SoCalGas has had instances where trace constituents were introduced into the SoCalGas pipeline network and the majority of these instances happened more than 20 years ago. As such, advances in technology have enabled SoCalGas to add better monitors to measure and control trace constituents from entering SoCalGas' pipeline network. In looking at the instances which have occurred over the past 15 years, they are limited to CO2 and liquids/hydrates only. The instances related to the liquids/hydrates resulted in tighter water and hydrocarbon dew point limits in SoCalGas' Rule 30 and SoCalGas has not experienced any major or wide-spread liquids/hydrates issues since the change in Rule 30. And as mentioned previously, the SoCalGas BCS facility will have a CO2 continuous monitor for the biomethane (as well as a separate CO_2 monitor at the point of receipt facility under Rule 30) and SoCalGas will review the data on a continual basis to identify any trends and/or outliers.

This concludes my prepared rebuttal testimony.